

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

Interview with
Harold M. Agnew

October 10, 2005
Solana Beach, California

Interview Conducted By
Mary Palevsky

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The material in the *Nevada Test Site Oral History Project* archive is based upon work supported by the U.S. Dept. of Energy under award number DEFG52-03NV99203 and the U.S. Dept. of Education under award number P116Z040093.

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

Mary Palevsky: *Harold Agnew, thank you for meeting with me this morning. If you could start by just telling me your full name, place of birth and date of birth, and a little bit about your family background, that would be great.*

Harold M. Agnew: Harold Agnew. Born in Denver, Colorado on March 28, 1921. My dad originally was a stonecutter. Born in New York City; so was my mother. And as a stonecutter he traveled west, building courthouses; they were made of stone in those days. They ended up in Denver where he was, I guess, the foreman of the Civic Center there, which is a big limestone edifice, so to speak. He got sort of a form of silicosis which stonecutters got in those days, so he became a salesman for a roofing company called the Western Elaterite Roofing Company and that's what he did until he died.

We lived in South Denver. I went to South Denver High School and then the University of Denver, and then later on the University of Chicago after the war.

Right. Now was your dad born in this country? Were your parents born in this country?

New York City, both of them. He was born on Bleecker Street in Manhattan. I think his father, who had come over from Ireland, was a bartender. He had five or six sisters. And his mother died when he was a baby.

They were married—

In Denver.

In Denver.

I don't know much about her family. Her father was German but he actually was brought up in Britain. Her mother was Polish, but I think she was born in this country a long time ago. But I don't know anything about them.

Did you have interests in science or mechanics or anything like that when you were a kid?

Yes, I had a chemistry set. I always liked to do things with my hands, so I had a chemistry set and used to do things in the basement of our house. I liked to go fishing and hunting. It was different in those days in Denver.

Denver must've been a lot different in those days.

Oh, entirely different, yes. Cherry Creek was fairly close to where we lived and you could go there with your BB gun and walk along the creek. Now it's all built up with houses and things. We had a vacant lot next to our house and somebody said a vacant lot is part of growing up. There weren't any girls in our neighborhood, only boys. We dug caves in this vacant lot and covered them over. We'd steal potatoes from our house and have a little bonfire and cook the potatoes in the bonfire. I thought it was great.

You were born in '21, so Pearl Harbor comes and you're in college at the time?

I was just finishing college. I was to graduate in June or May of '42. Well, no, Pearl Harbor was '41. And Beverly and I, well, we'd gone through high school together and college together, and we both signed up to join the Army Air Corps as soon as the war happened. But we were told, or I was told, don't sign the papers. Wait. And it was in January that Joyce Stearns, who became deputy director of the Met Lab [Metallurgical Laboratory, University of Chicago], who had been chair of the physics department at Denver, was told that if he had any living bodies that could read and write and hadn't been drafted, to bring them with him. So I went with him in January 1942 to the Met Lab, and stayed at the International House. I had enough credits so I could just

graduate. I didn't have to go back. Beverly didn't, so she stayed back and then on May 2nd I went [00:05:00] back and we got married. I came on a Friday, we were married on Saturday and went on the train to Chicago, and Monday she went to work as the secretary for the head of the project, Richard L. Doan. And she was his secretary.

Richard L. Doan was the head of the Met Lab. [Arthur Holly] Compton was above that. He was in some sort of administrative position. But the head of the Met Lab was Richard L. Doan, who had gotten his degree at Chicago. Most all the guys there were graduates of the University of Chicago. Doan had gone to work for Phillips Petroleum, and he came and took over as director or whatever it was called then. Stearns was the deputy.

Right. Because I guess I always think of Compton as being the director, but you're saying he was even higher in the hierarchy.

He was higher than that. He wasn't really involved in the nuts and bolts of the organization—I've got an organizational chart someplace; the early one.

That'd be great to see. I'll make a note to ask you for that at some point. I can copy it.

I don't know where it is. I've got it on a slide.

Oh, really? Oh, that'd be neat.

Yes, but I won't give it to you.

No, no, I would make a copy of it.

I may have one. I don't know.

I talked to you a little bit about this before but it'd be interesting to go over again. You spoke the last time we met about how you really felt that you wanted to be involved in the war effort.

Sure. Everybody did.

And that when you got there you felt that this was satisfying that need?

Well, I didn't know what it was about.

How did you find out?

Oh, it was quite a bit later. Just did. People would say, What did you do during the war? I'd say, whatever I was told to do. It wasn't till maybe several months later that I started to catch on, because I was assigned to work in a group with Herb Anderson; Herb was one of Fermi's right-hand people. [Walter] Zinn, Anderson, and Fermi really ran the Met Lab. There was no question about who was in charge. Herb had the night shift on CP One and Zinn had the day shift and Fermi was in charge. There was no question about it. What was going on there and who was doing what was pretty much, even in theory, directed by Fermi. An illegal alien, he was called, so he couldn't be in charge, but he was in charge and the organizational chart shows where he fit in.

So they were called enemy aliens in those days?

Well, he was an enemy alien.

Because he was Italian.

He was an Italian citizen. And the only reason he got out was because Laura was—her family was Jewish, and he saw the handwriting on the wall. He was not allowed to leave but he got the Nobel Prize and he just kept going. He'd been negotiating with Columbia way before that, trying to figure it out. Columbia University has a lot of documentation on Fermi's correspondence with, I think, [George] Pegram at Columbia.

I think that's right.

And also even in some of his letters he says, Don't answer to my address. Send them to somebody else. Because evidently his mail was being watched. But Columbia had a thing for

him on his would-have-been-100 birthday a couple of years ago and they even put out a booklet of these letters between Fermi and Columbia, which is really interesting.

I'll get that. I'll track that down.

I don't know who was there—it was put on by the Italian something-or-other at Columbia.

I can research that.

Several years ago. I don't know.

What year would he have been born? Around—?

He was born—

Around 1900, would you say?

No, I think it's—he was either fifty-three or fifty-four when he died in either '53 or '54, so he was born in '01, I think.

So you're at Chicago and what kind of stuff do they have you doing originally?

[00:10:00] Well, since I had been working at Denver with—see, Denver had a direct tie with Chicago, because they have a cosmic ray lab on top of Mount Evans. The big nuclear thing at Chicago was cosmic rays at that time, so they had pretty good contact. I had been, I don't know how, but I'd become acquainted with Geiger counters and circuits and stuff like that, so they put me to work. I made Geiger counters at Chicago and also did a lot of things working with a radium beryllium source. We had no monitors or anything. That's how I sort of got cooked a little bit. But I just pretty much did whatever Herb wanted. I spent some time building CP-1, fooling with those big things of graphite, getting all dirty. So I did pretty much everything.

Right. Now at some point in that, you go back to Columbia, though, is that right?

Well, that was at the very beginning.

At the very beginning.

At the very beginning, when I arrived, I was immediately sent up to Columbia where Fermi was. Fermi was still at Columbia. He had a small pile there, and we did experiments on the pile, again doing what I was told to do. We'd irradiate Indium foils and then run down and count them and then run back, put in foils. Fermi did it with us. After about two weeks of that, John Manley went up there with me, too. But after a couple of weeks of that, things weren't going very well and they were going to do something to increase the hydrogen content of his pile, which had been evacuated to get the air out. He thought nitrogen was causing a problem. Elizabeth Graves was there. We were going to fill the thing with propane. There we are on like the fourth floor of Pupin or Schermerhorn or whatever the name of the building was, and here we're going to fill this thing with propane. It was a big thing, about an eight-foot cube. And Diz [Elizabeth Graves] said, Well, it's evacuated. We can get it in, but how are we going to get it out? It's an explosive mixture. So we didn't put it in and Fermi called Compton and said, I think we'd better come to Chicago. We'd better come someplace else. Then I guess Compton, or Sam Allison went to [Robert Maynard] Hutchins and convinced him that it was safe and we could use one of the racket courts, the squash courts. So we just moved back to Chicago and then started building a pile. I got to working on counters, working with radium beryllium sources, irradiating things, measuring, scattering a cross-section of paraffin, and things like that.

Now when you're married, then, where did you live with your wife?

We lived in the Blackstone Mansions, I think it was called; got an apartment there. And then from there we moved to a lady's house, Mrs. Bailey I think it was—she lived there but she had a big apartment or a house, I guess it was a house. We had a bedroom and kitchen privileges. She

was a funny old lady, she stayed out of the way. But anyway, we lived there until we moved to Los Alamos.

Right. So I know you were present at the chain reaction. You talked about that. Well, obviously by this time you know something—you know what's going on.

Well, I knew that but I still wasn't very clear about the bomb business. See, there was this argument going on between [John R.] Dunning [Jr.] at Columbia who said the emphasis should be on separating [U]235 and Fermi who said the emphasis should be on plutonium and the reactor. He was also busy at Hanford I guess, he and [Eugene] Wigner and Manson Benedict, they essentially designed the Hanford Works; Wigner, Fermi, and Benedict. Anyway, it doesn't matter. But they were the main designers of the Hanford.

People talk a lot about what an interesting person Fermi was, but as a young man and here's this European Nobel Prize winner, what were your impressions of him?

Well, you know, after the war, we couldn't find a place to live and he and Laura just took us in [00:15:00] with our daughter. We lived with them for three months. They had a problem in that Laura had not seen her sister since the war, since they left in '38, and this is now '45. No, it was '46—we went back to go to school. So she wanted to go. They had the kids, Giulio and Nella, and Enrico knew what we were looking; I was living with Herb Anderson and Aaron Novak, on his couch actually.

This is after the war.

After the war. I was living with them, on his couch, trying to find a place to live, and Fermi was aware of this. He said, well, why don't you and Beverly, and Beverly was still in Denver with her parents, you can come live with us because Laura's going to go to Italy and Beverly can run the house and you can take care of the lawn and whatever has to be done. So we just lived there. I was asking Beverly who bought the food, we

couldn't afford the food for—we can't remember who bought the food. Fermi never bought the food. Nella was just a little girl and Giulio was just really a little kid, so I guess Beverly did the shopping and maybe he reimbursed her or just gave her money, I don't know how it worked.

Now did you have a child at this point?

Yes. We had a daughter who was born in '44, so she would've been two years old.

And what's her name?

Nancy. She just retired. Her birthday was yesterday, the ninth. So what is she? Sixty-one?

Retired from what, may I ask?

IBM. She was some systems something. I would ask her and she'd say, You wouldn't understand. So I don't understand.

That's amazing. So the Fermis had a house, I guess.

Oh, a very nice house. They had a three-story house; upstairs was a ballroom, and once a month we would have square dances. He would invite kids. And I at that time knew how to call a little bit, so I would be the caller. Afterwards they'd have punch and cookies. But they were young kids, like Jay Orear who's been at Cornell. He was younger than I was, but he and a guy named Arthur H. Rosenfeld. I remember those two graduate students. And anyway, it was sort of nice. He liked young people. Fermi liked young people. I remember once when Laura came back, we still didn't have a house, so we all lived there. And they would once in a while have guests, and he would always say, Well, we need to get some young people. These people have to be "diluted." That was his word for some of his colleagues.

Right. Deluded. That's great. But you eventually found a place.

Eventually found a place in a carriage house behind a Kealey Beer mansion, so we lived there. It was pretty grim.

So once the war was over and you decided to go back to graduate school, in what ways had the war work influenced what you were deciding to do?

Well, I wanted to go back and stay in physics and Fermi said fine, come on back. He got me a National Research Council Fellowship which wasn't very much, \$125 a month I think, but in those days we could live on that. And we finally found a place. We had some savings. I made a deal with a guy who had a big house on I think it was Fifty-Fifth Street, I'm not sure. If he would make an apartment out of the back part of his house, I would pay for that and then he would prorate the rent. We had just enough till I finished my graduate work and got out of there. But it worked out.

But your undergraduate degree is in?

Chemistry or physics or I don't know what.

Chemistry. And you had said when I talked to you last time that if these things hadn't happened, you probably would've become a schoolteacher, is that right?

Yes, I was going to be a schoolteacher and a professor named Byron Cohn at the University of Denver who was a physical [00:20:00] chemist also graduated the University of Chicago said no, I should go on to graduate school. I'd gotten a scholarship or whatever you call it, a graduate thing at Yale and had been accepted, so I had a tuition thing to go to Yale, but then the war happened, so we didn't do that.

So people were aware that you had more potential than—

Something. I don't know.

So you're now in physics at Chicago, obviously.

Yes.

And how long were you there?

Well, I went back in '46 and I got a master's in '48 and doctorate in '49. In a hurry. It was a very terrifying experience.

Why?

Well, anybody could come, and you had to take an exam to see whether you would either get a master's or get out, or go on for a doctorate if you could find somebody that would take you on. And the exams were done without names; you were given a number, so the graders didn't know who you were either. In my class there have been since four Nobel laureates. And you're all competing unnamed for this exam. They dictated that—well, some people flunked and were never heard of again. Other people passed and got a master's and were told to go away. I was lucky enough somehow to pass and was told if you could find somebody that would take you on, you could go on. I went to Fermi and he said OK. But it was the most terrifying experience. Lois Garwin tells me that Dick [Richard L. Garwin] was even terrified.

Wow. That is terrifying then.

And he's not one of the Nobel laureates.

I know.

But we had [Tsung-Dao] Lee and [Frank] Yang [Chen Ning Yang] and [Owen] Chamberlain and [Jack] Steinberger. All subsequently got Nobel Prizes.

And they were all in that cohort?

All of us together. In fact I shared an office with Chamberlain. It was very scary because most of these guys had a master's. Not Garwin, but most of them already had a master's, so it was very unpleasant for me in graduate school. Terrifying. Everybody knew everything. I didn't know anything.

Well, you must've known something.

I don't know. I still get a worry about that, that whole thing, what might've been.

What do you mean?

What if you'd have flunked? What if you hadn't been, you know, what would you do? There you are, isolated in Chicago, a wife and a child, it was scary.

So the exam was for how long?

Three days. Written. They gave you questions each day.

Problems of some kind, I guess.

All kinds—I remember a problem in quantum mechanics, a problem in how to design a submarine to go so many feet down, another problem on they mixed two metals and they wanted to know what the melting point would be at a eutectic. Really strange questions, none of which, except the quantum mechanic thing, had anything to do with any of the courses we'd ever taken. Strange, strange bunch of questions.

You have to explain what a "eutectic" is.

Well, let's say something melts at 100 degrees and something melts at 50 degrees and you mix them together, they usually melt at something between those and that's the eutectic.

All right, and you have to determine what that would be.

You have to determine what that is. You know I couldn't do it now, but everything I did—that was one from my physical chemistry—I sort of had a clue on, and I think I did that one real well. The submarine one is just a matter of—it wasn't a submarine, it was a submersible to go down a couple of thousand feet. So you had to talk about the structure, and there had to be a person in it, so you had to be smart enough to say you have to have oxygen, you [00:25:00] had to get rid of the carbon dioxide. Really, really weird—for a doctoral exam, it was very strange.

And how long did you have to wait, do you remember? Was there an excruciating waiting time?

Probably about a week. It was on the bulletin board and it was a number. Just said the number: these numbers passed. I had a little slip that had my number. Wow. That's scary.

Wow. That's an amazing story.

Don't want to go through that again, ever. But the thing that amazed me was when Lois Garwin told me that Dick couldn't sleep, he was terrified, too. But he would walk out an hour early. We had a fixed time on it. He would always leave early.

Now he was Fermi's student, too, you were saying?

Yes, the two of us were students. We're still very close. In fact he called me last night but it was too late for me; I tried to call him today and he wasn't there.

I saw him a while back. I talked to him about testing and arms control. I wanted to ask about those kinds of things. He's a really interesting guy.

We agree on most things but some things we don't agree on at all. I believe in testing; he doesn't, or he says there's no need for it. I think he believes in it but he says there's no—he likes the CPB [Comprehensive Test Ban Treaty]; I think it's nonsense. It's things like that.

Yes. We talked about the treaty. So what was your work with Fermi? What did he set before you as your task?

Well, there was a beta ray spectrometer that had started to be built, so he said, why don't you take that over and see if you can make it work? So I did that and I introduced some novel scheme to try to see lower-energy electrons. Anyway, it was OK. It passed whatever the criteria were and it got published. Then I wrote up the thing in *Physical Review* about it or whatever. I think it was called "Review of Scientific Instruments," the thing that was written up.

A guy at Chicago, Cronin, Jim Cronin, he dug all this out. Somehow Chicago screwed up all my records. I've got my Doctor in Physics and so on, but they had me in some weird

category, so I wasn't listed as being a student of Fermi's. I wasn't a student of anybody's. Maybe Allison, and that was just nonsense. And at some conference, [Marvin] Goldberger wanted to know why wasn't I listed as a student of Fermi, because he'd been there and he knew I was a student. I said I didn't know that I wasn't. Well, after a long thing, Cronin finally dug out what had happened. See, I didn't stay to get my degree. I got it and left to go to Los Alamos. I didn't stay around. Anyway, he tells me it's all straightened out now.

So it shows you as a student of Fermi's at that time.

That's what he tells me, but you might talk to Jim. He's a nice man.

OK, I'll ask him. I've never met him. He knew my dad [Harry Palevsky] and I know who he is.

He got a Nobel Prize.

I know. Yeah. So I'll give him a call.

Give him a call. Tell him you talked with me and I was still confused as to whether this whole thing had been straightened out.

Will do. So what was it like for you doing that work? Did you enjoy it? Did you enjoy science?

Oh, yes, I always liked tinkering, I guess. Science in those days was fun. I don't think it's any fun today because they have teams and they're enormous teams and all the equipment you buy. You don't make anything, which people don't realize, even O-rings didn't exist. People [say] what do you mean, O-rings didn't exist? They must've come with the Ten Commandments. No way. There were no O-rings. We used a lot of glass. Vacuum pumps were made out of glass, diffusion pump. Everything was just different. It was fun. I just don't think it's any fun today, really. I guess if you're brought up with the way it is today, if you like it, you like it.

But you had different kinds of challenges along with—?

Yes, and today all the nonsense on security and all the nonsense on safety, you know, people [00:30:00] just paid attention. We had bad accidents: Louis [Slotin] and [Harry] Daghlian and had a bad one with Jim Kelly at Los Alamos.

What was the Jim Kelly one?

Oh, we were storing plutonium waste.

Now this was after the war or during the war?

After the war, when I was at Los Alamos. I guess there was a sludge buildup at the bottom of this vessel and he turned on a mixer and it went critical and he got cooked. It changed everything, the way people handle those things now. That was a vessel like this—

A few feet.

—and now all the vessels are like this, so you can't go critical. They're all—

Smaller.

—skinny things now.

I see.

It was just the geometry of the vessel that did that. Just no one had thought about that, that there could be enough plutonium in the sludge to actually—sort of like a water boiler. Didn't cause any explosion or anything, but it was just a high radiation field, and he was right there by a switch, I guess.

So back to the timeline. You get your degree and then you immediately go to Los Alamos?

Go to Los Alamos.

Now what was the deal there? Had you known that they would want you or you wanted them or what was the deal?

Well, they knew that I wanted to come back, and we went back. I joined P-Division. Dick [Richard F.] Taschek was the group leader. Art [Arthur] Hemmendinger was the deputy group leader.

I know Art.

Is Art still alive? We've sent him Christmas cards. We don't hear from him.

He is. I'll tell you, I saw Art and Peggy because they were friends of my parents and were actually in the car when my parents, at the end of the war, July '45, said they were going to be married, so they were friends.

I see. Was your dad at Cal Tech then?

At Los Alamos.

Oh, at Los Alamos. Because I know Art was a Cal Tech graduate.

Right, but this was in '45.

OK, I didn't realize.

Yes. So they were all in Los Alamos. And so my husband and I went up for dinner at the Hemmendingers' in that nice house they have out in Santa Fe and they were both in remarkably good shape, but they may not be doing Christmas cards anymore. I don't know.

Well they just—it's been two years in a row we haven't heard from them, so we didn't know.

Yes. They seemed in really quite amazingly good shape.

OK. How long ago was this you saw them?

The summer? No, six months ago. I was there in May.

OK, fine.

Yes, I'd say five, six months ago.

So you joined P-Division.

Yes. And stayed in P-Division until '50 when we decided to go thermonuclear, joined a thing called DIRX. I was the project manager, or project engineer I guess they call it, on the [Castle] Bravo shot. The two Runts were mine, and those were the ones that were actually stockpiled and named Mark-17, I think. [Operation Castle: Romeo, Runt I; Yankee, Runt II]

Yes, let me ask you about that because you have to explain to me what kind of work you did in P-Division first of all.

We just measured cross-sections on the Van de Graaff. Day after day after day.

And then when the decision was made to go thermonuclear, you worked on you said DIRX?

It was called DIRX. It was something that [Norris] Bradbury had formed under Marshall Holloway and that's the reason at least Teller says he left, because he couldn't stand Holloway. Neither could I, but he was my boss.

Why couldn't you stand him?

It was just the funny way he ran things. He was not a collegial guy. He never told you anything of what was going on. You know I had I guess been brought up under the Fermi school of everybody was on a team and you knew what was going on, and he [Holloway] just said, You just do your work and you report to me how you're doing and that's that. And all of us in fact, Ben Diven, myself, Bob Shreffler, Wally [Leland], we all didn't like him. Wally Leland, he's dead and so is "Shreff."

But you were all in that group, that DIRX group.

We were all DIRX. We were the four DIRX. See, there was Shrimp, that was Ben Diven, that [00:35:00] was the first one. Wally had Jughead, which was liquid deuterium, which was never tested. And Schrefler had Alarm Clock, I guess it was called, and it wasn't tested. Maybe it was tested. I'm not sure. I can't remember. The two Runts were tested and they went.

And what were they called? I mean I have the list here what they're called but you have another name. The device name is different.

The device names were Runt. Runt I and Runt II.

Oh, they were. OK.

Yes. I don't know why. And I think the first shot, Runt One, was Bravo.

Shrimp was Bravo, I think.

No, I think it was Romeo, wasn't it? I don't know. Maybe you've got it.

The first shot was Bravo. Fifteen megatons.

OK, then that's Shrimp.

That's what I thought, yes.

So then maybe I have Romeo. It was the second one.

Eleven megatons.

Yes. Does it say Runt?

No, this list doesn't give me that translation. And then we've got the Livermore one, and then three more, Union, Yankee, Nectar. But I can look up—

It doesn't matter. I've got it someplace. It doesn't matter to me. There were two Runts.

So explain to me, you're trying different configurations?

Where?

On these tests, these designs?

Yes, they were different. The first one had very highly enriched lithium. Shrimp. Mine was normal but had tritium in it. And then the second Runt had no tritium, and that worked fine too.

And you're saying that the ones that you did are the ones that went into the stockpile?

Mine was the only one that went in, in that era. I don't know, it weighed forty thousand pounds or something. It was ridiculous. It's a Mark-17. It's in the museum in Albuquerque. A big thing.

So talk to me a little bit about that project, and then you go out to the Pacific for all that stuff, so what was that like?

Yes. We were testing. Well, fine. Good food. Steak whenever you wanted and ice cream and strawberries. Cheap booze. Cheap Roquefort cheese. Crackers. We sort of just really babysat our device. It had already been built, put together. It was a on a barge. And when the test day came, the barge was taken over to Bikini; we shot at Bikini on that series. And before that I had worked on Mike, which was the first big one.

Oh, that's right. You had been out there for Mike.

Yes. I was working with Frank [Dunn], John Mosley, Bob Potter. We put the tritium in Mike.

That was our job. That was the big one. Scary.

I was going to ask you, what was that like?

Really scary. The heat from that was scary. Even though we were thirty miles away, it was scary.

That was a big one.

Now this is an obvious question, you must get this a lot, but when you're seeing something like that, are you thinking it's an experiment, are you thinking about what it can do in war?

No. Just hoping the heat will go off. And it worked. The main thing was, it worked.

Hoping the heat would go off, that's an interesting—

Yes, you worry, is it going to work? And it worked. That's fine. It worked. People ask, don't you worry about the sociological impact? I never have worried about it, never thought about any of those things. It was just we were in a battle, so to speak, a Cold War it was called, whatever it was, versus the Russians. It was rather sobering that the Russians actually had a deliverable

thermonuclear weapon before we did, and then they had tested the 60- [00:40:00] megaton, which was essentially clean by so-called standards, so it could've been 100 or more if it had been dirty. My gosh! That's one point where you go back—I was actually in France when all the Oppenheimer stuff [security clearance hearings] went on. Beverly, with Priscilla Greene had been [worked] in Oppenheimer's office at the beginning of Los Alamos when she—that's why I really went, I think, my getting cooked. And Oppy had seen her in Chicago and knew she knew a little bit about what had to be done, and that's why we went there.

To Los Alamos?

Yes. I think that's really the reason we went. Well, Manley needed people but it was sort of two for one of people that were already in the project and cleared and whatever was required, so it worked out fine.

Right. But you were saying that you were in France during the time of the Oppenheimer trial?

The Oppenheimer thing, and so I wasn't really involved in any of it. But I do remember that when I went first to Los Alamos and that would've been in '43, and then after the war when I came back in '49, there was this big argument going on about whether we should work on the thermonuclear. And the opponents of working on it were very close to Oppy. John Manley. Oppy wasn't there anymore, but John Manley was and John Manley had been the secretary to the General Advisory Committee, and was very close to Oppy even before the project started. He was sort of Oppy's gofer on coordinating experiments throughout the country. John Manley did that. And I was just appalled that we wouldn't work on it. And of course the major influence on saying no was Oppy. So if you read the testimony, I think Teller got sort of a bum rap in that if you read the testimony he says all good things about how Oppy ran the project. He also says that if he were going to choose somebody to do it, he would still choose Oppy. But then he says, 1

really wouldn't like him to be in a position of setting policy, or whatever it is. And I think that was because of his opposition to the hydrogen bomb work, which if we hadn't proceeded, really would've been a disaster politically. Between the Soviets, because of [Klaus] Fuchs, they knew what was going on and they actually, as I mentioned, had a deliverable thing before we did. So if we hadn't worked on it, you know as far as whatever the global politics are concerned, I think things could've really been tilted the wrong way.

So I think in that context, Teller was right. But immediately he became the *bête noir* of the pro-Oppenheimer people. I know [Robert] Christy wouldn't even shake hands with him and Bradbury sort of had a ruling that he was not to visit Los Alamos. So from that time until I became director, Teller was never allowed to come to Los Alamos, which I thought was ridiculous. As soon as I became director, I invited him to spend the summer, which he jumped at and came. I did it for several reasons. Whether you get along with him or not, you can love him one day, you can hate him the next day because he's a very dynamic figure. And I figured first, from an intellectual standpoint, he would be good for the lab. I thought as far as the troops there were concerned, the fact that he would wander around and talk to people, I thought, gee, you know, this is really good, because I could see the guys going home, telling their wives, you know, I spent a couple of hours with Edward Teller today, and this is just a good thing. He was a very stimulating guy.

But I did have a problem because I realized when I invited him that with Edward you [00:45:00] need a keeper. You need a keeper. And I wasn't sure what to do because you had to have a smart keeper, because you were trying to get a good impression as far as the lab was concerned as far as Edward was concerned because he was quite influential politically in those days. So I chose a guy, Jay [George A.] Keyworth, who had the intellect, the drive, and boy, they

got along just great. And of course then later on when Reagan was elected, I had put Jay on the selection committee when I left to—who was going to replace me. On the Board of Regents was a guy named Bill [William A.] Wilson who was Reagan's financial advisor, "kitchen cabinet" guy, and he and Jay got along famously. And of course Edward and Jay got along just great. So when Reagan was elected and the question came, who is going to be the science advisor, Edward and Wilson said hey, this guy Keyworth is—so Keyworth got to be Reagan's science advisor and moved to the White House. And that's how that happened.

That's an interesting story.

Yes. And Jay knows it. He's mentioned us a couple of times in speeches. But it all worked out. He worked out very well.

So there's two things that come to mind when you say this. One is specific to what you just said, which was Teller needed a keeper. You needed to make sure that what?

Well, to have a guy come to a place all by himself, you really need someone that says, oh, you should go talk to this guy, or, you'll find the work over here interesting. I would call him a programmer or whatever you'd call it. And it worked very well.

Now the other thing is, it's interesting to me talking to you about your career because now in the fifties you're given this assignment to work on the Pacific shots, and then by 1970 you're the director of the lab, so let's fill in there so I can again understand what happens. And also I assume at some point, did you work on any tests in Nevada?

Oh, yes, all the time. I seldom missed a test. Well, let's see what happened. In the fifties I worked in—I also got elected to the state senate. I was our first state senator. And that was hard because I had to take vacation without pay. You got five dollars a day.

You were a New Mexico state senator.

State senator, yes.

And when you say the first—

We hadn't been one [a county]. Well, I had been president of the school board.

OK, so you were politically active is what you're saying.

Yes, but we had a problem because under state law, school board superintendents were elected, and the community of Los Alamos wasn't for that. They expected a very high quality person, and if the person had to run for an election with a limited term or whatever, the local pool, let's say, wasn't very—it didn't look like it would be a good thing, so as school board president I would lobby the legislature that we had to be—we were going to become a county. And we didn't want to be a county like the other counties, just for that one reason. Everything else, fine, but not—our school superintendent was to be hired by the school board, not an elected person. So we became I think it was called an H-class county. It was a different kind of county. Everything's the same except for that. And I would go down and talk to the people in the legislature. So when we became a county, our county commissioners asked me if I would be their state senator. So I was appointed, and then after two years an election came up and I ran again for that and was elected.

And then a couple of years later I was asked to go to NATO to be science advisor to what's called the Supreme Allied Commander. What a title. So we went, and we stayed there from like '61 to '64, and came back and I became the [00:50:00] alternate Weapons Division leader under Max Roy who was the division leader. Then he retired and I became the division leader. In '70 I guess it was, Norris decided to retire and I guess you'd say I competed for it, you know, the university had interviews of candidates. I was elected director and I stayed till '79, and then I came out here [California].

I had problems with the university. I wanted to pay people more than I got. Highest salary then was \$60,000. Big deal. And I objected, I said there were some people, some of our technical people that I thought were really crucial and they ought to get more money. For instance, like Conrad Longmire who jumped ship, he had five or six kids, and Norris wouldn't pay him more money. So he set up Mission Research or whatever it was called, did very well, and he's still around, still active, and lives in Santa Barbara, I think, or someplace out there. We correspond.

So—I forgot what I was talking about. I got distracted.

Well, you were saying that you had a problem with the university.

Well, yes, the president of the university, a guy by the name of Dave [David S.] Saxon did not approve of the university doing weapons work. It was that simple. It was just that simple. And I could put up with that because we had a mandate from the government, but when I wanted to pay certain people more than I got, or as much, he wouldn't approve it. So I was in Salzburg [Austria] at the time, at a conference, and he called to tell me no, he wouldn't approve of those salaries, and I said, *Fine. I quit. So I quit.*

Is that what happened?

Yes. Just like that.

Interesting.

And I said I'd leave in three months, give me some time. Well, it took longer than that. But as soon as that word got out, in the same day I got three calls, all from La Jolla [California].

General Atomics, Freddy de Hoffman called, came to the house. [J. Robert] Beyster called from SAIC [Science Applications International Corporation]. And somebody else. All from the same place. Would I come? So the General Atomics one, Freddy was more persuasive. It was a smaller outfit. So we came out here and so far have lived happily ever after.

OK, so we have to go back now and fill in some details here. What did you think of Bradbury generally?

Oh, I thought he was first-rate. Absolute integrity. Almost too honest. But absolutely a first-rate person. No pretentiousness. Very fair. Put up with terrible bureaucrats in Washington. No, he was just a first-rate person. He stayed too long. Twenty-five years is ridiculous. If you take a leadership job, if you can hack it, you ought to stay five years, but no more than ten, because there are things you want to do and you've either done them, or if you haven't done them in ten years you're never going to get them done and you're out of ideas. So let somebody else come over. So my almost ten years were up and it worked out. But Bradbury was great. He was always fair to everybody. The reason he didn't retire, quite frankly, was the housing there was owned by the government, the director's house, which is very nice. Had he retired, he would've had to leave. It was that simple. So there were some hearings and they were going to sell the houses, but they weren't going to sell the director's house. So I started a little campaign. You can say, well, there's ulterior motive here. I didn't know whether I'd get the job or not but I made a strong pitch that the director's house should also be sold. The provision was that when they sold the houses, people who were in the houses had the first chance to buy them. So this made it perfect. Norris got his house and then [00:55:00] some months later he decided he would retire. But that to me was the key. And I think he would've retired earlier had he had a place to live. But this wasn't till '55. I think it was '55.

He retired in '70.

He retired in '69.

He retired in '69. OK.

Yes. And the house sales were a little before that. But I'm convinced that without the house he couldn't have retired. I don't know what he would've done.

But during that twenty-five-year period, huge changes are taking place in the whole—well, you're going from the three bombs to this whole—

Big production, I know. He had good people. He had Max Roy in Production. He had Jane Hall in Production who ran the production business for him. Our people set up Rocky Flats [Colorado]. You know originally we did everything. We did the explosives. We did the plutonium and uranium, all the manufacturing, big shops. He did get rid of all the electronics using firing setup to Sandia. That happened right after the war. And that was Norris's doing. Anyway, he was first-rate.

I'm going to jump back a little bit also: when you say that you're designing this device for the Pacific tests, for the thermonuclear tests, is that something that comes down from Bradbury? How does that work?

No. Primarily the design was—well, first was George. Then there was Mike. And then, come on, eighty tons? It's got to be smaller. And so it was in T-Division. Carson Mark, George Bell, Walter Goad, those guys were the main guys, Al Peasley, designing—they were still awfully big. That was one interesting thing where I got in trouble with Holloway, I guess, in that I thought we were doing the wrong thing. The first test, fine. But our plans for the future, they were crazy to continue this Mark-17, the Runt thing. So I wrote a long letter to Bradbury saying what I thought we should do. Well, I didn't clear this with Holloway but I got [Hans] Bethe to co-sign it with me, which saved my ass. Otherwise I would've been fired for insubordination. That's the way Holloway was. At least that's what Max Roy told me. He said, *Boy, you were smart to get Bethe.* Bethe's such a nice guy. He would sign anything. It was reasonable. And it wasn't

confrontational. It just said we should do certain things, and actually it came to pass that the first things were modified according to what I had suggested, and then we went down and made much smaller ones after.

In layperson's terms, what was the issue at stake here?

I just said they're too big for the military to carry. Just way too big. Twenty tons? Come on. One per airplane? It's too big. Well, also, I objected that we were starting to tool up to make these things. Now it's an interesting point: Holloway became vice-president for American Machine and Foundry which were making these big things because they were the only ones—they made railroad cars and tanks and stuff. So there was a—that came to pass afterwards. But obviously he was not an advocate of "let's make small things." It's an interesting letter. It was never classified, and then I got it declassified, and now people say it's classified. Well, I don't show it to people.

So if I look for it, I won't be able to find it because it's classified.

[00:59:49] End Track 2, Disc 1.

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

I had a question about what you were saying about Holloway and the size of these things, because it's connected to this question about doing the science, the physics, the engineering.

I can probably get you a copy of this letter, but the problem is, today people are so ignorant that they don't know what's classified and what isn't, so they classify everything. They just save their behind. It's better to say no. You try to get something done and they say no because it's easier to say no than to worry about having said yes. I've got a copy of this Bethe letter. It doesn't say it's declassified but it was never classified. There's one little part that the classified guy, Bob Krohn

is his name, cut out, just scissored it out and said the rest of it's fine. But you can see the argument for why we should not do what we were going to do.

Right. I'd love to see it One of the things I like to do with these oral histories is include some photos, include copies of the unclassified documents that people refer to.

Remind me. I think I know where a copy is.

OK. All right. I'll remind you before I leave.

[Showing book: John Coster-Mullen, *Atom Bomb: The Top Secret Inside Story of Little Boy and Fat Man*, self-published 2004]

I started looking at it and there are drawings in there that are absolutely correct. Detailed drawings. I copied one of the drawings, scanned it, and sent it to Los Alamos and said, Aren't there some things here that are still classified? I know they were. I got hell. Their e-mail police called and said I had to clean out my computer and all sorts of things, and I was told, You can't do that over e-mail. If you want to send us something, do it over the phone or fax it. And I talked to this guy, he was out on Tinian with me [for sixtieth anniversary of atomic bomb missions].

This John Coster-Mullen.

Yes. I said, How did you do this? And he said, Well, you go to the archives and you get a little bit here and you get a little bit there and you can put the whole thing [together]. But he's got everything exactly: dimensions, materials, and things that have been really classified.

Yes, I'm seeing the drawings here.

No, but there's a detailed drawing of the—anyway I was—

OK, I won't know it if I see it.

I was told, If anybody asks you, you're to say, "no comment." Just no comment. And then the lab said, well, they wouldn't prosecute me or whatever it was this time, but from now on, no e-mail, only fax or over the telephone, not cell phone and not cordless phone, if I have any questions. Really weird. And then I talked with John Coster-Mullen and he said, Everything's gone. They've cleared out everything in the archives. Everything's gone. I don't know where it's gone, but it's gone. It's not accessible anymore.

So he got this stuff from the Los Alamos archives?

Well, Los Alamos—

Probably everywhere.

Everywhere. Mostly Washington archives. He's a very interesting guy. But it's funny. He describes, you know, he has this night run, ten hours [in his truck], and he says he has nothing else to do. And he said all of a sudden—he actually went to Los Alamos, went out to the original test site and dug around and got some pieces of materials, had them analyzed, and that's how he put together some of the confluent which are still classified. And it's been a sore point with the Japanese, you know, there's been this thing that Bob Christy ran on trying to get the discrepancy between neutrons and gammas between Hiroshima and Nagasaki, and the Japanese have always insisted that there's material in the gun, the Little Boy, that we never talk about. They're right. And it's classified. This guy goes out there and digs around, he finds materials in the ground, brings them back, has them analyzed, and discovers this [00:05:00] material, and it's sitting here. That's what got me, and I just scanned this page, sent it to John Immele who was number two or head of the weapons program, just with the question, aren't there some things here that are classified? And I got hell for that.

Because you e-mailed it.

Because I e-mailed it. But I said, what do you mean? It's in the book. You can buy the book. He says, well, the fact that you said that it may be classified is what triggered their e-mail police. Some gal called me up, just frantic. I had to clean out my computer, turn it off. Hey, go away! So they're absolutely paranoid. And I don't know why.

Well, do you think it must be connected to the terrorism?

Terrorists. Yes, but so what? Everything's out in the open. Used to be all the critical mass tables were unclassified. Maybe they're all classified now. I don't know. But this book, from your standpoint, I think you'll find it most amazing.

I'll get a copy. I will get a copy.

He's a nice guy [John Coster-Mullen].

Yes. So let's talk about Tinian a little. He was out talking at Tinian too?

Yes.

Tell me a little bit about what that was. That was a reunion for the—?

Sort of a reunion. None of my guys were there, our pilots or anybody. But the guy there, the guy's name is Phillip [Mendiola] Long. He's a Carolinian or whatever you call them, the native. They would like to make some sort of a historical park or something out of the old airfield.

I see. So he's a native of the island.

He's a native. He's an islander. And so they had this sort of reunion and they invited some people. I got invited and there were a couple of the Marines who had fought the battle for Saipan and Tinian. There were two survivors from the [USS] *Indianapolis* [CA-35] there. And then there were a bunch of crewmembers; the pilots are all dead. The crewmembers are younger so they're still around, you know, like the navigator or the flight engineer or a tail gunner or a

mechanic. There were about twenty of us, all in their eighties. It was a nice affair. But the main objective was trying to get support for—they want the [National] Park Service to take over that area, but the [U.S.] Navy owns it and the Navy won't give it up. The Navy says we may need it for maneuvers or something. Anyway, that's what it was. It was about ten days.

Did it bring back memories to go back there?

A little bit, yes. Well, everything's gone, and it's all covered with jungle. It's most amazing. The runways are still there but everything else is gone. Absolutely gone. They took us to where the assembly building was; there was just some remnants of the foundation. The two loading pits are there and they built sort of a little glass thing over the top of them to present them, but they're still there, where the Fat Man and Little Boy were loaded. Everything else was gone, the headquarters building, just incredibly dense jungle. But there's a good thing. There's a guy, a professor at the University of Maine, Presque Isle, I think it's called, his name is [Anderson] Giles, who has put together a DVD called *Rolling Thunder*, which is very good.

About Tinian?

About the whole business, yes. It's very good. That seems to be his career work. He's a professor and his obsession is that base and what transpired there.

Right. Oh, that would be interesting to see.

It's well worth it. I had a copy but I sent it to my son. I don't have it. But it's called *Rolling Thunder* and his name is Giles, he's a professor at University of Maine, Presque Isle.

Great. I'll find him.

[00:10:00] He's very agreeable, very accessible.

Now let me just pick up with one other little piece about this discussion of Coster-Mullen. He went out digging around Los Alamos and he was able to do that.

Yes. Well, it's not inside the classified area. It's right along the road. I guess he was able to do it. And the interesting thing was, he's an amazing guy, he said, Well, I found this piece of material, and he said, it's sort of curved on the top, so he said, I took it to a, and I didn't even know this machine existed, and he says, you go ding, ding, ding and it gives me the curvature. And he said, I'm thinking about it and I'm driving this night and, he said, all of a sudden it came to me, he says, [makes high-pitched noise], he blows his horn, he describes this. Very, very articulate, very interesting truck driver. And he made life-size models of the Little Boy and the Fat Man. He did it. And had them out there. I don't know where he gets his money or how he does what he does.

He had them out at Tinian?

He had them out at Tinian. They were too big to get into the hotel because they're big. The guys at the lab know about him, but they won't talk about it. It's very interesting. I had never heard of this, and he gave me his book. But he's well worth—

Now so that means that he's finding stuff up at Los Alamos where tests were done up there, so there were tests that were done up there in addition—

Well, in trying to design Little Boy, the thing was to make it stay together, and I guess sometimes it would fly apart so that there would be pieces. Nothing nuclear or anything. That's why it isn't in a classified area or anything. There's no nuclear material whatsoever.

It was just explosions?

No explosives. It's a gun. It's just that they wanted the projectile to stay but sometimes the thing would break and parts would go flying around, and I guess he found some little parts. But it's an amazing story. He's worth talking to.

Yes, he sounds really interesting. And I missed that. I see it was reviewed in the Bulletin. I missed that one.

I don't know.

I've got the information.

Anyway, I don't know where he gets the money to do this. I simply do not know. And he gets all these pictures, all these documents. You know, he's an amazing guy. I don't know how he puts this all together.

Well, he must be really smart, and then he's really interested in—

He's really interested, but as far as I know, he has no background in any of this. And it's so funny, when he describes what he does. He has this standard run, and this is his hobby. A standard run from Chicago to someplace with a load of tomatoes or something. But see, here we are, he lists all the people, all the crews. He even got my name right. Here we are. [Luis] Alvarez, Agnew, and [Larry] Johnston on *The Great Artiste*. Got all the numbers and everything; all the plane numbers. It's really an amazing bit of research for a guy that's a professional truck driver. It's mind-boggling to me. Very sociable guy. Anyway, you got where he is.

[Recording paused and resumed mid-sentence]

—the Fat Man was like. Got in a terrible argument with Edward once.

Tell me about that. Teller didn't know what the Fat Man was like?

No, Teller thought it was levitated instead of being solid. I had a terrible argument with him once back in Washington. It was so convincing that I got terrified. We're in this meeting and what [00:15:00] we're worried about was what did we think the Pakistanis and the Indians had done. And somehow the discussion came up about Nagasaki. There were maybe twenty of us in this meeting at one of the fancy agencies back there. Edward's describing Fat Man and I said no, it

wasn't that way at all. It was solid. It was solid, no levitation, solid. No. Boy, we were going at it. At that time he was in his Margaret Mead time; he walked with a big long stick. And we were really going at it. And he says, Let's go outside, out of the meeting, Whoo, he wants to step outside, you know. So we go outside and we're arguing and making nothing. He was so convincing, I thought, well, gosh, maybe I'm wrong. So I called the lab and was able to talk to Max Roy who was still there, and Max says, No, you're right. And he says, Actually if you read [Richard] Rhodes' book, he says, you'll see that Teller was not involved at all in the design of the Fat Man, it was strictly Christy. And Teller was with the people working on thermonuclear and trying to go super. So he didn't know. He really didn't know.

Now what's levitation? I don't understand.

Well, that means you have a free run, sort of like you want to chop a piece of wood, you take an axe, you can put the axe on top of the wood and push hard, or you can swing, and when the things are levitated, you're swinging. You have a free run and the thing come past you. But this thing was solid. There was no free run. And it's described in here as solid. It was funny. Funny things happen. How are we doing?

We're doing fine. This is very interesting. Let's go back to some questions I had. You've talked about the Pacific and Castle test. I'm not sure if—I'll ask this now. One of the questions that's raised with your thing with Holloway about the size is how much people are thinking in terms of deliverability if the thing's too heavy.

Well, I was always interested in that. I don't think he was. I don't know.

In his case, would you say—I'm asking—more the science?

No, I think he felt—maybe I'm being unfair; he's gone—he was looking ahead to going with American Machine and Foundry and they were going to make these things. He was leaving the

lab and there was no sort of future what we were going to do. That wasn't on his scope or thinking.

So they would've been deliverable even at that size.

[Mark] 17 was deliverable. It was in the stockpile. It was deliverable. We even had Jughead experimental and it was liquid deuterium, flying around. Real ones. And 17 was deliverable. I think it was a B-36. It was a big airplane. It was deliverable. It wasn't clear we could get away from it. That's when I conceived the idea of getting parachutes on things. Interesting story.

Tell me that story.

Well, if 10 percent of the yield came out in thermal from this 10-megatonish thing, the distance that the—I forget what they were—B-36 or something, would be away, they'd get cooked. Their skin might melt. So first thing we did was talk to the [U.S.] Air Force. They painted the bottom of them white to reflect some of the heat. But I had seen a movie of a German dropping a tank from an airplane on a parachute. And this was after the war. And I found out who the guy was that invented the parachute. His name was Knecke. He was a German. Found out he was in El Centro, California. Like [Werner] von Braun, we had grabbed him. He was down there. So I called a guy named Colonel Paul Butman who was in the Division of Military Application—he was a colonel—told him that we're going to have a problem here. [00:20:00] Maybe this guy could help. So he came out with another guy, can't think of his name, who became head of the FAA [Federal Aviation Administration] later on, in a B-25 to Albuquerque, and I met him there and we got on the airplane and I flew in sort of a jump seat. There was only room for two people in that airplane. We flew down to El Centro and we met with Mr. Knecke but we couldn't really tell him anything. We wanted to know how he had invented what was called a ribbon chute, and how heavy a thing did he think he could design a chute for and how big might it be. And he told

us he thought that they could do this and it would be so-and-so. So then that's how the Air Force took over the parachute business for our bombs. Then from there on they've used parachutes for if you want to deliver something on the ground from a low-level airplane, they can shoot out a parachute, and also now on the fast jets for landing, they shoot out chutes behind the airplanes. And all this started with this guy Knecke at El Centro as result of Paul Butman and myself going down there and finding out about it.

OK, a couple of questions. The point is, just so I'm clear on this, if you have a thing on a chute, it goes down slower and the plane can get away.

Has more time to get away.

And about Knecke, was he working for someone in El Centro or was he just living?

No, he was with the Navy. There's a big Navy base, El Centro Naval Station, and they had grabbed him, the Navy was interested in parachutes. He was part of the, you know, like von Braun at Huntsville. They were government employees, I guess it would be. He wasn't a prisoner of war.

Right. So does that mean that—this is something I didn't know—that the design for the dropping of a lot of these things uses parachutes in theory for dropping—?

In those days we hadn't thought about that, it wasn't our business. It's in my notebook someplace, which is in the archives, where it's showing that if a 10-percent yield comes out in thermal, you got problems, delivery problems, to get away from that. Anyway, that's how the Air Force got into the parachutes. The interesting thing, there's a big book that's put out annually on parachutes.

Anyway, I used to get involved with a lot of things. I got involved with the Chinese in a strange way and got to know them, their guys, all not official, not government-sponsored or

anything, and got to know their head designer whose brother, by the way, lives in San Diego and was chief of staff for the Taiwan Army. Very interesting. And this guy is Red Chinese, of course, head of their weapons program. A graduate of Yale. A very interesting guy. Anyway, through some contacts, they did a test on a parachute. The parachute failed and it fell onto the ground. I don't know how we knew it but we knew it, someone was telling me about it. So I got one of these parachute books and mailed it to my friend, the Chinese guy, and said, *This may be useful for you. I get an answer back, You sent me last year's. We have this year's. They had everything. They are in our knickers and there's maybe one under the couch. They have every bit of literature. The first time I went—and they're very polite in their rubber-hosing, you know, I try to learn something, they try to learn something, all really unclassified but you learn a lot from listening to their questions. You know what—and one thing they said, what is the formula for skinny steel?*

I said, *There's no such thing.*

[And they said], *Yes, there is. You use that. What is the formula for skinny steel?*

[00:25:00] [And I said], *No.*

And they brought out a lab bulletin about the Nevada Test Site and it says, *The bombs are lowered on this skinny steel tower. They had read it literally and translated it as an adjective. Skinny steel. What's the formula? Why do you use skinny steel? What's skinny steel? It's so funny. So funny. I had lots of experiences like that with them.*

Now what era is this when you're doing things and how did this come about?

It came about in a funny way. There's a guy named K.C. Wang, I think was his name, who is a physicist who, I don't know, was associated with the University of Oregon. People knew him as a physicist. They didn't know that he was number two and the head of their—it's called Machine

Ministry, which was where their nuclear weapons were. They didn't know he was a big shot there. And somehow I had met him. And then when the head of China came to the United States for the first time, that little gnomy guy, I don't know what his name was. Ping?

Deng Xiaoping?

The little guy. Funny little guy. For some reason I think I was director of the lab then. I was invited to meet him, to a reception. Well, I went, and I went through the line, you know, met him. K.C. Wang was there and I had met him at GA [General Atomics] earlier. He was interested in reactors and things, and he was a scientist, no weapons connection as far as anybody here knew. And lo and behold, who else is there but Frank Yang, Noble laureate, classmate of mine at Chicago, whose wife's father was the head of Chiang Kai-shek's army. He lost, OK, but—so they were in that circle. And I think that's how I got invited was Frank Yang. And K.C. says, *Why don't you have dinner with me?* You know they had a buffet and it was this fancy Ritz Hotel or whatever it was in Washington. Anyway there were several of the little side nooks. So I [said] OK, let's see what's going to happen. I go there and have dinner with K.C. Wang and a couple of other guys, I don't even remember who they were, and K.C. wanted to know what my interests were and I said, you know, defense science. And he says, *Oh, well, that's nice.* And then I got an invitation from a guy named Yang Fu-Jia who was president of Fudan University to come give a talk. So I was going to a fusion conference in Japan for GA at the time because we had a big cooperative program with the Japanese at General Atomics. So I said, well, I'll go across to Shanghai and I'll do this. So Beverly and I went. Well, Yang Fu-Jia is there, the president of the university. He meets us, and out of the woodwork come six guys, and Fu-Jia is terrified. He was a young guy then. This is 1970, I guess. I'd just come out here. And obviously he was terrified.

Seventy-nine, probably, if you were out here?

Yes, it was '80; '80, '81, that time period. I'm sorry. And Fu-Jia's obviously terrified. He knew sort of who these guys were in the sense that they were in the military or something, or spooks or something, but they weren't his. And I sort of sensed what was going on. And he says,

[00:30:00] I don't know these people. You don't have to go with these people. I don't know who these people are. And I said, No, it's OK. We'll play. And so he got introduced into this business for the first time. It was very interesting. Two years later I went back. They wanted me to come back and I said, OK, but I'll only go if I can go to Lop Nor. Nobody had ever been to Lop Nor.

What's Lop Nor?

That's their test site. Way out in Urumchi. It's the beginning of the Silk Road in China. Way out in East Jesus. So he said fine. Beverly's going to come. Fine. So I go there all on my own, now. This is no government crap. I'm out there walking in their tunnels.

You're kidding me.

No. We flew to Urumchi. Interesting thing: all the license plates there started with 32, which is what Los Alamos license plates start with. To me the whole thing was a riot. Anyway, they told Beverly she couldn't come with me but they would take her to some place. Well, they took her to a town, I can't think of the name of it, it's not Urumchi. Turfan, something. They took her to a wedding, to a place where everything is underground. I think it was called Turfan or something. It's on the map anyway. And so she was there for three days. They took very nice care of her. And I went off to the test site and walked in the tunnels and talked to their guys, watched them drilling holes down. Told them I was interested in geology. I picked up some corings because our guys, for seismic coupling, wanted to know what was the ground there. We'd never been there

before. And they said fine, so I took a couple of hunks, brought them home, and gave them to the guys at Los Alamos to analyze.

But it was very interesting. I wasn't schooled in that because there were a lot of things I should've done that I didn't do. They wouldn't let me take any pictures. But I didn't pay much attention to where buildings were because later on when I talked to people, they had overheads from the satellites and they wanted me to identify this or that and I couldn't do it because it didn't occur to me. I was interested in the technical stuff; I wasn't interested in the spy stuff. But it was real nice. I stayed there. I was at a military base and they just left me alone. I could wander wherever I wanted, but I couldn't speak the language and they couldn't speak—I'd go in the kitchen and see what they were doing, you know, on this big military base, watching them making all this food and, I would just walk around.

Were there a lot of people working out there?

Oh, it had a big—I don't know, it's like ours. It's like ours. People digging tunnels. Just very interesting.

And why would they want you to do that or let you do that?

Well, they would ask questions, not specific but questions. Like the skinny steel. They knew about tritium. They would ask questions and usually I'd say I don't remember, which was a copout. But it was an interesting experience. Got a lot of interesting pictures of their guys. One thing I did which was good for them, maybe it wasn't good for us and maybe it was, they had me talk to the guy that was really the most powerful guy, Chang Aye-Peng, head of their army, head of the People's Liberation Army (PLA). Old man; he's gone now, I suspect. I think his name was Peng, Something Peng.

It was very interesting. I had a little notebook and what I did, whenever I went to a meeting I'd say, Please write down your name in English, write it down in Chinese, and say where you went to school. And they were very happy. They gave me [00:35:00] all this. Now of course when I came back here, this was very useful for people who monitor things because they knew where these people were, what they were doing, and they could follow their correspondence and things, so it was very useful to have. These were the players. The same as if you got a telephone book from Los Alamos, these were the players. They had our telephone book; why shouldn't we have theirs?

Anyway, it was an interesting experience. Yang Fu-Jia, who is now really a big shot—I think he's number two in science for China. He left president of Fudan. I got Jay involved with him, Keyworth, and he's been there several times and he's very close to Fu-jai, more than I am. Fu-jai stayed here with his wife one night. I have a standing invitation; they'll pay my way if I want to go back. It's too far and I don't want to do it and Beverly, it's too hard on her. We went to Italy where I had all this problem [with eye]. That was hard. Transferring is hard and sitting that long is hard.

So what's your philosophy then with the Chinese regarding nuclear weapons? Well, it's obviously good to be talking to each other.

Yes. We have mutual respect. One thing that did upset me, they were interested in the permissive action like the PAL [Permissive Action Link] stuff, which is something I invented, the president's little black box. I did that.

Tell me about that then. I don't know that.

Well, I went on a trip to Europe with the Joint Committee on Atomic Energy, and that was when we had something called Quick Reaction Alert, QRA. And all the NATO nations had our bombs

on their airplanes on the ready five minutes. If they got an alert, they had it all preplanned where they were going to go, all external carriage in Mark-7, F-47-F airplanes, four airplanes, and the Belgians had them, the Germans had them—that's where I got upset—on the runway, ready to go.

You didn't want the Germans to have them?

Well, I didn't want anybody—well, it was funny. See, they're our weapons, and what's to prevent them from taking off? We had one soldier with a rifle on the enemy base. And I remember I went up and talked to this one kid, you know, a kid, eighteen, nineteen years old, and I said, what are you supposed to do?

He says, well, I'm guarding the weapon, sir.

[And I said], what are you going to do if these four pilots come out and get in their airplanes and start to do something? What do you do? I said, what are you going to do? Are you going to shoot something?

Well, it's obvious that this was ridiculous, so when I came back I wrote a long report. Bradbury put a cover letter on it and sent it back—I have a copy of this—which says, hey, we can put a lock inside, an electronic lock, so that unless you have the code for the lock—it's simple now. You have a home security system. You have an ATM machine. At that time it was a big deal. And so we started this program of what's called permissive action link, and that's how that started, you know, the president's little black box.

But coming back to China, as soon as they got a thing, I suggested we ought to help them in this context. It's not classified. It was not classified then.

As soon as they had a weapon?

Well, they're in the business, so actually the people—well, example. Here's India and Pakistan. They get a bomb. What do we do? Sanctions. OK? Bad boys. What we should've done is said,

OK, you guys are big shots now. You're a part of the nuclear community. You have responsibilities. But you have a problem, Mr. Head of Pakistan or Mr. Head of India. You have a nuclear weapon but you don't have it. Some sergeant has it. Especially in Pakistan. What's to prevent some guy saying, what was the movie, "The Mouse that Roared?" You don't have control. [00:40:00] You should have this type of a—to prevent unauthorized use, is what I call it. Well, they evidently had—we refused to help them.

Maybe two months ago I was in a meeting in Washington. Well, they had a thing on Trinity; July 16, celebrating Trinity [sixtieth anniversary]. And Linton Brooks was there, who's a big shot. And afterwards—well, actually I disagreed with what he said about testing. They're going to develop this RRW or whatever it's called and we're going to stockpile it without testing. Nonsense. But anyway we were all supposed to talk about something. I said, To me, the problem today is the problem of—not proliferation, that's going to happen—but the probability of unauthorized use. And so I went up to him again and I said, Why don't we try to get the Indians' and Pakistani's help in this technology which isn't classified? He says, Well, we can't because it's not allowed under the Nonproliferation Treaty [NPT]. How do you like that? Now I hate the Nonproliferation Treaty. From the very beginning it's a license to steal. You give them all the information they want, and whether it's peaceful or nuclear, there's no difference, just how you apply it. But they get everything they want by just saying, "we won't build a bomb." But then they can say, well, we've changed our mind, get out of the treaty, no penalty, no nothing. And this has been an objection of mine and also Senator Stuart Symington from the very beginning, saying this is a "license to steal;" it's utter nonsense. And now it's backfiring as far as Iran is concerned. North Korea said, oh, we punt. Nothing happens. It's just nonsense.

And you thought that from the beginning.

Very, very beginning. But the fact that you can't give them technology to prevent unauthorized use because of the Nonproliferation Treaty, that's—Linton Brooks said attorneys in the Department of Energy have said this is the ruling. You cannot assist them because it's contrary to the Nonproliferation Treaty. It's ridiculous. Really ridiculous.

Well, it sounds like the intent of the treaty isn't being borne out. I mean obviously that wasn't the intent, to prevent them from having unauthorized uses.

It doesn't have anything to do with us. The intent was they weren't supposed to have any weapons, but once they have a weapon—and they never signed the NPT, so why does the NPT apply in this particular context? I just think it's ridiculous.

I'm going to take you off track here a little bit but how did Pakistan get the bomb? I mean do you know? That's always curious to me because—

They evidently have centrifuges and enriched uranium and built bombs. I don't know. I've been out of the loop so I don't know what the—it was underground testing so we don't have any samples, but I think they do have—well, this guy [AQ] Khan or whatever—

Khan, I think, yes.

Khan was selling centrifuge technologies to Korea and all over the map.

Right. Forget I asked that question. That's a little off the subject. So you invented that little black box.

Well, I conceived the idea. I convinced the Joint Committee on Atomic Energy that we should do this. It was done with a guy named Don Cotter and the reason Cotter was involved was that when I went over there, I was concerned about safety matters on the Mark-7, which is what the bomb was that we had deployed, and he had been the project engineer at Sandia on the Mark-7, so he was the natural guy to go to. And he was a very bright guy, picked us up immediately, got the

Sandia guys to working on it. We made a breadboard unit, brought it into the Joint Committee, the two of us, demonstrated it. Didn't work but we didn't tell them. Everything was screwy. We had gone through a rehearsal, how we were going to do this, and I would say, OK, arm it, and I would say, Now watch, the red light will come on, but the green light would come on. So what we did, instead of my saying, I would tell him OK and he would do something and then I'd say, see, the green light, that means so-and-so. So we worked it backwards. And a guy named Jim Ramey who eventually became an atomic energy [00:45:00] commissioner but at the time was staff director at the Joint Committee [on Atomic Energy], and he ramrodded this thing. So you'll read something that says he invented it. Well, he really didn't. It was my coming to Cotter and then we're putting together with this letter to the Joint Committee and then Ramey arranging for the hearings where we could make this demonstration. The military of course was tremendously opposed to this.

Were they?

Oh, yes, two reasons. First was you don't trust us. Second, what if we don't get the code? And I said, That's the point. You're not supposed to go unless you get the code. What's the difference from the code then from somebody saying, OK, go. This is much better. There was one guy, name was John D. Stevenson, major general, Air Force, who liked it, and the reason he liked it, he was a tactical guy, and he said, with this, I can deploy. I can deploy with weapons, disperse my forces, and I don't have to worry about somebody using them. Without this, I have to keep them under lock and key. I can't disperse. I don't have any flex[ibility]. So he understood it from a different standpoint.

That is so interesting. Now again, what years—is this the sixties, then?

This would be like '58, '59, '60. I can give you a copy of this letter that started all this. It's interesting.

That's very interesting.

And it's always sort of pissed me off, there was these guys, like [Sidney D.] Drell just got a big prize for his work on nonproliferation.

Did he?

He got the prize, but what does it mean "working on nonproliferation"? Tell me what hasn't proliferated. And I always thought, gee, coming up with the idea of the little black box is more important. You know it's real. How are we doing?

We're doing fine. When do you have to stop?

I don't know.

I have some specific questions.

Let's try to wrap it up, OK?

About the military, since you brought it up, and maybe we can go till around noon, would that be OK?

That's OK. I have to do some things.

Yes. Let's do like maybe twenty more minutes. Because you brought [up] the fact that the military didn't like it, and I wanted to get to your directorship of the lab, because in this dissertation that I told you about, this woman who did all this research up at Livermore, she said something about your relationship with the military as opposed to Bradbury's. And I wondered if it were true. She says, "Agnew's rise to directorship of Los Alamos corresponded with the laboratory's need to become more attuned to military customers who had grown in importance since its early days" [Sybil Francis, Warhead Politics: Livermore and the Competitive System of

Nuclear Weapon Design, 1995, UCRL-LR-124754, p. 170]. *I think her thesis is that more than Bradbury, you—*

Bradbury didn't even allow them [the military] to come. They could come up for a one-day visit. They couldn't stay overnight. I have no idea why. I have no idea why. He was a commander in the Navy Reserve. And that's where Livermore was very wise. They had trainees in the military. Norris wouldn't allow that, wouldn't allow any military staff members. Livermore did, and that's how they got in the Navy program, plus Teller, so they had the first Poseidon, the first thing. But then when I became director, we took over and we are now the Navy, the 76, the 78, the 88, everything is all on my watch. They were all done. And Bob [Robert H.] Wertheim was SPO then, [Rear] Admiral Wertheim. They had been just kept out of Los Alamos. Very strange.

Now when you go for the directorship, is this something—you're aware that you had this difference in philosophy with Bradbury, going in?

Oh, yes, but that never came up. You know when we had our interviews or whatever you call them with the university, Charlie Hitch was the president. He was a wonderful guy. I made [00:50:00] it very clear what I thought the mission of the lab was. It primarily was our military nuclear deterrent and science. And I said we're unique, it's a mission, it's just Livermore and ourselves, there's nobody else, and that's what we have to excel at. I think the other candidates had never been really involved in the weapons stuff; they were more science-oriented. Anyway, I got the job.

So the other thing that this document mentions—

Plus too, see, they [Livermore] had military staff members. They would bring in young lieutenants, majors, teach them the business. And then some of them, even like Carl Hausman was one of their early guys, first-rate guy. He joined the lab, was a real strong person at the lab in

the directorship there in his later years. But they had an inside—I'll call them "buttering up" the military—and we had a standoffish, look-down attitude on the military, which I didn't like at all, because they were our customers. To me it was why we were there. And the military said what they wanted in general, you know, they'd like more, higher yield, smaller, easier to handle. They were the customer, and how do you work with the customer if you just say, write it down, don't talk to me. It was ridiculous. So we started building and we took in a few military staff members, invited them to come up, and things just evolved.

She mentions your relationship with Ed [Edward] Giller. He was the head of DMA [Division of Military Application] at that point.

Yes. He was wonderful.

Yes, I met him. I interviewed him down in Albuquerque last year.

Yes, he was wonderful.

In what way?

Well, first he had a doctorate in chemistry from Ohio. He understood science. And I just liked his attitude. He was a fighter pilot. I just liked him. We got along fine. And he supported the lab and we supported him. He was just a good guy.

So how would that relationship work? Literally they would say this is what we're looking for—

Yes. Or we would try to find out. The Army, Navy, and Air Force used to put out books of their equipment and what was going to be coming down the line, what Northrop was going to build or what Boeing was going to build. And I'd look at the bomb bays and what's the carrying capacity, how big are things, so to get a feeling of where we should be, where we thought they would be asking, and to get our guys' early design work going. I guess that's what people in the business community do; what's the product, what's the car going to be like, what do people want, miles

per gallon or luxury. And so we tried to anticipate what the military would be asking for and have our homework done. There was always competition between Livermore and ourselves, which was good. We had done our homework.

I can remember, I went out to, I don't know who it was, General Schultz or somebody, and they wanted I think it was the Mark-12A. That's something the Chinese were really interested in, too. I don't remember what it finally became but it's in the stockpile. But I remember I said, Oh, you want to keep the same weight and double the yield. OK. Easy as falling off a log. Anyway this guy reported back to the lab, to the designers, and they're going, What do mean it's easy?! I said, We can do it. We can do it. And there were a couple of us got together, Harry Hoyt, Al Peasley, and somebody else. No, it was just the three of us. And decided how we could reconfigure things and repackage things so we could meet this, and we got it.

We got the 12A, and that was something the Chinese were really interested in. How did we do the 12A? I don't know how they knew about the 12A, but they knew everything. They didn't have any details but they knew. Whatever evidently was published in any form, they had, and I imagine still do. They don't need it anymore.

So you're thinking it's from publication, not from spies and things like that?

Well, it's a combination but I think it's mostly publications. That's what upset me so on this Wen Ho Lee thing which, you know, a senior person at Los Alamos said this could change [00:55:00] the global balance. So I wrote an article which got published in the *Wall Street Journal*, just saying a megaton is a megaton. The Chinese have megatons. Maybe theirs are red, ours are blue. Doesn't matter. This is nonsense. It's not the end of the world. Technology. Anyway. So the defense lawyers got me involved with—

Did they?

Yes. But I just said, it's not the end of the world.

Right. That's interesting.

But it's a good article in the *Wall Street Journal* at that time.

Yes, I'll find it.

Just saying, you know, they have competence. There's always a "not-invented-here" complex, at least we always had it. Livermore always had it. You know, you never copy the other guy; you always can do better. I think the Chinese were a little cleverer than that.

They don't care—well—yes.

Yes. Plagiarize. There's nothing wrong with—anyway. OK. How are we doing?

Well, if you can give me a couple of minutes I wanted to ask you about your views on testing because you've alluded to that a couple of times, and the Comprehensive Test Ban Treaty [CTBT].

Fine. OK. Let's say the Comprehensive Test Ban Treaty I think is nonsense. I think if we don't want to test, we shouldn't test. If we want to test, we should test, and you shouldn't have to go through a bunch of malarkey of breaking a treaty. There's always a way of doing it. But why go through all that crap? I like handshakes. We're not going to test, fine. If we decide to test, we'll let you know. That's all.

So you don't think that the treaty serves—?

Treaties are things that second-rate people in the government earn their living doing. They make a career out of the treaty. I mean if you meet them subsequently, they'll say, I was involved in the treaty of this or the treaty of that. Their whole life's work is wrapped up—and for the most part, I don't think they really give a damn as to what the treaty is all about. It's just doing the

treaty. It's like getting a little gold star from reciting your catechism or something. To me, treaties are nonsense. It's a career field for people. But if people don't want to have the treaty, they'll abrogate the treaty. There's no penalty clause in treaties. Now if you had a penalty clause that the president of the country who breaks the treaty or gets out of it gets his head chopped off, treaties might make sense. But treaties, there's no penalty clause. There's a lot of money, a lot of effort, a lot of frustration. It's nonsense. Just like the NPT.

On the CTBT, I think if we don't need to test and we think it—clearly it isn't going to prevent anybody else from testing if they want to test if we don't test. That's a myth. If any government feels they need to test, really need to test, they will. People aren't—well, obviously—I suspect that if Russia starts to test, and I don't think they ever will again, we politically might be forced to test. I don't know why. We don't need it now. But I don't think we should ever put anything in the stockpile in the context of the nuclear deterrent that hasn't been tested, and they're proposing to do that with this new whatever program it is, and I challenged Mr. Brooks on this at this meeting at the Academy. And I said, I'll give you an example. I said, every once in a while you have to have a key made. So you go down to the hardware store and you give them your key and they make a copy. And the guy looks at it, takes off the burrs, compares it, you look at it, and everything is peachy keen. And you bring it home and you put it up on the shelf, right? No. You try it. And about a third of the time, it does not work. It's a very simple thing. I call it two-dimensional. It's three, but it's really two-dimensional. It's just a little off the original. And you can look at it and you compare it and it doesn't work. And you take it back to the guy and he looks at it and compares it with the original, and he throws it in a bucket that's just filled with keys, and he makes you a new one, and you say, [01:00:00] well, what's in that bucket? He says, those are keys I made that didn't work. And I said there's a message there.

These things are much more complicated than a key, and if you're really going to count on it, you better test it. So much for that. So I just think—I've seen too many failures.

Of tests.

Of tests. Not a lot, but just one is so—and these are complicated things. Now maybe if you're going to make a gun with umpty-ump amounts of uranium, yes, you don't know what it'll do, what the yield will be, but you'll know it'll work. It may fizzle but still it'll do something. But the present multi-stage devices are really quite complicated and you shouldn't put it in the stockpile unless it's tested.

You had said, and I'll make this the last question, when I spoke to you many years ago, you had said the one thing about—I'm paraphrasing my understanding—that nuclear weapons are a different kind of weapon because for the first time a leader that actually uses that weapon can be killed.

That's right. He's at risk as well as the little doughboy that he sends off to do his bidding. And that, I think, as long as leaders understand that, we'll be OK.

Do you think that that equation has changed at all in this era with terrorism and suicide bombers and things like that?

No, I don't think so. They have to get their hands on it, but that's not the leaders. That's why I think it's important to have proper technology to prevent unauthorized use. If it's authorized, OK. Nelly, bar the door. But I worry about unauthorized use of people who actually have physical access to these devices. You know the head of Pakistan has had two attempts on his life. I don't go to meetings anymore, but I went to a meeting and there was a Pakistani general there. And you sort of sashay around these things. And there was a young lady from Sandia who is also interested in this. And I said, Are you involved in the weapons? It was a meeting on sort

of weapons stuff. And yes, he was involved; he knew all about it. He was a brigadier. I said, Well, how do you have a good control? And he said, Oh, we have a good control. He said, We keep our warheads separate from our missiles. Well, for me, that's bad. From the United States, I'd like to have it on their missile because it only has a range of about 600 miles. It's not going to bother me. But the fact that the warhead is separate means that some guy in a pickup truck or a Humvee or something can grab it and go running someplace. I don't like that. But I couldn't really explore it, you can't talk much about it. It's the unauthorized use by those individuals who actually have physical access, in India and Pakistan. You know India's still not—between the Muslims and the Hindus. And Pakistan, God knows what's happening there. And the big Al-Qaeda gang someplace in Pakistan. And money talks. So that's a concern. Now it's true, regardless of how clever you may make these devices, if the guys really have access and can fool around with them long enough, they can bypass it. It's not as if you grab it and run with it.

Great. Thank you.

[01:04:25] End Track 2, Disc 2.

[End of interview]