

HUMAN RADIATION STUDIES: REMEMBERING THE EARLY YEARS

*Oral History of
Julie Langham Grilly*



Conducted February 3, 1995

United States Department of Energy
Office of Human Radiation Experiments
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FOREWORD

IN DECEMBER 1993, U.S. Secretary of Energy Hazel R. O'Leary announced her Openness Initiative. As part of this initiative, the Department of Energy undertook an effort to identify and catalog historical documents on radiation experiments that had used human subjects. The Office of Human Radiation Experiments coordinated the Department search for records about these experiments. An enormous volume of historical records has been located. Many of these records were disorganized; often poorly cataloged, if at all; and scattered across the country in holding areas, archives, and records centers.

The Department has produced a roadmap to the large universe of pertinent information: *Human Radiation Experiments: The Department of Energy Roadmap to the Story and the Records* (DOE/EH-0445, February 1995). The collected documents are also accessible through the Internet World Wide Web under <http://www.ohre.doe.gov>. The passage of time, the state of existing records, and the fact that some decision-making processes were never documented in written form, caused the Department to consider other means to supplement the documentary record.

In September 1994, the Office of Human Radiation Experiments, in collaboration with Lawrence Berkeley Laboratory, began an oral history project to fulfill this goal. The project involved interviewing researchers and others with firsthand knowledge of either the human radiation experimentation that occurred during the Cold War or the institutional context in which such experimentation took place. The purpose of this project was to enrich the documentary record, provide missing information, and allow the researchers an opportunity to provide their perspective.

Thirty audiotaped interviews were conducted from September 1994 through January 1995. Interviewees were permitted to review the transcripts of their oral histories. Their comments were incorporated into the final version of the transcript if those comments supplemented, clarified, or corrected the contents of the interviews.

The Department of Energy is grateful to the scientists and researchers who agreed to participate in this project, many of whom were pioneers in the development of nuclear medicine. □

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DISCLAIMER

The opinions expressed by the interviewee are her own and do not necessarily reflect those of the U.S. Department of Energy. The Department neither endorses nor disagrees with such views. Moreover, the Department of Energy makes no representations as to the accuracy or completeness of the information provided by the interviewee.

ORAL HISTORY OF JULIE LANGHAM GRILLY

Conducted February 3, 1995 in Los Alamos, New Mexico by Dr. Donald Petersen, a retired cell biologist from Los Alamos National Laboratory, and Michael Yuffee of the Office of Human Radiation Experiments, U.S. Department of Energy (DOE).

Julie Langham Grilly was selected for the oral history project because of her work as a histology technician in the Health Division at Los Alamos, her research with prominent radiation researchers, and—because she is the widow of Dr. Wright Langham—her insights into his life and career. The oral history covers Ms. Grilly's research experiences with Dr. Clarence Lushbaugh, her recollections regarding the Laboratory's changes over the length of her career, and her thoughts regarding Wright Langham's research and career.

Short Biography

Julie Langham Grilly came to Los Alamos, New Mexico from Minnesota. She received her B.S. in Bacteriology (Microbiology) from the University of Minnesota in 1946. From 1946 to 1947, Ms. Grilly worked for an internist in Minnesota. She moved to Los Alamos in July 1947 and began working at the Laboratory on August 5, 1947. Ms. Grilly spent her entire career, from 1947 to 1980, working as a laboratory technician in H-4 (Radiobiology/Bio-Medical Research). During that time, she assisted in research projects by performing histological tissue sections, taking photomicrographs, and making autoradiographs. Ms. Grilly was also a subject in some radiation experiments.

Arrival, Early Years at Los Alamos (1947–53)

YUFFEE: Today is February 3, 1995. I am Michael Yuffee from the Office of Human Radiation Experiments. I am here with Don Petersen¹ from the Los Alamos National Lab[oratory],² and we are in Los Alamos, New Mexico, with Julie Grilly. We are here to talk to her about her recollections from her work at the Lab for a number of years.

I guess I'll let Don take it away from here in terms of how to start. I think we'll start with, basically, some background info.

¹ Dr. Petersen has worked at Los Alamos since 1956, originally in Group H-4, Radiobiology (later renamed Bio-Medical Research) under Wright Langham. From 1964 to 1981, he served successively as the Cell Biology Section Leader and Group Leader, Alternate Health Division Leader, and Acting Life Sciences Division Leader. Since 1981 he has been the Program Manager for the Chemical and Biological Program. For the transcript of the November 29, 1994 interview with Petersen, see DOE/EH-0460, *Human Radiation Studies: Remembering the Early Years; Oral History of Cell Biologist Don Francis Petersen, Ph.D.* (August 1995).

² originally Los Alamos Scientific Laboratory, a key research and development center for the Manhattan Project. Nuclear bombs were assembled there before and during the Cold War. It has been a research and development center for nuclear weapon designs. Renamed Los Alamos National Laboratory, it is now a part of the U.S. Department of Energy, operated by the University of California.

GRILLY: Well, I came here [to Los Alamos] in 1947. I had graduated from the University of Minnesota in '46, and then I worked for an internist³ in Minnesota for a year and then came out here.

YUFFEE: What did you get your undergraduate degree in?

GRILLY: Bacteriology,⁴ which is not [called] bacteriology anymore; it's microbiology.⁵

YUFFEE: Sure.

GRILLY: This is ancient. (*grinning*) But I came out here for a visit, before I was married, in the spring of '47, and the Army was still here. I remember the GIs⁶ were still directing traffic and everything [as they had throughout World War II, during the development of the atomic bomb]. Then I came back to live in July and went to work August 5, 1947, at our old lab, which was commonly termed the "rat lab" [for its use of rats for radiation experiments], but it was the Biomedical Research Lab.

YUFFEE: Is that where HRL [(Health Research Laboratory)] is now, or is that different from this?

GRILLY: No, it [(Biomedical Research Laboratory)] was down on the canyon. It was converted barracks. It had started in the tech area. Wright [Langham]⁷ and a couple of others had a few rats down there they were experimenting on, and it just grew out of that.

Finally, he got th[ese] converted barracks, and he got another converted barracks. Then he got another converted barracks, so we grew and grew down there. We were there from '47 until '53, when we moved into the new building.

YUFFEE: What made you decide to come here to Los Alamos?

GRILLY: I had friends here.

YUFFEE: Was there a position open?

GRILLY: Yes, in the H-4 [Group]⁸—what was termed "H-4" then.

YUFFEE: Sure.

GRILLY: So there was a position open.

³ a physician specializing in the diagnosis and nonsurgical treatment of diseases

⁴ a branch of microbiology dealing with bacteria

⁵ the branch of biology dealing with microscopic organisms

⁶ a member of the U.S. armed forces, especially a soldier

⁷ Langham, regarded at the time as "Mr. Plutonium," led the Health Division's Radiobiology Group from 1947 until his death in 1972.

⁸ In a May 1947 reorganization, the research functions of the Health Group became the responsibility of a new group, H-4 (Radiobiology), under the direction of Wright Langham. During the late 1940s and early 1950s, research with human subjects at Los Alamos was limited to tritium studies. The human subjects were researchers in Group H-4. In 1949, the group's name was changed to Bio-Medical Research. By 1972, H-4 had grown to 70 staff members working in molecular biology, cellular radiobiology, mammalian biology, biophysics, veterinary biology, and pathology.

YUFFEE: And you had some friends in the area?

GRILLY: Yeah, working here in the Lab. So, anyhow, we were in those converted barracks for six years. We moved into our new building in '53.

I can remember Wright fighting to get this new building. They [(Langham and his research colleagues)] wanted to put it next to the hospital so the biomedical research would be next to the hospital. I can remember Norris Bradbury[, Director of Los Alamos Laboratory,] saying, "Good luck, Wright." He [(Langham)] was planning, and he went to Washington, and he got the building built. He did.

YUFFEE: And that's what now is HRL?

GRILLY: [Yes] what is now HRL.

YUFFEE: Great.

GRILLY: And we moved in there in '53.

Early Postwar Animal Research at Los Alamos

YUFFEE: And what type of work were you doing, at first?

GRILLY: Histology,⁹ mainly, at first, and effects of radiation on animals. For instance, Dick Widner and Norm Knowlton were doing mitotic indices.¹⁰

So, they would irradiate animals, and we would take them times after and take out certain organs—the jejunum¹¹ and the adrenal¹²—I forget what-all we took—and autopsied them afterwards. And animals injected with various radioactive materials.

And that's when—it was down there that I got my first photonic unit¹³ [(photomicrographic unit made by Zeiss camera and microscope)]—

YUFFEE: Why don't you talk about that?

GRILLY: —and started doing some autoradiography¹⁴ so that we could make sections [(cut out sections of tissue)] and determine where the radioactive substance was deposited.

YUFFEE: Sure.

⁹ the study of the structure of tissue

¹⁰ Mitotic indices are parameters for evaluating chromosome replication during the process of cell division.

¹¹ the middle portion of the small intestine, between the duodenum and the ileum

¹² the adrenal glands—a pair of ductless glands, located above the kidneys, that produces steroidal hormones, epinephrine, and norepinephrine

¹³ an instrument used in the laboratory to measure photons, a quantum of electromagnetic radiation, usually considered as an elementary particle that is its own antiparticle and that has zero rest mass and charge and a spin of one

¹⁴ a technique whereby photographic film is placed over thinly sliced tissue to record, in image form, the radiation tracks from the tissue that pass through the film's emulsion

GRILLY: Kidneys, lymph nodes, et cetera, and bone.

We did some teeth, as a matter fact. I remember, another gal and I went up to [Dr. William] Bloom's¹⁵ lab [at the University of] Chicago. We learned to section undecalcified¹⁶ bone, which was kind of a tricky thing to do.

YUFFEE: Yeah, from what I understand.

GRILLY: And we learned to do that. And so we actually sectioned bones, also, and teeth, for Dr. Ward Wainwright. (*asking Petersen*) Do you remember Ward?

PETERSEN: Mm-hmm.

GRILLY: He was a dentist. He was doing some research.

YUFFEE: Now, this was all animal research, for the most part?

GRILLY: Uh-huh.

PETERSEN: Well, Wainwright's studies—Wainwright did some studies on human teeth, but after extraction.

YUFFEE: Sure.

PETERSEN: See, they were *in vitro*¹⁷ studies on teeth. They were not teeth that were systemically labeled;¹⁸ they were teeth that were labeled after they had been pulled.

YUFFEE: How was it labeled after [being pulled]?

PETERSEN: They had been pulled. He pulled teeth and then used them as the material for the sectioning to see how—

YUFFEE: How do you label teeth?

PETERSEN: Well, he was just dunking them [in radioactive solution].

YUFFEE: Oh, really?

PETERSEN: Yeah.

GRILLY: Get the uptake—¹⁹

PETERSEN: Sure.

GRILLY: —on most of them.

PETERSEN: See, that way, did you get the material by penetration, or did it all happen via the bloodstream, metabolically?

¹⁵ a renowned histologist, chair of the Department of Anatomy, University of Chicago

¹⁶ bone that has not been deprived of lime or calcium-bearing matter

¹⁷ developed or maintained in a controlled, nonliving environment, such as a test tube; Latin for "in water"

¹⁸ incorporated with a radioactive isotope to make a substance traceable, from a source material administered intravenously (into the blood)

¹⁹ an excess assimilation of a radioisotope, indicating abnormality

YUFFEE: Sure.

GRILLY: Another interesting one was Dr. Robert Mosley. (*addressing Petersen*) Remember Bob Mosley?

PETERSEN: Mm-hmm.

GRILLY: He was a radiologist at the hospital. This was at the old hospital [(Los Alamos Medical Center)].

YUFFEE: Sure.

GRILLY: And he and Lush[baugh]²⁰ put rabbit ears [of a live rabbit] in [autoradiographic imaging] chambers to test the circulation [of the radioactive label through the bloodstream, from one ear to the other], and then they would irradiate the animal.

YUFFEE: Sure.

GRILLY: And they had some movies, and we took pictures through the microscope, because this little—it was a little Lucite™ [transparent plastic] thing they clamped on the ear, and you could see the blood flow through there. That was an interesting thing.

YUFFEE: That sounds [interesting].

Radiolanthanum Tests on Monkeys and Eniwetok Tissue Examination

GRILLY: Then we had Pickering—Colonel Pickering²¹ and his crew. They were down there, and they did some high-dose experiments—this was with the Air Force—and irradiated a bunch of monkeys out at Ten Site.²² And that was quite an experiment, because we—you know, when you work with animals, you work in a biological lab, you don't necessarily go home at 5 o'clock [because the animals must be fed, inoculated, examined, and otherwise tended to at all hours].

YUFFEE: Sure.

GRILLY: And these animals were dying at different times afterwards, and we had to autopsy them. So, I can remember sleeping in my darkroom down there, because some of them were about ready to die, you know.

²⁰ Dr. Clarence C. Lushbaugh, M.D., Ph.D.—H-4 staff member from 1949 to 1963. Chief Scientist of the Medical and Health Sciences Division at Oak Ridge National Laboratory, 1963 to 1975, and Chairman of the Medical and Health Sciences Division at Oak Ridge, 1975 to 1984. For the transcript of the interview with Lushbaugh, see DOE/EH-0453, *Human Radiation Studies: Remembering the Early Years; Oral History of Pathologist Clarence Lushbaugh, M.D.* (April 1995).

²¹ Colonel John Pickering was a researcher at Brooks Air Force Base in charge of monkey irradiation.

²² one of the geographical experiment sites at Los Alamos

And then, down there at the old Building 2, we did the one Pete [(Don Petersen)] mentioned. We did all the animal experiments' tissues from Eniwetok.²³

YUFFEE: Mm-hmm. Wow, that must have been a lot. What operation would that be?

PETERSEN: That was Greenhouse.²⁴

YUFFEE: Greenhouse. Oh, that one.

GRILLY: Greenhouse, yeah.

YUFFEE: That was a lot.²⁵

GRILLY: And we—I had to set up the thing. That was in the days before pre-washed microscope slides [on which tissue samples were placed for examination under a microscope].

YUFFEE: Mm-hmm.

GRILLY: So guess who was down there [in Building 2] for weeks before, washing slides in detergent and then, you know, alcohol, and drying them.

YUFFEE: (*grinning*) Sure.

GRILLY: They didn't have prewashed slides in those days—getting ready for this thing. And we did—in four to five weeks, we did over 20,000 slides.

YUFFEE: That's unbelievable.

GRILLY: It was. It was a production line. We had three—we had two setups sectioning. We set them up, sectioning, in the microtome.²⁶

And then we had a group staining these, because we had—[Army Major C.] Gleiser, [M.D.], and [Army Captain A.W.] Eaton[, M.D.], and Lush[baugh]—and we made all these slides in triplicate. I mean, you know, we made sections for each pathologist.

YUFFEE: Sure.

GRILLY: And then Gleiser and Eaton were out there reading their results and everything, so I've got pictures of all that stuff, too, back there.

YUFFEE: Oh, that's good. That's interesting.

GRILLY: But it was fantastic.

²³ an atoll in the Marshall Islands, a group of 34 atolls in the west central Pacific where the United States performed atmospheric tests of nuclear weapons in the 1950s

²⁴ the first of three series of nuclear weapon tests conducted at the Pacific Test Range. Operation Greenhouse included four tests detonated between April 7 and May 24, 1951, from towers at Eniwetok Atoll in the Marshall Islands. The only confirmed blast yield was for Shot Easy, said to be in the 47-kiloton range (Source: *U.S. Nuclear Tests, July 1945 Through December 1988*; U.S. Department of Energy Nevada Operations Office; September 1989).

²⁵ To collect data on nuclear effects, 15,000 animals were reportedly used in the Greenhouse series.

²⁶ an instrument for cutting very thin sections of tissue for microscopic examination

YUFFEE: I'm sure.

GRILLY: It was a real operation. I was proud of that.

YUFFEE: Actually, Pete[rsen]—he told me that you would definitely talk about that, because he said that it—that memory would certainly be fresh.

GRILLY: Oh, that was quite a project.

YUFFEE: It sounds it.

GRILLY: Then—well, most of the guys had gone out to Eniwetok. And I remember when Ernie Pinson—he was a General, later. He came back from Eniwetok, and he had slimmed down, tan. He was so handsome, and all the girls went, "Oh!"

(laughter)

We were so glad to see the men back from Eniwetok, you know.

YUFFEE: Oh, that's funny.

Research on Tritium Uptake in Humans

GRILLY: So—well, it was down at the old Building 2 where they started the development of the human counter.²⁷ But that's when Wright and Ernie [Pinson] did the work on tritium²⁸ uptake in humans.

YUFFEE: Sure.

GRILLY: And they used themselves [as subjects].

YUFFEE: Well, now, were they the only two people in this—these two subjects?

PETERSEN: John Storer[, a physician,] was the third one.

YUFFEE: That's right. I did know that. Sure.

GRILLY: Oh, John did some?

YUFFEE: So the three principals were—

PETERSEN: John was one of the volunteers. Wright—

GRILLY: And Ernie [Pinson].

PETERSEN: —and Ernie and John Storer are the three that—I got out the old Pinson notebooks.

GRILLY: Well, we were there—Norm Knowlton was there when I first went there, and Lush didn't come until—I think it was '48.

²⁷ HUMCO I was the first whole-body radiation counter that became operational at Los Alamos National Laboratory in 1956; the sensitivity and noninvasiveness of this new instrument permitted studies at levels 10 to 100 times below established limits of exposure. It opened an entire area of clinical diagnosis and the development of new diagnostic methods, mostly by Lushbaugh.

²⁸ a radioactive isotope of hydrogen having an atomic weight of three. The heaviest isotope of the element hydrogen, tritium gas is used in modern nuclear weapons.

PETERSEN: '48.

GRILLY: '48 or '49. And then [Dr.] Bob Carter came. He lives in Corrales[, New Mexico] now. He went to the Boys' School up here.

YUFFEE: Oh, really?

GRILLY: Which was kind of interesting. He came back here to work.

YUFFEE: I wonder, were there many other people that you've known of, who were at the Boys' School, that have come back?

PETERSEN: Sterling Colgate is a Boys' School alumnus.

GRILLY: That's another one.

YUFFEE: That's funny. That's kind of a—

GRILLY: He was a wealthy boy.

YUFFEE: It must have been a shock to come back.

GRILLY: I've got some old—

PETERSEN: This was at the depths of the Depression, and even in those days the tuition for a year—

GRILLY: I have an old book that somebody gave me of tuition costs and everything, and it was expensive even then.

YUFFEE: Oh, I'm sure.

GRILLY: I mean, you had to be wealthy to send your boys. But they toughened them up, you know. They slept outside, and all that.

YUFFEE: Well, apparently, the—I forget the name of the person who owned it, ran it.

GRILLY: Well, Pond—

PETERSEN: Ashley Pond.

YUFFEE: Yeah, Ashley Pond, but, apparently, he was big on sending the boys hiking and—

GRILLY: Oh, sure.

YUFFEE: And all sorts of extra activities.

GRILLY: So then, Payne Harris²⁹ came, and Bob [(Robert E.)] Carter, and John Storer came afterwards. Pete didn't come until we were in our new building. But we would kid Lush and John because—we would bow three times to the east, you know, to the University of Chicago[, where they had all gone to grad school or served in the Met Lab during the Manhattan Project].

²⁹ a physician with a degree in Physics. Mathematically gifted, Harris performed a good deal of support work for studies at the Nevada Test Site.

YUFFEE: Sure.

(laughter)

YUFFEE: Oh, that's funny.

GRILLY: I can remember working very hard on some lungs from Howard Eberline. I don't remember what was—he started the Eberline Instrument [Corporation]³⁰ down there.

PETERSEN: Yes, in Santa Fe.

GRILLY: And they dissected out his lung, for some reason. I remember working very hard on that because this important pathologist³¹ was coming to visit, and I wanted to impress him, and he *was* impressed.

YUFFEE: Oh, that's funny.

GRILLY: So we got along fine. I've worked with Lush for years.

Work With Dr. Clarence C. Lushbaugh

YUFFEE: Yeah, why don't you talk about Dr. Lushbaugh? What was it like working for him? Was he a—

GRILLY: Oh, he was great. He was wonderful.

YUFFEE: Was he a—would you say he was—

GRILLY: You know we did all the hospital pathology, as well.

YUFFEE: Sure.

GRILLY: So he would bring over the specimens from the hospital and give us a physiology³² and anatomy lesson while he was dissecting things.

YUFFEE: Sure. Was this your first introduction to human pathology?

GRILLY: Yeah, uh-huh. But he's a teacher. He loved it, you know. We would stand around and watch him dissect everything. In fact, we did frozen sections for him.

I took pictures at some of his autopsies. I was in the autopsy room with him, and he kept a light touch [(a sense of humor)]. But you know, you have to.

YUFFEE: Sure.

GRILLY: In an autopsy room, you can't—you know, it can get kind of morbid.

³⁰ Eberline Instrument Corp., Santa Fe, New Mexico, maker of radiation detection instrumentation and portable counters

³¹ a physician who studies the study of the origin, nature, and course of diseases

³² the branch of biology dealing with the functions and activities of living organisms and their parts

YUFFEE: Well, the rumor is that he was an excellent clinician.³³

GRILLY: Oh, he was wonderful, he really was. A nutty guy, but—

YUFFEE: (*laughs*) No-o-oh!

GRILLY: I loved him dearly. And he would expect you to do something, and he would go away and leave you.

YUFFEE: Sure.

GRILLY: He wasn't riding herd on you, but he expected you to do the work. You could contribute. If you had some good ideas, he would pick them up. I know Dorothy Bess, lots of times she had great ideas, and he would just pick them up. He would listen to anybody, and he was sympathetic to everybody.

YUFFEE: What was it like—

PETERSEN: But Bessie [(Dorothy Bess)] appears on the papers as an author.

GRILLY: Right, right.

PETERSEN: Lush was a victim of [others' theft of] a real bright idea, where somebody grabbed it and ran. And he never did that to anybody in all the time he worked.

GRILLY: No; I was on some of his papers.

YUFFEE: I know there was actually a paper that he published while he was at Chicago [doing research in the Toxicity Lab³⁴], and it was under, I think, "Charles S. Lushbaugh," and, boy, was he ornery about that.

GRILLY: Oh, really?

YUFFEE: Uh-huh. He was very upset, because it was, I think, his first paper that he had published there, and it was under the wrong name.

PETERSEN: Well, I—no, that—I think that's not quite correct. He's on the paper. He's [mistakenly] referred to in subsequent writings as "Charles S. Lushbaugh."

YUFFEE: Oh, really?

PETERSEN: But he's "C.C. Lushbaugh" on the paper.

YUFFEE: On the paper.

PETERSEN: But he's the 17th author, or whatever.

YUFFEE: Oh, down the road.

³³ a physician who treats and observes living patients, as distinguished from one engaged in research

³⁴ During World War II, the University of Chicago ran a toxicity laboratory for the U.S. Army Chemical Corps to conduct research in chemical warfare. From 1948 until 1951, the Atomic Energy Commission used the facility for radiological warfare research. In 1948, the AEC worked with the Army and the university on a research program for the laboratory that focused on the poisonous effects of radiation exposure. Animal research was conducted on the local effects and general toxicity of radioisotopes considered for use as radiological warfare agents.

PETERSEN: And it was actually his brainchild.³⁵

YUFFEE: Oh.

GRILLY: Well, with that crew down there, nothing you could say anyplace would shock me or anybody else, because we had such an uninhibited bunch down there.

YUFFEE: It sounds it.
(laughter)

GRILLY: And joke tellers. We really had a lot of fun. We really did.

YUFFEE: It sounds like it. Was it—I found it interesting, the fact that he was the first person to split time between the hospital and the Lab.

GRILLY: He was hired by both.

PETERSEN: He was the only one that ever had that.

GRILLY: The only one.

YUFFEE: He was the only person ever to split time between the two?

GRILLY: Right.

YUFFEE: So was there a free flow of—

GRILLY: Oh, yes.

YUFFEE: You know, if you needed facilities there, you could go there?

GRILLY: At first I did all the histology for him. And then, of course, all the doctors came over.

YUFFEE: Sure.

GRILLY: And we would have all the doctors over there consulting about the slides and everything, and so—back and forth.

YUFFEE: Well, that's good.

GRILLY: Oh, yeah, it was great.

PETERSEN: It was a much friendlier time than now.

GRILLY: And he had a pretty foul mouth at times, but we got used to that.
(laughter)

He won't take objection to that, because he knows it.

YUFFEE: And I've read the transcript of his interview, so I know it, too. Definitely.

³⁵ Lushbaugh explains in his oral history: "I discovered that the nitrogen mustards were lymphotoxic and were, therefore, applicable to the therapy of the various lymphomas. It was that idea that I took to Jacobsen that day and had to get permission from Dr. McLean in order to do the work in human beings. The human being research was carried on by Leon Jacobsen and by his resident staff there in the Department of Hematology. Since he was a member of the Department of Medicine, he had all the physicians in the Department of Medicine on the paper plus all the people who had any 'swat' at all."

GRILLY: No, he was great to work for. But, as I say, there were other people that—other experiments going on. It wasn't totally Lushbaugh.

YUFFEE: Sure. Just one thing: if there's anything I'm missing that I should be asking about, Pete, then maybe you should interrupt me.

High-Intensity Radiolanthanum Source Research

GRILLY: But that monkey experiment, that was the big experiment down there at the old lab. And then—

PETERSEN: You might clear that up a little bit. That was a radiolanthanum high-intensity source, much like the ones that were used in Bayo Canyon.³⁶

GRILLY: The ones at Ten Site, you mean, the monkey—

PETERSEN: Yeah. And so you could—if you were close to them you could get fairly high gamma³⁷ dose rates.

YUFFEE: And so they would place the monkeys in specific positions throughout the canyon?

PETERSEN: No, no. This happened at a different site.

GRILLY: This was at Ten Site.

PETERSEN: This is simply using the lanthanum as a radiation source. In Bayo Canyon, you see, it's used as an intense radiation source to look at an event.

In the case of the monkey experiments at 10 Site, it was used simply as an intense gamma source and just sat there and irradiated. It was simply pulled out of shielding, used as a source, and then put back in the shielding again.

YUFFEE: And what was the purpose of this study?

PETERSEN: These were studies that were done to find out if pilots would develop sufficient ataxia³⁸ so they would be incapable of flying in a combat scenario where—

YUFFEE: Sure. There were clouds [that contained radioactive particles] and so on.

PETERSEN: —they were penetrating a cloud, yeah.

³⁶ From 1944 to 1962, Los Alamos conducted 254 open-air implosion physics tests in nearby Bayo Canyon. The purpose of the program was to test weapons designs using conventional high explosives and radioactive lanthanum (RaLa), a short-lived but intense radiation source. Tests were performed specifically to diagnose material motion and compression through high-speed x-ray photographs of the earliest moments of the implosion. The sources involved contained quantities ranging from around one hundred to several thousand curies of lanthanum-140.

³⁷ a highly penetrating photon of high frequency, usually 10^{19} Hz or more, emitted by an atomic nucleus

³⁸ loss of coordination of the muscles, especially of the extremities

Research with Ethylene Diaminetetraacetic Acid (EDTA) With Harry Foreman

- YUFFEE:** Maybe now we can talk a little bit about some of the other people that you worked with, some of the other projects.
- GRILLY:** Harry Foreman.
- PETERSEN:** You might want to mention just a little bit about Foreman.
- GRILLY:** Harry Foreman was down there with his EDTA,³⁹ trying to extract plutonium from bones. That never materialized.
- PETERSEN:** Well, when Harry was still with Joe Hamilton⁴⁰ at Berkeley, he attempted to enhance the excretion of plutonium from one of the—well, he was with Hamilton, and they had the three patients out there.
- YUFFEE:** Sure.
- PETERSEN:** He attempted, I think, in one of them, to enhance plutonium excretion. But after he got here—
- YUFFEE:** —[to enhance excretion] with EDTA?
- PETERSEN:** Yeah, that would have been EDTA.
- GRILLY:** Mm-hmm. In fact, I think that's—
- PETERSEN:** The more modern ones [(chelating agents⁴¹)] weren't available yet when that was done. This must be late '40s, early '50s time frame.
- GRILLY:** Right, right.
- PETERSEN:** Because he came here in the very early '50s.
- GRILLY:** He was down at our old lab. Harry Whipple brought George Voelz⁴² down when George Voelz was just a young medical student [from the University of Wisconsin]. Then George Voelz left.⁴³
- YUFFEE:** To go to Idaho [National Engineering Laboratory (INEL)].⁴⁴
- GRILLY:** Then he came back later.

³⁹ Ethylene diaminetetraacetic acid is a chelating agent for several heavy metal cations.

⁴⁰ Joseph Hamilton, an M.D., worked at Crocker Laboratory, then the site of a 60-inch cyclotron that he operated to produce radioisotopes in support of research and some medical diagnosis and treatment.

⁴¹ a chemical agent that removes heavy metals from the bloodstream and soft tissues and carries them to excretion (urine)

⁴² For the transcript of the interview with Voelz, see DOE/EH-0454, *Human Radiation Studies: Remembering the Early Years; Oral History of Dr. George Voelz, M.D.* (May 1995)

⁴³ After med school, Voelz served at Los Alamos under Dr. Thomas Shipman, the Health Division leader. Voelz's initial year was part of an in-plant training program for the practical application of industrial medicine. He stayed on for another three and a half years in a staff position in the Application Medicine Group at the Los Alamos Scientific Laboratory.

⁴⁴ Created in 1949 as the National Reactor Testing Station (NRTS), INEL has served as the test site for prototypes of many reactor designs in wide use today. INEL now operates the Advanced Test Reactor (ATR) for engineering studies, and focuses on waste disposal and remediation technology.

PETERSEN: Matter of fact, George did my entrance physical.

YUFFEE: Really?

(laughter)

Oh, that's funny. Was that the last time that he ever—

PETERSEN: Well, he left very shortly after that. I don't know if there's any connection there.

(laughter)

But shortly after that, he became the medical director at INEL.

YUFFEE: *(grinning)* Well, let's hope that it had nothing to do with you.

PETERSEN: *(grinning)* I hope so.

Anecdotes About Louis Hempelmann

GRILLY: Well, Louis [(pronounced 'Lew-ee)] Hempelmann,⁴⁵ of course, was the division leader, and he would come out. I'll have to tell you a cute story on him.

We were ready for one of these experiments where we had to do this times afterwards, you know—sacrifice the mice [at certain time periods after treatment].

We had been planning this for a week, and Norm Knowlton—we were all ready to go. We had our dissecting boards and our bottles [of formalin⁴⁶] and everything. And Louis Hempelmann sauntered in, and he says, "Now, let's get organized," and we all just looked at him.

(laughter)

GRILLY: And then he sat down and proceeded to tell us how his horse turned on the pump, down at his place in the valley, when Norm Knowlton was down there.

YUFFEE: Oh, that's a good one.

GRILLY: But, oh, I loved Louis, loved him. Norm Knowlton, too. He's still in St. Louis [at Washington University].

YUFFEE: Oh, really?

GRILLY: Mm-hmm.

YUFFEE: What kind of a person was Dr. Hempelmann?

⁴⁵ Hempelmann was a group leader in the Health Division at Los Alamos Scientific Laboratory from 1943 to 1947, and led the division from 1946 to 1948. An expert in radiology and radiobiology, Hempelmann served in the Atomic Energy Commission from 1948 to 1950, then joined the faculty of the University of Rochester.

⁴⁶ a 40-percent solution of formaldehyde, used as an antiseptic and disinfectant in dilute solution and as a fixing agent for histological specimens

GRILLY: I think—I don't know. I thought he was great. He was kind of unassuming, in a way.

YUFFEE: He was Health [(H)] Division⁴⁷ leader at the time?

GRILLY: Yeah.

YUFFEE: This was before [Dr. Thomas] Shipman, [M.D.]?⁴⁸

PETERSEN: Before Shipman, yes.

GRILLY: Well, it was all "A" [(Administrative)] Division at one time.⁴⁹

YUFFEE: Sure. And he had been here since '44?

PETERSEN: He came here very early from—

GRILLY: [The University of] Rochester.

PETERSEN: Well, but he had been in California.

YUFFEE: Up at [the University of California at] Berkeley?

PETERSEN: The major interest was in an activity that was going to—well, the reason that he went to California was [because of] the Washington University interest in a cyclotron.⁵⁰

YUFFEE: Okay.

PETERSEN: And he was overtaken by events. He knew medicine, and he knew E.O. Lawrence⁵¹-style big physics,⁵² and he was the perfect candidate to come here and be [J. Robert] Oppenheimer's⁵³ medical director.

YUFFEE: So he came here in '43?

PETERSEN: He was essentially fingered very, very early to do that.

YUFFEE: (*grinning*) So the poor guy leaves St. Louis on an innocent mission and, the next thing you know, he's shanghaied to Los Alamos?

⁴⁷ Formed in a May 1947 reorganization, the "H" or Health Division had responsibility for a much broader range of health activities than its predecessor, the Health Group (Group A-10). These responsibilities included radiological safety, health physics, and industrial health. The H Division also monitored exposures and was responsible for safety for all weapons tests conducted by the Laboratory.

⁴⁸ leader of the Health Division at Los Alamos National Laboratory and the Lab's Medical Director

⁴⁹ The Administrative Division had been set up by J. Robert Oppenheimer during the Manhattan Project. It was responsible for such activities as health, procurement, and patents.

⁵⁰ an accelerator in which particles move in spiral paths in a constant magnetic field

⁵¹ U.S. physicist, 1901–58; a pioneer in nuclear physics who built and operated (with M. Stanley Livingston and Milton White) the first cyclotron in 1930 on the Berkeley campus of the University of California; established the University of California Radiation Laboratory in 1936 and served as its director until his death. His ingenuity and drive made the Berkeley-based Radiation Laboratory the unofficial capital of nuclear physics in the United States.

⁵² high-energy physics research activities, which typically require large, costly facilities and large teams of scientists and engineers

⁵³ J. Robert Oppenheimer, U.S. nuclear physicist (1904–67) who was chosen by General Leslie Groves to direct the development and construction of the atomic bombs at Los Alamos, New Mexico

GRILLY: (*grinning*) A nice place to be shanghaied to.

YUFFEE: (*grinning*) Yeah, I agree. I wouldn't mind it myself. I wouldn't mind it myself.

Langham's Role in Plutonium Injection Research

GRILLY: Well, then, okay, let's get—since you mentioned Louis, let's get this “plutonium stuff” out of the way.

YUFFEE: Okay.

GRILLY: This was all done before I came here.

YUFFEE: Sure.

GRILLY: I wasn't involved in any of this. The only thing I don't like is all this being laid at Wright's doorstep. He [(Langham)] was just a young Ph.D. here. He had come out from the [Chicago] Met Lab⁵⁴ with Rod Spence and some others. And they found out he had worked with plutonium there, so they got him to work in H Division.

YUFFEE: Sure.

GRILLY: And this whole project was set up by—well, Oppenheimer was interested in it and, definitely, Stafford Warren.⁵⁵ So, Wright was just a channel to get this done, really.

YUFFEE: Sure.

GRILLY: But he [(Langham)] went about it—when he was more or less assigned it, he went about it scientifically: “Let's set this up the way it should be.”

YUFFEE: Sure.

GRILLY: And it bothered him that these people hadn't been told. He had no—he did none of the [plutonium] injections.

YUFFEE: Sure. This is one of the things I wanted to—

GRILLY: No way.

YUFFEE: He didn't do—

GRILLY: He couldn't inject anything.

(*laughter*)

He was always shaking. He couldn't inject—no.

⁵⁴ Metallurgical Laboratory, the laboratory set up at the University of Chicago during World War II to lead the secret research and development of controlled nuclear fission under the Manhattan Project; in particular, the design of reactor facilities and the chemical separation of uranium, plutonium, and fission products from irradiated nuclear fuels

⁵⁵ a professor of Radiology at the University of Rochester (Rochester, New York), site of research involving plutonium and human subjects. Dr. Warren worked on the Manhattan Project in Oak Ridge as head of the medical section and headed an Intramedical Advisory Committee. After World War II, he became dean of the University of California, Los Angeles Medical School.

YUFFEE: That's what Pete was saying.

GRILLY: Oh, no, there is no way. He wasn't present when the injections were done. I don't know. It might have been they prepared—see, at that time there was so little plutonium around.

YUFFEE: Sure.

GRILLY: I mean, micrograms⁵⁶ of plutonium. It had just been discovered, really. And they were really, I guess, concerned about the workers with the plutonium. So these guys decided that would be one way of doing it [(the effects of plutonium on humans)].

YUFFEE: Sure.

GRILLY: And he [(Langham)] went about it scientifically and saw how it should be set up, but he was not the instigator.

YUFFEE: So he would have handled—the interns were trying to come with a way to analyze the information, the data.

GRILLY: Right. Right.

YUFFEE: And he would—in terms of decision-making capabilities, he wasn't—

PETERSEN: Well, be very, very clear that the method of making the measurements [of exposure to plutonium], the chemical method for making the measurements, was Wright's [idea].

YUFFEE: Okay.

PETERSEN: He solved that problem at a level of [radiological] sensitivity that was acceptable for observing occupational exposures.

YUFFEE: Sure.

GRILLY: And the "Langham equation" [(the formula describing the rate of plutonium excretion in urine and feces after a systemic uptake of plutonium in man)] is still used today. It has had some modifications, but it really provided very important information for the plutonium workers who may have gotten much more exposure [to plutonium] if they hadn't worked out this method.

YUFFEE: Sure.

GRILLY: But as to the injection of the humans, he did not instigate it.

YUFFEE: So it wasn't something that he said, "This is something we should do, and I want to do it"?

GRILLY: No. No. Stafford Warren said it.

YUFFEE: And on a scientific level, of course, there was interest.

⁵⁶ A microgram is one-millionth of a gram; there are about 28.35 grams in one troy ounce.

GRILLY: And he was a young Ph.D., and look, here's General Groves⁵⁷ [and] Stafford Warren [in Oak Ridge, Tennessee],⁵⁸ saying, "We need to do this."

So, Wright's a plutonium chemist. So he looks at it logically and says, "Okay, you know, this is the way the experiment should be done." But he did not instigate it.

YUFFEE: I guess one of the things I want to make sure that I understand, and that people understand, is that, essentially, up until the data [from the plutonium injection experiments] got back to Los Alamos, he [(Langham)] had no involvement up until that point.

PETERSEN: Until the excreted samples [of feces and urine] got back to Los Alamos.

YUFFEE: Right. Exactly.

PETERSEN: One of the things you should think about is how all those excreted samples got here, with the whole business being secret. In other words, if you have somebody giving you every drop of urine and every bowel movement for six weeks—I know if they tried that on me, I would want to know why.

YUFFEE: Sure.

PETERSEN: The samples came back here [to Los Alamos] for analysis.

GRILLY: Well, I think some of the patients were informed to a certain extent [about the plutonium research], but I don't know. I think it bothered him [(Langham)]. But he was not an M.D. He did not do the injections. He didn't propose the whole program.

YUFFEE: Sure. Did he ever say, you know, on a more personal level, give an impression about the way it had been done, the way the injections had been done?

GRILLY: Wright and I never discussed it, particularly. I mean, we were busy with other things.

YUFFEE: Sure.

GRILLY: But I think he mentioned it in a memo to Pat Durbin.⁵⁹ I think he thought some of this should be followed up later.

YUFFEE: Okay.

⁵⁷ General Leslie R. Groves, of the U.S. Army, assumed command of the Manhattan Engineer District in 1942 and led it to completion of the Manhattan Project.

⁵⁸ During World War II, the Manhattan Project had built a vast complex of highly classified facilities in and near Oak Ridge, Tennessee, to process uranium for use in atomic bombs. The Atomic Energy Commission assumed control of these facilities upon its creation and, today, they belong to the Department of Energy.

⁵⁹ From 1951 to 1977, Durbin worked as a chemist and radiobiologist at the Crocker Laboratory of the Lawrence Radiation Laboratory (Lawrence Berkeley Laboratory). For the transcript of the November, 11, 1994 interview with Durbin, see DOE/EH-0458, *Human Radiation Studies: Remembering the Early Years; Oral History of Dr. Patricia Wallace Durbin, Ph.D.* (June 1995).

GRILLY: In fact, at the time of his death, he had this one folder that had some historical replies that—well, I gave it to the group here. But he had just renewed his acquaintance with some of these scientists, and I think he thought it should be written up more completely.

But he didn't want any more involvement. He didn't want to do any more samples. He didn't want—at least if he was going to do the samples, he didn't want to be involved in any way.

YUFFEE: Sure.

GRILLY: And I think that letter, that memo from Pat Durbin—I talked to her when she was here—he was not really happy about it, and this [undeserved notoriety] just dogged him, and he didn't like it, you know.

YUFFEE: Sure.

GRILLY: Because he did so much other—so many other things, that this is just one blip on the—

YUFFEE: —on the whole screen.

GRILLY: But it did have some bearing—they've used, as I say, the "Langham equation" for years with deposition data for [plutonium] workers. And another thing that's so amazing about all this, most of this has been published years ago. It has all been in the—

YUFFEE: Yeah, Pete and I have talked about this.

GRILLY: It has been in the literature. I said to the ones who were here interviewing me for CNN [(Cable News Network)], I said, "What are you supposed to do, write this up for the *National Enquirer*?"⁶⁰ I mean, I said, "It's in the scientific literature. There it is."

YUFFEE: Which is where it would have gone.

GRILLY: Absolutely. [There have been] several articles in the paper where, you know, this is all laid at Wright's doorstep, and that isn't fair.

YUFFEE: Sure.

Langham Provides Assistance After Radiation Incident in Palomares, Spain

GRILLY: It just is not fair, whatsoever. He got to be known as a plutonium expert, and he always—he *was*, for the rest of his life. In fact, we were sent over when they had the Palomares incident in Spain,⁶¹ and the reason we were

⁶⁰ a weekly tabloid generally regarded as sensationalist in its coverage and treatment of news

⁶¹ On January 17, 1966, an accident occurred between two U.S. Air Force jet aircraft: a KC-135 tanker and a B-52 bomber carrying four thermonuclear weapons. Two of the weapons were found intact. The other two experienced non-nuclear explosions that resulted in the release of some fissile fuel and some burning. The United States and Spain, in a joint effort, performed remedial actions and instigated a long-term program to monitor the cleanup.

sent over there was because Wright was a plutonium expert. And he did a marvelous job over there.

YUFFEE: And that's when he got his commendation from the Department of Defense?

GRILLY: Yes, from the DoD.

YUFFEE: I've heard—I don't know if [it originated] posthumously or not—the moniker, "Mr. Plutonium."

GRILLY: Yeah. Well, they—

YUFFEE: Is that something that he—is that while he was still alive?

GRILLY: Yeah, yeah. They sort of picked that up.

YUFFEE: Did that bother him, or did he not feel one way or another?

GRILLY: I don't know. But he was an expert in it. After all—

PETERSEN: It's a fact.

YUFFEE: Sure. It's uncontroverted evidence.

GRILLY: He probably knew more about plutonium [than anyone], and as a result, he calmed down the Spanish people. We've got some good Spanish friends [as a result]. The American Embassy was spastic over this,⁶² of course. But he did a marvelous job.

YUFFEE: When did you first meet him?

GRILLY: 1947.

YUFFEE: It was '47 when you got here?

GRILLY: He was my boss.

YUFFEE: And what kind of a guy was he?

GRILLY: *(laughs)* Well, I thought he was terrific. Do you want a one-man cheering section here?

YUFFEE: *(grinning)* Sure. I know we've got two [Langham supporters] here, so—

GRILLY: Wright was a very interesting person. He was driven, he was dedicated.

YUFFEE: I understand he was rather dapper, too.

GRILLY: Was he ever! I have a picture of him that Louis Hempelmann finally gave me. He was down at the Trinity⁶³ site. He has a bow tie on.

(laughter)

He's talking to Louis Hempelmann.

⁶² The United States was concerned with the public perception of the accident and the effect of the accident on its relations with Spain.

⁶³ the first test detonation of a nuclear weapon, conducted at Alamogordo Bombing Range in New Mexico, July 16, 1945

YUFFEE: Is that the one where he's leaning up against the car?

GRILLY: Uh-huh, that's the one.

Langham Meets Enrico Fermi

YUFFEE: I've seen that picture.

GRILLY: He has got a good story there, too. He was really thrilled, because [Enrico] Fermi⁶⁴ came along and had a flat tire. So Wright was down there with the plutonium counter and had a methane tank. So he filled up Fermi's tire with methane, and Fermi went on his way.

And he always thought, "Gee, this is a highlight, that I helped Enrico Fermi!" you know. So he was down there.

YUFFEE: That's an interesting question. Is there a lot of adulation amongst the people towards others? I mean, was Enrico Fermi thought of as—

GRILLY: Oh, yes.

Famous People Visit Los Alamos; Oppenheimer's Loyalties Challenged by Teller and Strauss

YUFFEE: I mean, did the people put each other on pedestals in terms of their own mind, what they thought of them and their science?

GRILLY: They admired each other.

YUFFEE: Sure.

GRILLY: They didn't put them on a pedestal, I don't think. Of course, everybody in Los Alamos loved Oppenheimer, and he's the one that guided us through some rough times, you know, in the war years.

YUFFEE: Sure.

GRILLY: And [Edward] Teller⁶⁵ was not particularly liked in this town. I can remember when the lodge used to have—they used to have a restaurant in there. And Teller would come to town and have lunch there, but hardly anybody paid much attention to him.⁶⁶

(laughter)

⁶⁴ Italian-born physicist under whose leadership the Chicago researchers produced the first sustained nuclear chain reaction on December 2, 1942

⁶⁵ (1908–), Hungarian-born refugee physicist and the "Father of the Hydrogen Bomb." In the early 1980s, Teller became the leading proponent of advanced strategic defenses (which he argued should be based on nuclear weapons) as morally preferable to offensive, retaliation-based deterrence.

⁶⁶ The 1954 decision to revoke Oppenheimer's clearance polarized the scientific community, large segments of which ostracized Edward Teller, who was seen as having abetted that action, for many years.

Of course, he was on the outs with Oppenheimer, so—⁶⁷

YUFFEE: Sure.

GRILLY: And then, of course, he [(Teller)] screwed him [(Oppenheimer)], and so did—

YUFFEE: Yeah, that lasted a long time.

GRILLY: So did—who was the head of the [AEC]—

PETERSEN: [Lewis] Strauss.⁶⁸

GRILLY: Strauss.

YUFFEE: Oh, Admiral Strauss?

PETERSEN: (*grinning*) We've had a terrible relationship with admirals over history.

YUFFEE: (*laughs*)

GRILLY: Another interesting thing is that we justified the whole Los Alamos project because we were not so highly classified.

YUFFEE: Sure.

GRILLY: Everybody that was famous, Wright showed them through the Lab. And I remember the first one was H.V. Kaltenborn.⁶⁹ Now, this is before your time.

YUFFEE: Yeah, I've never—

⁶⁷ From early in the Manhattan Project, friction developed and grew between Teller and Oppenheimer. Teller favored development of the hydrogen bomb; Oppenheimer opposed it. After World War II, Oppenheimer's strength of reputation in the scientific community came to be seen as a major threat by H-bomb proponents. In July 1954, the AEC revoked his security clearance. Teller, who led the U.S. development of the hydrogen bomb, presented views critical of Oppenheimer that contributed to the AEC decision. However, the decision in the complex matter, in which no security lapses by Oppenheimer were ever proven, has come to be widely regarded as less a result of objective deliberation than of differences over early Cold War national security policy, professional rivalry, and personal animosity. Oppenheimer's pre-war associations with Communist front groups dogged him through the war years. Oppenheimer also challenged a broader national security policy at a critical time. Speaking before the Council on Foreign Relations in February 1953, he opposed the emergent U.S. nuclear retaliatory deterrent policy on practical and moral grounds, favoring instead a defensive strategy. This position exacerbated friction with proponents of the H-bomb, by then at the center of scientific influence on national security policy once occupied by Oppenheimer. When the Soviets detonated their first hydrogen bomb in August 1953, the event accelerated the development of U.S. nuclear weapons and cast Oppenheimer in the position of having contributed to earlier paralysis in decision making. Sources: John Major, *The Oppenheimer Hearing*, Stein and Day, New York, 1971; and Peter Goodchild, *J. Robert Oppenheimer, Shatterer of Worlds*, Houghton Mifflin, Boston, 1981.

⁶⁸ AEC Chairman Strauss is reported to have determined to punish Oppenheimer for having opposed him, in scathing terms, during testimony favoring the export of radioactive isotopes in 1949. Oppenheimer's 1953 speech before the Council on Foreign Relations (discussed in preceding footnote) further focused opposition to him in the AEC. Strauss, known for his politically conservative views, initiated the hearing on Oppenheimer's clearance and approved the decision. In 1959, Strauss was nominated by President Eisenhower to be Secretary of Commerce. Two Los Alamos scientists testified in opposition, citing three cases, including Oppenheimer's, in which they said Strauss had abused the AEC security program to punish employees who opposed his views. Strauss's nomination was barely reported out of committee and was defeated in a vote of the full U.S. Senate. Sources: Major, *ibid.*, and Goodchild, *ibid.*

⁶⁹ a famous American radio newscaster

GRILLY: The radio announcer. *(to Petersen)* Remember H.V. Kaltenborn?

PETERSEN: Mm-hmm.

GRILLY: He came down to our old lab. And then we had the Queen of Greece. We had [American screen actor] Kirk Douglas and his [future screen actor] son, Michael. We had [American screen actor] Ernest Borgnine. We had Aly Khan.⁷⁰ We had—oh, who all did we have?

PETERSEN: Prince Baudouin of Belgium, before he became king.

GRILLY: Yeah, Baudouin of Belgium, and [American novelist] Pearl Buck. We entertained her; I remember making coffee for her in the library. And Lewis Strauss, and just a whole series of people. We justified all of Los Alamos. And, of course, people like to see a biological lab, anyhow.

YUFFEE: Oh, sure.

GRILLY: It has a lot of human interest.

YUFFEE: Oh, definitely.

GRILLY: And, of course, Ernest Borgnine recoiled when he saw the rat colony. Remember that [1971] movie he was in?⁷¹

YUFFEE: *(grinning)* I'm sure the rat colony might have turned off a few people.

GRILLY: Kirk Douglas was very nice.

YUFFEE: Oh, that's funny. So, I mean—and basically, you know, these were uncleared visitors that just had access as much as you give them, to be toured and stuff.

GRILLY: Right.

Langham's Recollections From Trinity; Concerns About Radiation Fallout; Research With Scintillation and Whole-Body Counters

YUFFEE: One thing I thought was interesting, in researching some documents over at the [National] Archives [and Records Administration (NARA)], I've been getting people's recollections from Trinity. But I was wondering if—I didn't see anything from Wright Langham about his recollections, about his thoughts.

GRILLY: He was down there. I have a—see, after Palomares, there were two books written, one by Flora Lewis of the *New York Times* and one by Tad Szulc, who has written a number of other books. And he had—

YUFFEE: Was one of them—oh, I know that one book is—

GRILLY: *The Bombs of Palomares*. I've got them in here. You can see them. But he always wanted to meet Tad Szulc, and they were going to meet in

⁷⁰ the playboy son of the spiritual leader of millions of Muslims. A Pakistani, Khan was married to American actress Rita Hayworth from 1949 to 1951.

⁷¹ *Willard*, in which thousands of rats are loosed upon a city by an angry psychopath.

Madrid, and they were going to meet in New York, and he [(Langham)] never got a chance to really meet him [(Szculec)]. Because he really liked Tad Szculec's book on this.

And one Sunday—I guess I was out playing golf—and he had this handwritten letter, the story of his life, all his feelings about everything. He had written this to Tad Szculec, and I didn't find this until after he was dead.

YUFFEE: Oh, really?

GRILLY: And it's really touching.

YUFFEE: Oh, definitely.

GRILLY: And he mentions Fermi in there.

YUFFEE: Oh, the story about the methane?

GRILLY: Yeah. And he had friends in high places. He could go to Washington and talk to most everybody. People really liked him.

YUFFEE: It seems, you know, that he has achieved—

GRILLY: He had testified many times for—because then he became interested, of course, in [radioactive] fallout.⁷²

YUFFEE: That's one thing I definitely want to talk about. How did he become interested in fallout?

GRILLY: Well, I guess from the tests and everything here.

YUFFEE: Was he interested—you know, influenced by [Willard] Libby⁷³ and RAND⁷⁴ [Corporation studies] and all that?

PETERSEN: Well, see, there was a[n information] pipeline [to Washington] right in here from Libby. Ernie Anderson⁷⁵ was Libby's student at the time he got the bright idea to do carbon dating.⁷⁶

⁷² radioactive debris from a nuclear detonation or other source. Fallout is usually deposited from airborne particles.

⁷³ an American chemist who researched physical, inorganic, and nuclear chemistry and radiochemistry. He worked at Los Alamos in the late '40s and early '50s and received the Nobel Prize in Chemistry in 1960 for the discovery of radiocarbon dating—the practice of measuring the ratio of radiocarbon to stable carbon to establish the approximate age of an artifact, region, etc.

⁷⁴ a Federally Funded Research and Development Center (FFRDC) based in Santa Monica, California. RAND analysts are called on by the Department of Defense and other Government agencies to analyze complex technical and interdisciplinary problems; RAND was the prime contractor for the Greenhouse project that Willard Libby started.

⁷⁵ Ernest Carl Anderson was a physical chemist who worked at the University of Chicago Metallurgical Laboratory during the Manhattan Project, 1942–44, and then at Los Alamos Scientific Laboratory. Dr. Anderson received the AEC's E.O. Lawrence Award in 1966. He conducted research in natural radiocarbon, liquid scintillation counters, low-level radioactivity measurements, and cellular biochemistry. He also designed the HUMCO II, an improved version of the first whole-body counter, HUMCO I.

⁷⁶ the practice of measuring the ratio of radiocarbon to stable carbon to establish the approximate age of an artifact, region, etc.

In other words, Jim Arnold and Ernie Anderson were Libby's graduate students, and they carried the load, as far as the data on which the old radiocarbon dating idea was pursued. Libby was given the Nobel Prize for that.

YUFFEE: Sure.

PETERSEN: The idea that fallout was going to be important was because Ernie and Wright talked all the time, and while they couldn't look at strontium-90 readily with their instrument, they *could* look at cesium-137 and do it on a routine basis.

YUFFEE: Sure. Was Wright Langham sort of the main—was his interest in fallout the main reason why so many people came here to be counted [(have the level of radioactivity in their bodies measured in whole-body counters⁷⁷)], or was that in conjunction with the counters here?

GRILLY: In conjunction, but they—and then they tested milk. Remember that big project [(Project Sunshine)]⁷⁸ when they tested [for fallout radioactivity in] milk from all over the country, and they had cartons of milk they counted?

And, in fact, Randy Lovelace⁷⁹ was—he was a good friend of Wright's. He had all the astronauts up here. He ran *them* through the human [(whole-body)] counter, too.

(laughter)

PETERSEN: It might be worthwhile to back up and just have you comment on the very early days of scintillation⁸⁰ counting⁸¹ with Newt Hayes—

GRILLY: Newt Hayes?

PETERSEN: — and Bob Cowan and Fred Reines. I'm looking through—and do you remember?

GRILLY: I remember them working on it. I don't know. I just lived through the development of it, I guess, so much. Ernie Anderson was very instrumental in it.

YUFFEE: How did Dr. Langham get into it? How did he get so interested?

⁷⁷ apparatuses that measure radionuclides in man using shielded detectors and multichannel energy analyzers

⁷⁸ Project Sunshine was initiated by the AEC in response to the urgent need for radiation biomedical information. The Project began as an evaluation of the hazards associated with nuclear war and grew into a worldwide investigation of radioactive fallout levels in the environment and in human beings.

⁷⁹ Dr. Randolph Lovelace was the director of the Lovelace Foundation and Hospital in Albuquerque. He was intimately involved in the clinical aspects of health and well-being of workers involved in overpressure tests.

⁸⁰ a flash of light from the ionization of a phosphor struck by an energetic photon or particle

⁸¹ measuring radioactivity by registering the number of scintillations it produces

- GRILLY:** See, [radioactive] fallout particles, [their] effect[s] on animals. Chet Richmond did a lot on that.⁸²
- PETERSEN:** Well, maybe Julie just doesn't appreciate how fundamental Wright was in the whole business of scintillation counting. But when Newt came here in the very early '50s with these terphenyl oxyzols⁸³ that he had synthesized at IIT [(Illinois Institute of Technology)] in Chicago, the light went on over Wright's head, saying, "This could be a big counter!"
- GRILLY:** That's right.
- PETERSEN:** And immediately, Ernie Anderson started working on the idea of the big counter [(a whole-body counter)]. But the lightbulb went on over Wright's head, and that's important.
- GRILLY:** That's right.
- PETERSEN:** That's a historically important thing to get into the record someplace.
- YUFFEE:** And so, essentially, this was the birth of liquid scintillation counting.
- PETERSEN:** It's the birth of large liquid scintillation counting. Other people had known about scintillators for some time, but the idea—
- YUFFEE:** —of a human [whole-body] counter.
- PETERSEN:** Two ideas, one of large counters and one of biological counting. See, Wright and Ernie—Ernie Pinson—and Storer had been doing all this work with a very laborious method on tritium. And suddenly, here was a way that you could count tritium in a sample just by shaking the vial.
- YUFFEE:** Okay.
- PETERSEN:** A tremendous advance in the convenience of biological counting.
- YUFFEE:** Now, this may be a rather silly question to ask, but when something like that happens, you get the idea that you want to—you know, "We can build a large-scale liquid scintillation counter"—who goes about the mechanics of it, the actual building of this thing that looks like a morgue chamber, you slide right into it?
- GRILLY:** Jim Perrings, Bob Shuch, Ernie Anderson—
- PETERSEN:** But Ernie Anderson was the straw boss.
- GRILLY:** Ernie Anderson.

⁸² From 1955 to 1958, Richmond was an assistant, then a staff member, at Los Alamos Scientific Laboratory. In 1958, Dr. Richmond was appointed to the staff of the Atomic Energy Commission—Division of Biology and Medicine in Washington, D.C., where he remained until returning to LASL in 1971 to head the Biomedical Research Group. For the transcript of the January 24, 1995 interview with Richmond, see DOE/EH-0477, *Human Radiation Studies: Remembering the Early Years; Oral History of Radiobiologist Chet Richmond, Ph.D.* (August 1995).

⁸³ a series of chemical compounds that scintillate when irradiated. The use of one oxazole—terphenyl—for scintillation counting was pioneered at Los Alamos in the '50s. Terphenyl remains a staple for scintillation counters.

PETERSEN: The whole thing is Ernie's brainchild.

YUFFEE: I guess what's so amazing—I mean—

PETERSEN: The operation, Ernie Anderson is the architect of this whole business.

YUFFEE: I guess what's so amazing to me, you know, so many people with no engineering training or, if you *were* engineers, with no training in physics or whatnot, you know, it's like at that time you—

GRILLY: Oh, I don't know. I think it's sort of interchangeable. I mean—

YUFFEE: Well, I think it seems like the times made it so.

GRILLY: Like Ernie's brilliant in one—he's brilliant in several fields. I think—well, then you go to the experts and you ask them how you can design that.

YUFFEE: Sure.

GRILLY: I know lots of times Wright was over in the engineering department designing something, this or that. You go ask the experts. Explain your problem to them and, then, you go to Washington and beat on desks and get the funding for it.

YUFFEE: Sure.

GRILLY: Because, in those days, we were all—nobody had their individual grants. So it was up to Wright to get the funding for all of the projects.

YUFFEE: I know that's something that Pete ended up being quite adept at, but was that something that he was well-known for?

GRILLY: Yeah. And he would go and talk to Hes Hawkins and try to get some Department of Defense money transferred over to our Lab. You've got to work at it. He was a politician, too.

YUFFEE: I guess that's one thing. How much were some of the people who were division leaders or group leaders, you know, when you had to—did they find it difficult to mix the administrative side with getting their hands dirty and doing the research?

GRILLY: Well, yeah. I think it sometimes is not good for a creative person to take on an administrative position. I know Wright said sometimes, "I'm going to quit and go back to the bench. I'm going to quit and go back to the bench."

But he had these good ideas. I mean, in fact—well, he supported the guys that started the cell separator,⁸⁴ and he thought that was a great idea.

YUFFEE: *(to Petersen)* Wasn't that you?

PETERSEN: No, it was—the first idea for separation is Mac Fulwyler. He got the idea for—see, the idea was not just separating cells, it was isolating

⁸⁴ a device for sorting individual cells, flowing in a fine stream, based on their physical characteristics

them physically [(for example, to separate one type from another: damaged or changed cells versus undamaged or unchanged cells)], so that you could have a jar with special cells in it that you could look at all at the same time—Mac Fulwyler, Marv Van Dilla,⁸⁵ Paul Mullaney,⁸⁶ Phil Dean,⁸⁷ Scott Cram, a bunch of guys.

Personal and Professional Interactions at Los Alamos

YUFFEE: It sounds, the way you describe the way things ran—and, as you said, that there weren't more people, you know, constantly looking over your shoulder—it sounds very much like the hierarchy was suspended in some ways.

GRILLY: I think everybody was very dedicated and cooperative. If you had a special project, you would go to this person or that person. They [(Los Alamos researchers)] all interacted.

YUFFEE: Sure.

GRILLY: Don't you think, Pete? I mean, there's a lot of interaction, and there was a lot of pioneering spirit when we first came up here. Everybody was kind of single-minded, you know, when I first came here, as a holdover from the [atomic] bomb [research] days.

YUFFEE: Sure.

GRILLY: And things were run so differently. I'm glad I worked when I worked, because I say that with all the rules and regulations now, they never would have gotten the bomb built, you know. Good heavens.

(laughter)

YUFFEE: That seems to be a feeling that almost everybody universally shares who was involved in that during the time frame. I mean, it seems clear that people feel like nothing could be gotten done now that was done then.

GRILLY: Oh, good heavens. Oh, all the paperwork and all the rules and regulations and—can't even have a cup of coffee in the lab anymore. My heavens—good heavens: I took my dog to work all the time!

(laughter)

YUFFEE: Oh, that's funny.

GRILLY: Oh, dear. But, you know, we would—when we had to work, we had to work, and it didn't matter—as I say, sometimes all night. We [didn't] complain about that. We would take a little time off and—

⁸⁵ a physicist at Los Alamos who had come from MIT

⁸⁶ In the 1950s at Los Alamos, he worked with Van Dilla to run the development of instrumentation for cell growth experiments.

⁸⁷ Dean was in charge of operating and refining the HUMCO II whole-body counter during its early development.

YUFFEE: —play golf.

GRILLY: It leveled off, you know.

YUFFEE: Was it a pretty tight-knit community, the Los Alamos community at that time?

GRILLY: Well, if you drive down [the road called] Trinity here, that was the community. This was the first housing built, here in the old part of town.

When I first came here, the Episcopal church down there, those were the horse stables. And everybody lived on Trinity or around the tech area. That was it when we first came here.

YUFFEE: Really?

GRILLY: Oh, yeah. In fact, when I first came here, we had a[n electric] two-burner hot plate to cook on.

YUFFEE: *(laughs)*

GRILLY: And I remember coming home from work, down Trinity—we were in a quad [(a four-unit apartment building)] at that time. I remember being so thrilled, coming home from work at noon. There were stoves sitting out, all down Trinity, waiting to be installed in the apartments. So we got a four-burner stove with an oven below.

YUFFEE: *(laughs)* But it took a while. And this was in 1947?

GRILLY: Yeah, mm-hmm.

YUFFEE: This is two years after the end of the war, and still the situation was pretty primitive.

GRILLY: Well, the “Bathtub Row,” they were set up a little bit better, but—we didn’t have bathtubs, either. That’s why they called it “Bathtub Row” over here. *We* just all had showers.

YUFFEE: Showers?

GRILLY: So when, you know, some years later, we got a bathtub, it was a real luxury.

And, I think it was the first winter I was here, it got down to 20 below out at DP Site,⁸⁸ and our heat went off. And I’m from Minnesota, but, you know, that’s cold.

So what they did was, the KRS, which was the community radio station—Bob Porton ran it—and he announced on the radio, “Everybody go to the lodge if you’ve got small kids, or else find a friend with a fireplace!”

Well, we knew Art and Helen Murray. Art used to work in our lab; he was a chemist. They were the first people I knew up here, and we went over to their house. They had a fireplace, so we stayed there until we

⁸⁸ DP West was the site of the early plutonium chemistry labs before the CMR building was built.

managed to go home, get under the covers, and about 4 o'clock in the morning, they knocked and said, "The heat's on now."

(laughter)

YUFFEE: Oh, that's funny.

GRILLY: I mean, it was primitive.

YUFFEE: Sure.

GRILLY: But everybody had a pioneering spirit.

YUFFEE: Oh, it must be. I can't imagine being—

GRILLY: Very informal, and everybody was on a first-name basis. I remember when some of the doctors first came to work in our lab—"Dr. So-and-So." That didn't last. Phyllis and I got after them, Phyllis Sanders and I. You know, it didn't take long until they were one of the gang and they were—everybody's on a first-name basis.

YUFFEE: And this went up to the top. I mean, it's true that people called Oppenheimer "Oppie"?

GRILLY: Sure. "Norris" was [Lab Director] Norris Bradbury, and all the way down. "Louie" was Louis Hempelmann, you know. There was not—you didn't want to call everybody "Doctor," because there were so many doctor's degrees up here that—

(laughter)

GRILLY: But it was, you know, just all together like that.

And we had some fellows working in our lab. One was Ed Leifer. One was John Hogness, whose father was head of the Chemistry Department, University of Chicago; he was in the Army. And one was Lloyd Roth, and Lloyd Roth established—we had a foreign film society. He got that started.

Everybody was together. And I used to play the cello, and we had orchestra concerts, and—a lot of talent out here.

YUFFEE: Oh, really? I was going to ask you about that, because I interviewed Waldo Cohn in Oak Ridge, and he started up the Oak Ridge Symphony there.⁸⁹ He, too, is a cellist.

GRILLY: Uh-huh.

YUFFEE: And he started up the Oak Ridge Symphony there, which is actually one of the things, when we asked him what he considered his crowning achievements, he said that would be one of the top two.

Were there similar types of social activities and cultural activities here?

⁸⁹ For the transcript of the interview with Cohn, see DOE/EH-0464, *Human Radiation Studies: Remembering the Early Years; Oral History of Biochemist Waldo E. Cohn, Ph.D.* (June 1995).

- GRILLY:** Oh, yes, all sorts of musical get-togethers and choral groups, and I've played in many light operas and everything. They have more talent up here than—so much talent.
- YUFFEE:** Was there much travel between here and Santa Fe?
- GRILLY:** Yeah, a fair amount.
- YUFFEE:** I mean, to get off the hill, and—
- GRILLY:** But, of course, they still had the Badge Office there [(at Los Alamos)].
- YUFFEE:** Right.
- GRILLY:** And they were worried about opening it, and everybody up here was worried. "We're going to become an open city, and we're going to have all these people coming in!" Well—
- YUFFEE:** So, the feeling on the inside was, you liked being [a] closed [community].
- GRILLY:** It was kind of nice. The feeling was definitely [so] at this particular one.
(laughter)
- GRILLY:** And so they were going to open it, and there was this big to-do about it. And, finally, one day, Friday afternoon, they announced the Badge Office [to the city] was going down—the Pass Office was going down as of Monday morning, so there was no time to have any—be against it, you know.
- YUFFEE:** Right.
- GRILLY:** And so—there wasn't any great influx. Anybody in the [Rio Grande] Valley who had wanted to come up here, they already had a badge. All the maids were from the valley, and everybody had been in here. So—
- YUFFEE:** What was it like after it became open?
- GRILLY:** It didn't change much.
- YUFFEE:** It didn't change much?
- GRILLY:** No. But you did have to show your badge.
- YUFFEE:** That's interesting, though, that the people on the inside actually preferred it that way, to be closed. You would think—
- GRILLY:** But they [(the authorities)] didn't give them a chance to object this time. They just said—this was Friday afternoon, and they announced, "We're opening it Monday morning." There was no time to object.
- YUFFEE:** What was the feeling like when the AEC⁹⁰ started to divest itself of all of the property when, you know, homes became private homes and not AEC-owned, and things like that?

⁹⁰ the U.S. Atomic Energy Commission, predecessor agency to the U.S. Department of Energy and Nuclear Regulatory Commission (NRC); established January 1, 1947

GRILLY: Well, see, that was in about '64, something like that. First they sold lots out on Barranca [Mesa]. I remember Jake Spalding and Ted Trujillo got places out there.

But then—well, you had to buy it, but, you know, it had been kind of nice to have the Government take care of you.

(laughter)

Rent was very cheap.

YUFFEE: Sure.

GRILLY: If it needed painting, they came in and painted. If it needed painting on the outside, they painted. Of course, everything was Zia Green.

(laughter)

GRILLY: But they gave you such a good deal on buying, you couldn't—

YUFFEE: Oh, really?

GRILLY: Oh, yeah. And, then, it was nice to own your own home.

YUFFEE: Sure.

GRILLY: People liked that. But—oh, another interesting thing. We used to be on the point system here as to what housing you could get.

YUFFEE: How did that work?

GRILLY: Well, every Friday afternoon in the *Bulletin* [(a weekly internal Los Alamos publication)] was listed the number of points that you had to have to get a certain apartment or a house.

And the first thing they considered was the number of children. The next thing was your salary and your tenure. So they would add up certain points, and—yeah: housing points, and your service and your salary. Mm-hmm.

YUFFEE: Oh, that's funny.

PETERSEN: That's a calculation that I made.

GRILLY: Sure. And so, every Friday afternoon, everybody would check to see what they could get.

YUFFEE: And this determined what kind of home you could buy?

GRILLY: Yeah. Mm-hmm. Well, not buy. Well, yeah, move into.

PETERSEN: This was for renting, too.

YUFFEE: Oh, this was for renting?

GRILLY: For renting, sure.

YUFFEE: I don't know. It sounds funny. I mean, you would sort of save up your points to get the better apartment if it came on the market?

GRILLY: Yeah. Well, first of all, it was the number of people in your family.

YUFFEE: Uh-huh.

GRILLY: And then your salary, and then your tenure. And so, every Friday afternoon—I remember the little bulletin. And up there was this address, and so many points, and this address, so many points, and this address.

YUFFEE: Oh, that's great. So that's how they marketed new—the apartments that were available.

GRILLY: This is for renting. This is before they sold.

PETERSEN: Then some money became available to modify the houses.

GRILLY: Oh, yes, "the needy and the greedy."
(laughter)

YUFFEE: What's "the needy and the greedy"?

PETERSEN: Well, there were reproductively active people here who had grossly outgrown their quarters. They were the needy.

YUFFEE: Uh-huh.

PETERSEN: Then there were those with sufficiently high salaries so that they qualified on the basis of salary alone. They were the greedy.

GRILLY: You could get an extra addition put on.

YUFFEE: I told him, next time we come here, I'm going to write down all the expressions he uses, because I love that.

GRILLY: Well, "the needy"—that's so old; that was common. That was "the needy and the greedy."

YUFFEE: Oh, that's great. *(laughs)*

Grilly as a Subject in a Tritium Ingestion Experiment

PETERSEN: Julie, one thing that—

GRILLY: Yes.

PETERSEN: —might be worthwhile just talking about from your perspective, since you handled so much of the traffic, in terms of studies on people, volunteers—

GRILLY: Mm-hmm.

PETERSEN: —and animals. What's your impression of the amounts of that kind of activity that came through your lab? I mean, was it mostly animals or mostly people?

GRILLY: Animals. That was the only thing I had to do with, was animals. I mean, Chet Richmond and—as I say, we took—we ingested particles for him, and—

YUFFEE: So you, yourself, have been a subject?

GRILLY: Oh, sure. One time—what was that group that was here? They measured our fat, and we—they dunked us [in a tank of water to determine our body fat as a percentage of weight].

PETERSEN: This was NRDL.⁹¹

GRILLY: Was that it?

PETERSEN: Yes. They had people—

GRILLY: They dunked us under [water in] a tank, and they collected our urine, and we drank tritium water, and—oh, sure. No problem.

YUFFEE: Would you say—

GRILLY: This passage of—well, they wanted to know the passage of these [radioactive] particles through the gut.

YUFFEE: Oh, so this was by ingestion. You would ingest—

GRILLY: Uh-huh.

PETERSEN: The problem was that they were afraid of a launch accident for a nuclear package aboard a satellite that might be destroyed and burn up, or burn up on reentry and provide these little—mostly it was launch accidents, and they simulated the burned up fuel.

And the question was, “Would the density of the particles affect their gut transit time?” So they used uranium carbide as the heavy particle and zirconium spiked with manganese-54 as the light particle.

GRILLY: Manganese, that was it.

PETERSEN: And then they gave both of these [radioactive substances] in a capsule and then [radiologically] counted the people until they [(the particles)] disappeared [by being excreted]. As I remember it, the canning issue was in Lush’s [idea].

GRILLY: Well, what we did—I told the CNN guys this, and they—I said, “Well, we swallowed it, and then we had to collect our feces.” We had a little toilet seat with a plastic bag.

We collected it, and we took it into the lab. Lush had some cans, and we put formaldehyde on it, and then he canned it, and then they counted it. See? So they found the passage [through the gastrointestinal tract] was very good [(efficient)].

YUFFEE: What did the people from CNN think when you told them this?

GRILLY: He started to laugh.

⁹¹ Naval Radiological Defense Laboratory in Hunters Point near Oakland, California

Recollections of Other Plutonium Research

GRILLY: . . . and some—they did some particles on skin, on monkey backs. I remember taking pictures of that for Phil Dean.

In fact, Wright put some particles on his skin. I've got pictures of that. I took pictures of—I did a lot of histology and photomicrography⁹² for plutonium, both plutonium particles injected and inhaled. I did, oh, hundreds of those. And then I had to be very careful—

YUFFEE: [Was this research done on] animals?

GRILLY: Oh, animals, yes. Rats, mostly rats.

PETERSEN: And hamsters.

GRILLY: And hamsters. Dogs, occasionally.

YUFFEE: What other—

GRILLY: But I did a lot of work on that hot particle⁹³ project,⁹⁴ and we had to be very careful, because we would have to pick up that little plutonium particle and make sure it got out okay. So they would—we were monitored [for radioactivity] very closely, and I was very careful.

YUFFEE: I was going to ask you, what type of monitoring was that?

GRILLY: We knew how to handle these [radioactive] things. We weren't afraid of it [(plutonium)], but we knew how to handle it.

YUFFEE: Were your film badges⁹⁵ read often?

GRILLY: Oh, sure.

PETERSEN: Urine collected.

YUFFEE: You should have told the CNN people it wasn't that unusual to have to worry about taking urine samples, that it was fairly common practice.

GRILLY: Then Wright got interested in—in fact he has edited a book on it, *Radio-biological Factors in Manned Space Flight*, and he did a lot of work on that.

In fact, we were down in Cape Canaveral for one of the shots [(Voyager or Pioneer: plutonium-238 was used as the heat source to keep instruments warm enough to operate)] down there, because they had a little plutonium reactor aboard, and they wanted him there just in case.

⁹² the practice of taking a photograph through a microscope

⁹³ a multiatom particle of radioactive material that emits many alpha or beta particles

⁹⁴ The hot particle project arose in response to a concern that, if a nuclear-powered rocket would abort before leaving the atmosphere, particles of plutonium would rain down to earth, be inhaled, and lodge in people's lungs. The project is discussed at length in "Dr. Langham's Postwar Studies of Plutonium" in the Petersen transcript (DOE/EH-0460).

⁹⁵ dosimeters worn routinely to measure accumulated personal exposure to radiation on photographic film

YUFFEE: Is that the same project that Carl Gamertsfelder⁹⁶ would have worked on?

PETERSEN: Mm-hmm.

GRILLY: Carl who?

PETERSEN: Gamertsfelder.

YUFFEE: Because I know he was in Philadelphia, I think, working on—

PETERSEN: The power sources [for a nuclear-powered rocket] that Wright was associated with were actually designed here.⁹⁷

YUFFEE: Oh, they were?

GRILLY: They were designed here, yeah.

PETERSEN: And built here.

GRILLY: Marv Van Dilla was in on that, wasn't he?

PETERSEN: Mm-hmm.

GRILLY: And Phil Dean, or had Phil Dean gone by then?

PETERSEN: Chet [Richmond]. Chet had a major piece of that.

GRILLY: Chet. Yeah, we were down there for one of the launches.
And then, of course, in '66, we got—Harold Agnew reassigned us for six weeks to Spain. That was wonderful.

YUFFEE: Isn't that for the Palomares incident?

GRILLY: And that was quite an operation.

YUFFEE: Oh, I'm sure.

Langham Provides Assistance After Radiation Incident in Greenland (1968)

GRILLY: And then, in '68, Norris Bradbury called. He said, "Is Wright there?" I said, "No, he's"—he was down in Florida. I said, "What *now*?" He said, "Well, I wanted him to go to Greenland."

(laughter)

⁹⁶ For the transcript of the interview with Gamertsfelder, see DOE/EH-0467 (September 1995).

⁹⁷ Grilly is referring to the Rover experiments, a research and development program initiated by the AEC and the U.S. Air Force in 1957 to develop nuclear rocket propulsion. The National Aeronautics and Space Administration (NASA) replaced the Air Force as cosponsor in 1960. AEC had responsibility for the nuclear aspects of the program. AEC work was assigned to Los Alamos Scientific Laboratory and Lawrence Radiation Laboratory; field experimentation was conducted at Jackass Flats, Nevada. The Kiwi series of experimental reactors was part of Project Rover. The relatively long development lead time associated with nuclear rocket propulsion caused the program to lose funding priority to chemical rockets in the 1960s. Source: Linda Neuman Ezell, *NASA Historical Data Book, Vol. II: Programs and Projects 1958-1988*; National Aeronautics and Space Administration; Washington, D.C.; 1988; p. 473.

So he was up there for the Thule, Greenland, the [airplane] accident up there.⁹⁸

YUFFEE: Sure.

GRILLY: So we got acquainted with the Danish people up there.

YUFFEE: Oh, that's funny. Now, was that a—

GRILLY: And he went directly from Florida up there. He got the mukluks,⁹⁹ and he got all his—and, in fact, I've got some radioautographs of some of the ice samples. And, you know, he was very involved in how the plane had come in. We've got pieces of the plane and autoradiographs on them, and everything.

YUFFEE: That's important.

GRILLY: So, I mean, I was kind of in everybody's experiment. It was—

YUFFEE: Sure.

GRILLY: It was a wonderful job.

YUFFEE: Now, when did you finally retire from the lab?

GRILLY: 1980.

Grilly's Work During Agency Transition Years (1970s)

YUFFEE: What kind of work did you do through that whole transition period?

GRILLY: Same thing I had been doing.

YUFFEE: From AEC to ERDA [(Energy Research and Development Administration)]¹⁰⁰ to DOE [(Department of Energy)].

GRILLY: Same thing I had been doing.

YUFFEE: Really? Was it as if it hadn't really—things hadn't changed all that much?

GRILLY: Oh, they've changed, but—you had to write more paperwork. No, it didn't. It didn't affect my job, particularly. Pete is—that's a different situation, but I didn't have to write job proposals and all that sort of thing, luckily. But, as I say, I had a little piece of everybody's [paperwork].

⁹⁸ On January 21, 1968, a B-52 airplane from the U.S. Strategic Air Command crashed in Bylot Sound, 7 miles (11 kilometers) west of Thule Air Force Base in Greenland. Due to the impact of the plane, the chemical explosive in the four unarmed nuclear weapons onboard the aircraft detonated, causing the release of kilograms of plutonium into the environment.

⁹⁹ soft boots worn by Eskimos, often lined with fur and usually made of sealskin or reindeer skin

¹⁰⁰ ERDA succeeded the AEC in the early '70s, and in turn was replaced by the DOE in 1977.

Oh, and then, chromosomes. Oh, my gosh, forerunner of the [Human] Genome Project¹⁰¹ up here, when Larry Devon came.

YUFFEE: Sure.

GRILLY: I took chromosomes until I could see them in my sleep at night, clicked pictures through the microscope, and radioautographs of them, and everything. *(to Petersen)* In fact, I came across a paper you and Larry and—so that has gradually evolved into quite a project, the Genome Project.

YUFFEE: Now, you mentioned microscope work. Was the microbiology—you know, it got much—

GRILLY: No, microbiology is different from—this is photomicrography I'm talking about.

YUFFEE: Okay.

GRILLY: Microbiology is bacteriology, more or less. Sort of.

YUFFEE: Mm-hmm.

GRILLY: But I loved microscope work, because—well, I could show you some of my pictures. But it was so fascinating, because microscopy is artistic, as well.

And sometimes I took pictures like, I have a radioautograph of some of these spheres, and they wanted to see the uniformity of labeling, so I made radioautographs of them, then took them with different lighting.

And, for instance, plutonium in the lung, and you could see what cells were at risk from the alpha tracks¹⁰² branching out. But, I mean, there are different ways of looking at things, different lighting. It's fascinating. I just loved it.

YUFFEE: I understand that some of your pictures have actually been award winners.

GRILLY: They have. They've been published several places. It was a lot of fun.

PETERSEN: You ought to show him that gold and blue background.

GRILLY: Well, I'll show it to him, yeah.

Grilly's Comments on Negative Perceptions of Los Alamos and of Radiation Research

YUFFEE: Okay. One other thing that might be of interest to just comment about, in all of the public utterances now, they start with the assumption that the Laboratory staff and Wright, in particular, had in mind to hurt somebody.

GRILLY: Oh, heavens.

¹⁰¹ a broad-scale program sponsored by the National Institutes of Health and the Department of Energy to map the location of every gene of all 47 human chromosomes

¹⁰² the tracks recorded on photographic film by emitted alpha particles as they would streak by

- PETERSEN:** And I would just like to have you comment a little bit on the—
- GRILLY:** I know they think—I think they think they're a bunch of ghouls doing this. They were just trying to get some data, and he [(Langham)] was not the instigator, but he was presented with these samples, and he analyzed them in a very logical way.
- YUFFEE:** And in terms of other research involving people, do you recall—I mean, it's basically the same question that, I think, we asked you [before the interview]: Do you recall questions, discussions of ethics and ethical considerations?
- GRILLY:** No. *(laughs)* We just did it. I mean, we just took things [(the exigencies of the Cold War, including experimentation) for granted].
- YUFFEE:** Do you remember any use of the outside subjects, volunteers, in studies?
- GRILLY:** I wouldn't know about that. I wouldn't have been involved in that.
- YUFFEE:** Actually, there was one thing I came across that I think we might have mentioned when we talked to Dr. Lushbaugh, namely research involving the AEC firemen. Do you remember that?
- PETERSEN:** Oh, sure.
- GRILLY:** See, that I wasn't involved in at all. I couldn't—
- PETERSEN:** That Julie wouldn't have had anything to do with. The firemen were used primarily in an iron-59—in that iron-59 uptake study, right on the transition between the two big [whole-body] counters [(HUMCOs I and II)].
- YUFFEE:** Oh, that's right.
- PETERSEN:** Where it was a requirement for some—well, it was legitimate metabolic data that he [(Lushbaugh)] was after, but he was after it.
- Those people, incidentally, received doses of about 200 nanocuries¹⁰³ of iron-59, and so their total doses from radiation in that study are representative of living in Los Alamos just from natural background radiation. They [(those dose levels of radiation)] were the equivalent of living in Los Alamos at one milligram per day, of living here between 20 and 50 days.
- YUFFEE:** Sure.
- PETERSEN:** Very, very tiny doses of lifetime radiation from those [experiments]. And the reason that those people were recruited was that Lush was actually responsible for giving the training lectures to the firemen on radiation effects and, in the course of that, made a plea.
- And I think about a dozen of them volunteered to take 20 microcuries¹⁰⁴ of iron-59 and then be counted over a protracted period of time, because

¹⁰³ A nanocurie is a billionth of curie (10^{-9}); a curie is a unit of measure expressing activity of radioactive substances. A curie denotes 37 billion radioactive decays per second.

¹⁰⁴ millionths of a curie

that was the metabolism of the iron-59. Our specific question associated with that was the objective of the experiment.

YUFFEE: Okay. I don't think that we talked about that.

GRILLY: Because when Louie Rosen wanted to get the LAMPF¹⁰⁵ going, the meson facility,¹⁰⁶ Wright and—well, Dave Gross was here; he was a consultant. They wrote up a proposal for the biomedical part of the LAMPF facility, where they could treat [diseases] with radiation. They could treat cancer patients.

YUFFEE: Sure.

GRILLY: So, Louie Rosen, every time he went someplace, he used this as a justification. So Wright's proposal really—Wright had a very fertile imagination. He was thinking all the time. He really was.

I remember once, many, many years ago, down at the old building, I did a [literature search] for him. He had the idea of injecting a vital dye¹⁰⁷ [into an animal, and ultimately into a person] that would, maybe, selectively go to tumor cells. Then you could label it, because, you see, we had this—which I thought was a clever idea. Something like trypan blue,¹⁰⁸ or something, a vital dye, and if you could inject that into the animal and it would selectively go to the tumor and label it, you could—

YUFFEE: Yeah. You could tell—I mean, that would be great—

GRILLY: But it was just ideas like this, all the time, that kept coming.

YUFFEE: That's interesting.

GRILLY: He was a workaholic. He didn't mind if I played golf [on the weekend], because [that way] he [was free to] go to work.

(laughter)

YUFFEE: In terms of the pion therapy,¹⁰⁹ whose notion was that to get involved in that?

¹⁰⁵ Los Alamos Medium Energy Physics Facility, an accelerator facility that has been used in a number of studies to investigate the potential for accelerated particles in cancer therapy. Construction was completed in the early '70s. The clinical part of the studies was conducted by the University of New Mexico. Dr. Mort Kligerman, who directed the university's Tumor Registry, served as the principal investigator. Patients were selected by the university nationwide for the clinical trial, received clinical workups at the university, then came to LAMPF for their radiation treatment.

¹⁰⁶ A meson is a fundamental particle of matter. A meson facility is an accelerator used for causing atomic collisions that produce pi mesons for therapy applications and other scientific investigations in high-energy physics.

¹⁰⁷ copper porphyrin dye, selectively taken up by cancer cells

¹⁰⁸ an example of a vital dye that turns living cells blue without killing them, used for staining sections for tumor diagnosis and pathology

¹⁰⁹ Pi mesons (or pions) are subatomic particles responsible for the strong interactions between protons and neutrons in atomic nuclei. Mesons occur in pairs, and are liberated during the high-energy bombardment in accelerators. They have very high energy (140 MeV to 10,000 MeV) and are short-lived. Researchers have used pi mesons for cancer therapy with some success. See "Pion Irradiation Therapy at Los Alamos (1974)" in the Voelz transcript (DOE/EH-0454), May 1995.

PETERSEN: Well, it's generally a physics notion, because of the special properties of pions. They would traverse normal tissue while slowing down and then dump all their energy at the back end of their path, the so-called "Bragg peak."¹¹⁰

And so it was theoretically possible to tailor treatment volumes of pions to minimize the damage caused on entry and, because there was no exit, eliminate the damage behind the tumor and actually steer the radiation source so that only the treatment volume, which contained the tumor, contained the energy of the radiation.

The whole project was based on the premise that, with this sophisticated business of being able to move pion doses in two dimensions and the patient in the third dimension, you could actually cover a treatment volume of some complexity and spare the surrounding normal tissue.

YUFFEE: Now is this what fueled the desire to build the meson facility?

PETERSEN: No.

GRILLY: No. Louie Rosen wanted it. Oh, but, I mean, he just used—you see, people understand biology better than physics.

YUFFEE: Right. Sure.

GRILLY: So he used Wright's plan for a facility for treatment, and he used that in every speech he ever gave. It just helped Louie sell the meson facility.

YUFFEE: Sure.

GRILLY: No, it was Louie's idea, Louie's baby.

Langham's Persuasive Power in Washington and His Impact on Los Alamos

GRILLY: But one thing I'll have to tell you, I don't think I've heard in this life a better speaker than Wright was.

YUFFEE: Really?

GRILLY: Oh, he could speak, I mean, beautifully. Oh, he could, he really could. He was an outstanding speaker.

YUFFEE: Could he make what sometimes are difficult concepts for the lay person understandable?

GRILLY: Mm-hmm. Absolutely. How do you think he sold these guys in Washington lots of times [on funding projects at Los Alamos]?

(laughter)

No, he was a wonderful speaker, and he would introduce humor at the darnedest times.

¹¹⁰ the rapid increase in relative specific ionization of a charged particle per unit pathlength near the end of its path in matter

YUFFEE: How did H-4—if it was still H-4 at the time—how did his death [in 1972] affect the way that the group ran?

GRILLY: Well, he had sort of been moved upstairs [(promoted)] a little bit. You know how these things go. And he was just getting established up there, and it was bothering him, because this was his Lab.

YUFFEE: Sure.

GRILLY: And he was moved over to the division office, but the whole Lab was his baby, really.

PETERSEN: In a word, devastated.

YUFFEE: And what happened in terms of trying to rebound? Did it take a long time to find somebody to replace him?

PETERSEN: You had to invent new ways to do what Wright had done. It was clear that you discovered in a hurry all those neat things that he had done for you that now you had to do for yourself.

GRILLY: And all the contacts he had.

PETERSEN: All that had to be reestablished.

GRILLY: Because he could go and talk to anybody in Washington and they listened to him.

YUFFEE: Were there times when H-4's research initiatives were directed by Washington?

GRILLY: Well, somewhat.

PETERSEN: Not [in early times].

GRILLY: I suppose.

PETERSEN: [Not] in early times.

GRILLY: I suppose. There were problems they wanted solved, like—well, I mean, like this fallout. I mean, that was important to everybody, because you had to sort of go along with Washington and the AEC to get funding.

YUFFEE: Right. But, I mean, it's interesting. It sounds like funding was a big issue at Los Alamos. For example, people I've talked with who were at Argonne Cancer Research Hospital¹¹¹ or down at ORINS¹¹² in Oak

¹¹¹ one of three clinical facilities created by the Atomic Energy Commission in 1948. While the AEC owned the 58-bed Chicago hospital, the University of Chicago medical school administered and staffed the facility. Patients were admitted on a selective basis: physicians chose persons whose condition best suited the hospital's research and treatment applications. The hospital admitted its first patient in January 1953. The Energy Research and Development Administration terminated Government support for Argonne and the other AEC-created research hospitals in 1974, three years after the hospital's name was changed to the Franklin McLean Institute. The facilities are now used by the university's medical school for studies in radiology and hematology.

¹¹² Oak Ridge Institute of Nuclear Studies, established in 1946 by the Manhattan Engineer District and operated under a Manhattan Project (and later Atomic Energy Commission) contract. ORINS was responsible
(continued...)

Ridge, there wasn't a funding problem, because they got—it's like they were given a blank check [to spend on research].

And, you know, there was very little involvement between them and Washington as to what types of research they were supposed to do. It was, "Here's your cancer hospital and here's your check, and start doing your research," whereas, you know—

GRILLY: But you had to produce results. I mean—

YUFFEE: Well, sure, and publish.

GRILLY: Sure.

YUFFEE: But, I mean, it sounds as if, with Los Alamos, because of, you know, being a completely different—you know, in terms of dynamics of the research, completely different—or I shouldn't say, "completely different," but being different, that funding was a big issue.

GRILLY: DBM¹¹³ looked kindly on us.

PETERSEN: Los Alamos was different, and Wright was viewed as one of the chief problem-solvers. If you wanted a problem solved, you didn't go to Alex Hollaender,¹¹⁴ you went to Wright. And so, there was that fundamental difference between the Laboratories.

Wright had the reputation of having not only the mindset, but the crew that would turn to on these special problems that the AEC had. And so, Wright was—Wright had that reputation that he would solve your problems, and they would turn to him time, and time, and time again. And they didn't turn to the other Laboratory Directors for those problems. They went to Wright.

YUFFEE: It's interesting.

GRILLY: He was pretty highly respected.

YUFFEE: I feel like if people knew more about him, then they wouldn't lay the plutonium injections, in particular, and other things that are maybe not looked so highly upon anymore, at his feet.

GRILLY: Well, I can't see that that is the biggest issue in his life. It wasn't.

¹¹² (...continued)

ble for training physicians and researchers in the safe handling of radioisotopes and in the development of isotope applications in medicine. A research hospital the Medical Division at ORINS. One of three AEC-supported hospitals, the facility had approximately 30 beds for people with certain types of cancer.

¹¹³ Division of Biology and Medicine (of the Atomic Energy Commission)

¹¹⁴ director of the Biology Division of Oak Ridge National Laboratory (ORNL)

Langham's Achievements; Additional Comments on Plutonium Work

- YUFFEE:** What would you say that you would consider to have been his crowning achievement, a scientific research achievement?
- GRILLY:** Oh, boy.
- YUFFEE:** Or was that not something that you necessarily would have spoken of?
- GRILLY:** Well, there are so many things that were developed that he was proud of in our Lab. I think he was very proud of getting his medal.
- YUFFEE:** From the DoD.
- GRILLY:** From the DoD.
- YUFFEE:** The pictures I've seen make—he looks pretty happy in them.
- GRILLY:** I've got his medal out here. But everything he did was kind of a project in itself. He did them all very well. Of course, there were people that didn't agree with him, (*laughs*) but what the heck, you could talk to him. And he surrounded himself with good people. Pete—
- PETERSEN:** Ernie [Anderson].
- GRILLY:** Ernie, Payne Harris.
- PETERSEN:** Payne Harris, John Storer, Lush.
- GRILLY:** I mean, good people, you know, working in your group.
- PETERSEN:** Chet. They had a gang that was responsible, especially in those early times.
- YUFFEE:** Sure.
- GRILLY:** He had a great bunch. All those people were outstanding in their own fields.
- PETERSEN:** I wonder, if Wright were alive to vote, if he wouldn't recognize that the problems associated with the human [whole-body] capabilities wouldn't be things that he would pick.
- GRILLY:** Probably. Probably.
- PETERSEN:** It's hard to do this, because you can't crawl inside his head and say, but if you look at where his energies really were focused, they were in support of things like the Sunshine Project.
- YUFFEE:** Sure.
- PETERSEN:** Wright wrote the early—when Sunshine was just getting off the ground, and they were—the fundamental ideas that were the nub of Sunshine, Wright wrote that final report—or the interim report, in 1956.
- YUFFEE:** Are there bulletins? Or was this one of the actual reports?
- PETERSEN:** One of the actual reports. The 1956 report has his authorship with others contributing, but—

YUFFEE: But he appeared before the Joint Commission [(Joint Committee on Atomic Energy)].

PETERSEN: And it's almost exclusively from that bunch's considered view that strontium was picked as the fundamental [radiation] hazard.¹¹⁵

YUFFEE: Of worldwide [radiation] fallout.

PETERSEN: Right. And, of course, he always felt—and there are some very brisk disagreements about this that are recorded—that if you could count cesium, you could keep track of strontium.

YUFFEE: Sure.

PETERSEN: And that was not generally agreed upon, but it was essentially the operating notion that he and Ernie [Anderson] and Tom Shipman and all the folks around here working on that had.

GRILLY: Well, and in the Spanish incident, he sent some of his good people over there—Bill Moss, Phil Dean. Let's see, who else went over there?

PETERSEN: Wasn't Eric Fowler over there?

GRILLY: Eric Fowler went over. And Wright had these people go and follow up and teach them the latest counting techniques, and he got them a human [whole-body] counter that Washington paid for and had it shipped over there [to Spain].

YUFFEE: Oh, wow.

GRILLY: Yeah. Yeah. In fact, we've got a picture from Angier Biddle Duke, the ambassador there. We were at his house one night for cocktails. He has, it says, "To the hero of Palomares."

And he had gone down, the Ambassador had gone down near Palomares for a swim in the Mediterranean to show people that there wasn't anything wrong down there.¹¹⁶

(laughter)

But we were at the cocktail party there, and I remember his wife asked me, "Do you play golf?" I said, "What am I going to do if she wants to play golf?" Wright says, "Go play golf with her," you know, but I didn't get to.

PETERSEN: Putt, putt one.

GRILLY: So this one fellow started talking to me, and—I don't know, one of the underlings of the Embassy went over to Wright and said, "Go stand by your wife," because this guy was trying to pump me about me about something. So Wright came over. They weren't going to get any information from me!

¹¹⁵ Petersen discusses the concern over strontium's fallout threat in the section, "Nuclear Weapons Fallout Studies (1946–54)," in his oral history.

¹¹⁶ Duke later died of cancer at a relatively young age.

YUFFEE: That's funny.

GRILLY: The Embassy was spastic about these things. And Wright just calmed down the Spanish people a whole lot. They had a lot of faith in him. We've still got good friends over there.

No, it was an interesting life with Wright. We went to Heidelberg[, Germany] one time for a week. He was—

YUFFEE: At the conference there?

GRILLY: In Heidelberg, yeah. And I don't know, he told some joke about von Karmann, the father of aviation, something about stages of senility, and they were translating everything, different languages and everything.

The whole place broke into this uproar because he used something about, the last stage, he didn't zip his pants, or something like that.

(laughter)

I mean, he had a way of interjecting something that was so unexpected. I remember the whole place was just—Lowry Dobson was over there at the time.¹¹⁷ Did you know Lowry Dobson?

PETERSEN: Just by—

GRILLY: He was living there in Geneva[, Switzerland].

YUFFEE: Well, I can't really think of any other questions that I have. Can you?

GRILLY: Well, as I say, I can't tell you much about the science of all this, but I had a little part of all of it and loved it.

YUFFEE: Sure.

GRILLY: I really did. I've had a good life.

YUFFEE: Can you think of anything we've missed, Pete?

PETERSEN: I've been trying to think, and—

GRILLY: It's kind of interesting that they fixed up a book of tributes to Wright up in the division office. There's one letter, and it's from Stafford Warren. You see, the week that Wright went to Washington, he went to see Shields Warren¹¹⁸ and Stafford Warren get awards. And Stafford Warren says, "I'm sorry to wait for a long time," because he [(Langham)]—see,

¹¹⁷ R. Lowry Dobson, Ph.D., M.D., a physician who was born in Beijing, China, in 1919 and became a U.S. citizen. He was a research fellow at Donner Laboratory and Lawrence Radiation Laboratory (at UC Berkeley) and was chief medical officer until 1958. Additionally, he was a senior scientist in the Biomedical Sciences Division at the Lawrence Livermore National Laboratory, conducting research on the health effects of exposure to environmental agents, radiation, and internal radionuclides.

¹¹⁸ Shields Warren, M.D., was Chief Pathologist at New England Deaconess Hospital and Professor of Pathology at Harvard Medical School. He joined the U.S. Navy Medical Department in 1939 and wrote with others on what was then known about radiation during World War II. Dr. Warren served on the first U.S. team to visit Hiroshima and Nagasaki after they were bombed with atomic weapons and was involved in creating what became the Atomic Bomb Casualty Commission. He was the first director of the AEC's Division of Biology and Medicine and, later, established his own cancer research institute at New England Deaconess Hospital.

then, he was killed on a Friday afternoon,¹¹⁹ and Stafford Warren felt so bad about that.

See, he and Stafford Warren were good friends, and that's how this whole—all this plutonium business started, but Wright was not the instigator. He was just a young Ph.D., doing his job.

YUFFEE: Sure.

GRILLY: He wouldn't knowingly—Wright wouldn't knowingly hurt anybody for anything. No way. And I think that letter from Pat Durbin expressed that, that it bothered him to—it always bothered him that these people weren't properly informed, but he didn't have anything to do with that part of it.

YUFFEE: Sure.

GRILLY: He wasn't—

PETERSEN: He and a lot of other people have exercised significant judgments in terms of conducting all these investigations under circumstances where nobody was injured.

GRILLY: But nobody was—

PETERSEN: And that's a fact. Within the context of this and lots of other studies, there was no injury to the volunteers, and the suggestion that there has been something is not—

GRILLY: None of these people were injured from this plutonium at all.

PETERSEN: It's not demonstrable. Well, there are—there have been claims made to the contrary, but I don't think they're supported by facts. And certainly the history bears out the fact that nobody was hurt. That's quite different from the ethical counterparts that have been suggested.

Closing Comments

YUFFEE: Well, I want to thank you for taking the time to talk to us.

GRILLY: Well, nice to talk to you.

YUFFEE: And we appreciate it, and—

GRILLY: I don't know if I contributed anything, but—

YUFFEE: Oh, no, you did. I mean, it's hard, and, having gotten into this game and trying to research this issue, Wright Langham is one of the—in particular, Los Alamos and Wright Langham, they're synonymous in many ways, and it's hard, since he's no longer alive, it's difficult to get an idea.

GRILLY: Right.

¹¹⁹ Langham was killed in an airplane accident, Ross Air, departing Albuquerque for Los Alamos, on May 19, 1972.

YUFFEE: And I think that people are going to see his name a lot of places in terms of his work and his influence, and it's important to get a personal accounting of what he was like and the type of work he did. So I thank you for that.

GRILLY: Yeah. He just went at it scientifically when he was more or less assigned this project.

YUFFEE: Well, hopefully, I think that that message will get out. I think it will.

GRILLY: But this business of instigating, it really disturbs me, because it isn't true.

YUFFEE: Well, then, that will be a good place to end. Those will be good last words to have.

GRILLY: *(laughs)* Okay.

YUFFEE: I thank you. □

