

ORAL HISTORY TRANSCRIPT

LAUREL L. WILKENING
INTERVIEWED BY CAROL BUTLER
ELGIN, ARIZONA – 15 NOVEMBER 2001

BUTLER: Okay. Today is November 15, 2001. This oral history with Dr. Laurel Wilkening is being conducted as part of NASA Headquarters' history project, the Herstory Project. Carol Butler is the interviewer, and the session is being held in Dr. Wilkening's home in Elgin, Arizona.

Thank you very much for talking with me and having me out to your home today.

WILKENING: I'm pleased to be here with you, and I'm glad you could find it. [Laughter]

BUTLER: Yes. Not a problem at all there.

WILKENING: Good.

BUTLER: Not a problem.

WILKENING: My husband's map. He's the mapmaker.

BUTLER: Oh, good. Okay. It was such a pretty drive. It really was.

WILKENING: Good. Well, he's out in the vineyard and I'm sure he will come in with the dogs at some inopportune moment. [Laughter]

BUTLER: Well, that's all right. I like dogs, so that's good.

WILKENING: Okay.

BUTLER: We'll just add them in. Let them have their say.

WILKENING: Yes. Well, they will.

BUTLER: [Laughter] Good.

Well, to begin with, going back to and thinking about maybe what led to your interest in science, chemistry, how did you move into that area in your early studies?

WILKENING: Probably I should begin with my parents, because while I can't point to anything specific, when I tell you how I grew up, then the question will, I think, answer itself.

My father, when he was a graduate student in Chicago at the Illinois Institute of Technology at the beginning of World War II, was working on a technology that was critical to nuclear reactors and the atomic bomb. So his professor and he were recruited to work with Enrico Fermi on the Chicago Pile One at the University of Chicago.

He'd been a high school teacher, and that's where he met my mother in a small town in Missouri. They both grew up in Missouri. So they were married by the time and he had decided

to go back and get his doctorate. So that was interrupted by the war, and they followed the bomb all around the country. I was born in Richland, Washington, which is where the Hanford site was. Then they moved to Los Alamos [New Mexico].

According to Mother, my mother, she was holding me. I was asleep. They knew—some of the wives knew, because my father was at the bomb site, when they were going to detonate the first atomic blast. So the women went up to a ridge outside of Los Alamos where they could see to the southeast. I slept through the whole thing. So that was not an auspicious start for my scientific career. [Laughter]

But my father, after the war was over, he went back, finished his degree, and got a job at a small college in New Mexico, New Mexico Tech [Socorro, New Mexico]. I think we moved in there in [19]48 or '49, so I was about four or five years old. He had been recruited there by a professor that he had had when he was an undergraduate.

There was a president of that college who was quite visionary about the postwar boom, with all the veterans coming back for education and so forth, that they were expanding the mission and the scope of what they were doing at that college, which was essentially a school of mines when it was founded in probably 1889 there, plus or minus. So they were expanding the physics department, so my father went there and continued his career in geophysics and atmospheric physics.

So I grew up on that college campus. I used to go down to my dad's office and lab quite often. Occasionally he'd give me a project to do in the summer. So it kind of came with the territory. [Laughter]

My switch over to an interest in chemistry really came while I was in college. Between my senior year in high school, my freshman year in college, I had a job in a little county hospital

in the laboratory. My family physician had—well, I had pneumonia when I was a sophomore taking chemistry, so I missed about one-third of the chemistry course, but he thought I was kind of smart. He knew that the medical technician was going to be taking some leave. In the hospital, it's like a big hospital now, they had physicians that are in charge of the various services, and he was in charge of the laboratory and the X-ray.

So he suggested that I might want to try that, learn some of the routine stuff. So, under his oversight, the routine lab tests could continue while she went on her leave. So that's what I did in the summer. It was an eye-opening job in many ways, but I discovered I really liked working in the laboratory and I liked kind of the chemistry aspect of it.

I thought I'd be premed, and then I went to Reed College in Portland, Oregon, which is a very good liberal arts, very intense, intellectual college. Because I came from such a small school and I had missed half of my chemistry or a third of my chemistry course, I did not place in the chem-physics program that would have led me [into] the premed program, which was a three-year program.

So I got placed in the regular chemistry, which actually turned out to be great, because I had a very inspirational professor there. Because my family was not wealthy, the only holiday that I went home for, aside from summer, was Christmas. So on the other holidays, like Thanksgiving, he gave me projects to do in the lab. So I just loved it. I just loved chemistry. I don't know what else to say about it, but that's how it happened.

I got interested in meteorites while I was there at the college because that college requires every student to do a senior thesis, and my department also required a senior paper, which was an oral presentation. They weren't supposed to be the same thing; you had to find two different topics. So I gave my oral presentation on meteorites, because I had come across a journal that

had displayed the arguments that were very going on that time about whether there was any evidence in meteorites of biological formation of the compounds in meteorites.

Harold [C.] Urey was on one side, and Edward Anders was on the other. This [was] a tremendous—I mean, the vitriol in their two columns was so incredible, I thought, “Wow. This sounds kind of exciting. Must be something going on with these meteorites.”

So after I finished there, I applied to several graduate schools, but each one of them I knew had a program that was involving cosmochemistry or the study of meteorites in particular. I applied to both schools where the two protagonists were, University of Chicago and the University of California-San Diego [UCSD]. I also applied to MIT [Massachusetts Institute of Technology] and a couple of other places. I got into all the places I applied, but I decided to go to San Diego because not only was Harold Urey [there], but there were several people who were doing a lot of different interesting things with meteorites. At that time that was a really interesting place to be. I think it probably still is, in the field.

So I ended up going to UCSD, and that was interesting. I think we’ve now moved to another one of your questions. [Laughter]

BUTLER: Okay. Well, I think we can just continue on from there.

WILKENING: Okay.

BUTLER: Talking about your experience there.

WILKENING: Okay. Because somewhere in there I think you have a question about when did you first—did you experience any problems because you were a woman.

BUTLER: Yes.

WILKENING: Until that point, I had had nothing but good advice, goodwill, mentorship. At Reed College there were a couple of women [faculty] in the chemistry department. I had a woman math professor when I was a freshman. It was really inspiring for me, because I had limited exposure to women in scientific roles. So they were an inspiring group of women.

BUTLER: That's good.

WILKENING: I went to UCSD, and in many ways I really enjoyed it, especially the first two years, because I was with a cohort of my fellow graduate students. They put us in offices in a new building, and we were all together isolated from everything else, so we really had a lot of fun supporting each other and learning together, and that was good. The first couple of years were fine, or about the first year or so was fine.

Then in the second year you really have to settle on what your research project is going to be. They had a program there we called rotation, which was you got to choose different professors to work with for a quarter. They were on the quarter system. So I was rotating through the people that I was most interested in, and I was in Professor Jim [James R.] Arnold's lab. I was working on kind of a heroic project. I mean, it was a brute-force kind of project. We were trying to isolate from a dissolved—oh, we were trying to find out if there were other

contaminants in lead bricks, because Professor Arnold's lab focused on very low-level radiation, and they wanted to minimize any source of radiation, so they wanted to know if there were any other radioactive materials in the lead bricks that were used for shielding. It sounds kind of weird. So I dissolved a whole lead brick with sulphuric acid. This took quite a long time.

BUTLER: Yes. I imagine.

WILKENING: Most of a quarter. [Laughter] And so the quarter came so I continued on in his lab. Well, in his lab there was a really obnoxious postdoc, and at one point he said to me, he says, "Well you know, women don't belong in the lab. Women and dogs, I mean, they just don't belong in science."

So I had been thinking I wanted to work for Professor Arnold, so that was kind of dismaying, but I'm kind of pugnacious, so I didn't think too much about it. But then when I went to ask him [Arnold] about the possibility of doing Ph.D. with him, project with him, he said, "Well, I've had two women who did their Ph.D.'s with me, and they both got married and stopped doing science, so I really don't want another woman."

So those were probably the first and most personal shocking experiences I had, all in that lab. So I was very demoralized. But I had to find a professor, so I went to talk to Dr. Urey, and he said—and I pretty much knew this, because his last student was John [S.] Lewis, whom you talked to yesterday, and that was his last Ph.D. student. But he was still in the lab, and he had this big lab going of doing a variety of tests, including mass spectroscopy.

So I went to talk to him, and he suggested a project to me, but he said he couldn't take me on. He says, "You know, I don't know how long I'm going to last. I just really can't take on any

more students.” He was very consistent about it, very nice about it. He said, “You’re welcome to work in my lab if you decide to do this project, but I’d suggest you go talk to Hans [E.] Suess, who needs graduate students and has money.” [Laughter]

BUTLER: There’s always a big plus.

WILKENING: So I went to talk to Hans Suess, and Hans Suess was such—all these people are now passed away, except Jim Arnold. I think he’s still around. I saw him when I worked at the University of California-Irvine.

Hans was just—I mean, it’s hard to describe him, and that would take us off for another hour. But suffice to say, he was a very benevolent and helpful professor for me, and he pretty much left me alone. I mean, he said, okay, yes, he liked the Urey suggestion. It fit in. He could think of some ways that his labs would be helpful, and so he suggested, he said, “Yes. Go ahead. Start trying.”

WILKENING: So that worked out well. Hans had most of his—all of his laboratory space ... at Scripps Institution of Oceanography, which was just down the hill from the UCSD campus, so I got to move my office down there, which was wonderful. I spent most of my time there, so I worked with a lot of the famous names in oceanography, marine geology, geophysics, and so forth down there, because that’s where I was basically for the rest of my time, except for I did use Urey’s gas noble gas mass spectrometer for my project.

So I did the project. It worked out fairly well, mostly because there was kind of a new technology that came along, and there was a professor at Scripps that was working on it, and he’s

from India. He only was there every two [years]—he alternated going back and forth between India and UCSD, but he got me and another Scripps graduate student interested in [his work]—and what we were doing was we were studying radiation exposure of meteoritic materials in preparation really for Apollo 11.

Davendra Lal, who was the professor, the Indian professor, worked very closely with Jim Arnold, so there was a collaborative effort going on at UCSD to try to measure, as soon as the lunar rocks came back and as soon as they were released from quarantine, to measure to see what the radiation exposure had done to them. If you did the right tests, you could determine how long a rock had been exposed on the surface of the Moon, which would allow you to do essentially some geological dating of the process, geological processes on the Moon.

So when the first lunar rocks [came back]—we got the first rock that was released from quarantine.

BUTLER: That must have been interesting.

WILKENING: Yes. I think it was 100017. I know it was rock 17, happened to be its number as put on it by the astronauts that collected it.

So it turned out that Jim Arnold's lab then did become the center for this particular kind of study, trying to determine the radiation exposure age of the surface of the Moon.

We were working on solid state damage, which are called nuclear particle tracks or cosmic ray tracks in meteorites. That's what I was doing with Dr. Lal. And by that time, Lal's group in India had really [developed the best procedures]—it's like developing a film. You have to put the minerals or the rock sections into a chemical etching. You may know this as a

geologist, but anyway. Then it develops. It's just like film. You create a damage trail or damage spots when you expose film to light. Well, it's the same thing, only it's a rock. It takes much stronger solutions, and it's more vigorous than developing film, but it works essentially the same way.

But then you have to look at things microscopic, so you have to examine them microscopically or even with an electron microscope. So by this time, that technique was pretty well developed. I was using it on meteorites, on certain kind of meteorites called gas-rich meteorites, which were believed to have resided on the surface of meteorite parent bodies. So it's very similar to what we thought about the Moon. We didn't even know where the meteorites came from, but we figured that there was this transferability of knowledge.

So when the first rock came—this was so wonderful, and it happened all over the world wherever there were people studying these lunar rocks—they had to do all of this security on their labs. So then the rock was like it was on an operating table. What the people who were doing the radiochemistry were going to do is they were going to shave it off in layers, because different radio-nuclides would be formed at different layers because of the whole [range of] solar cosmic ray and galactic cosmic ray interaction.

But they said, "Okay, you nuclear particle track people come up here and you do the first measurements," because our stuff was fast. These people were going have to count low level radiation for hours or days [or months], and that's why they were anxious to get the first rock out. Because every second that passed once it was taken from the Moon, you were losing information because the short-lived radio nuclides would decay away.

So they said, “Okay, Lal, get up here, because we want to know which side of this rock was facing up, because we don’t want to start studying from the bottom. We want to work our way top down. So we’ll let you take samples from all around the rock.”

So Lal, he’s such a character, he asked Doug MacDougal, who was the other graduate student from Scripps, he says, “Okay. You two go do it. I’m too nervous.” [Laughter]

So we go up here, and here all these radiochemistry [“greats”], these really wonderful big names in cosmochemistry, they’re standing around there ready to start taking [samples]—because they wanted to watch, because then they were each going to take samples off to their labs around the country.

So we go up there, and we didn’t take the samples. They just gave us some samples and marked where everything was. People were stationed around to [watch], because they were using a dental drill to do this kind of thing, because you had to account for every microgram or less of the lunar rock. Everybody is garbed up like surgeons, and it was kind of a kick.

So Doug and I took our samples, went back to the lab, developed them, and they were filled with tracks, and all of them were. We could not distinguish one from the other. So it was clear that this rock had been on surface for a reasonably long period of time and it had been rolled over, which itself was interesting. This was somewhat of a disappointment to the [radiochemistry]—but, actually, in some ways it made their life easier, but that was one of the things that we did.

So all of that was fine, and I was able to put that in my thesis. I went to defend my thesis, and Hans Suess, the ever helpful dissertation advisor, my ever helpful dissertation advisor, the character, says to me, he says, “You know, Laurel, it would really look good if you had a couple

of Nobel laureates on your thesis committee.” Harold Urey suggested the project, so I mean [he] was an obvious one.

I said, “Yeah, great idea.”

Then he says, “And I think we should put Hannes Altvén on your dissertation project, because he’s become a visiting professor here and he’s formulating this new theory of solar system formation, and I think that would be great.”

I said, “Hans, this is not such a good idea because I’ve been going to his seminars for the last year, and he’s going off on a track that is totally out of sync with everything that—.” I mean, that’s fine, blazing a new path, because that’s what his claim to fame was in a certain sense, in magneto hydrodynamics, but I said, “His ideas of the solar system and my work [are] at variance”

Hans says, “Well, it doesn’t matter. It’s just a name. Nothing will happen.”

So at UCSD, like some places, this [defense of the Ph.D. thesis] was a public event. I had been the secretary of the graduate students; a lot my fellow graduate students showed up. My father was on business there [a business trip]; he came to it. The department secretary came. So I had a big audience, which is kind of surprising for a dissertation defense, but I did.

So I made my presentation, and then Hans was supposed to preside over the deliberations, but what happened was that Altvén challenged me or asked me something, I don’t remember now the exact sequence, and Urey jumped in, and they got into a big fight.

BUTLER: Oh no.

WILKENING: Hans Suess, Dr. Suess, he just—I mean, he’s a very gentle kind of a person, and he just sat down and retreated. He was nowhere to be seen.

So I’m up here, these guys are fighting, and this went on for a long time until finally the allotted hour or hour and a half, whatever it was [passed], and I finally said, “Well, you know,” I said, “I think maybe the audience might have had enough of the excitement of cosmochemistry and maybe we should let the audience go home.” [Laughter]

So the audience left, but the committee had to vote, and so they went to Urey’s office. Meanwhile, the Suesses had planned to have a party for me, so I went over to the Suesses. I think my father came. I don’t remember him there, for some reason, so he may have had to leave and catch an airplane or something. We’re all sitting around because we didn’t know was I going to get my [degree].

BUTLER: You didn’t know if you should celebrate.

WILKENING: Yes. Exactly. So it was bizarre, and they were deadlocked. Because it had to be unanimous there [at UCSD]. So Altvén said unless certain things were changed, he would not sign it, and Urey said, “If any word is changed, I will not sign it.”

BUTLER: Oh no.

WILKENING: So the process in the University of California is then it had to go to the Graduate Council. Well, my dissertation defense was right before Thanksgiving, so they weren’t going to meet. There was no possibility of getting them together for seven days or ten days or something

like that. So I was in limbo for about two weeks. Whenever I'd walk across campus, people would say, "Are you the person?" [Laughter] It was kind of horrible, but it was kind of fun.

Anyway, in the end they decided that I should get my degree. Altvén said he would—I think he said he would vote yes, but not sign the dissertation. So I was in the interesting situation that I couldn't change a word. So I took it to the library in the state in which I had submitted it. So that was exciting.

Then I took a year off. I had a fellowship from the AAUW [American Association of University Women]. This was my mother's doing. My mother always [helped]—she had to quit teaching high school when she married, because at that time you could not be married and be a teacher. They only had single women. Yes, shocking. I didn't even know this. Young women today take for granted a whole lot of things. Well, in those days, married women were supposed to be devoted to the homeplace. I think they didn't want pregnant women teaching or something. I don't know exactly what was in their minds, but that was typical all across the country.

So she did some work during the war, because in that secret project, there weren't too many people that—there are only certain people that knew, so the wives of the scientists were considered useful people to hire because they wouldn't spill the beans. They'd already been checked out, and they kind of knew what was going on, but not a whole lot. So my mother had various jobs during the war. But after the war, that ended.

So she was always looking [out for me]. She was a big booster for me. My father was a great inspiration, and he was helpful, too, all the way along in many ways. But she was the one who would look for things and say, "Well, you ought to do this," or, "You ought to do that," not in a [directive] way, but, "Here's an opportunity." She's a member of AAUW, and she says, "They have these fellowships. Why don't you apply for one?"

So I applied for one, and I got one. So then that, plus some work I was going to do for another colleague at Scripps, allowed me to go to India to work with the professor that I had been working with in California. We had developed some new techniques for using [electron] microscope, and so he wanted me to come teach his technical group how to do what we had been doing. So they agreed to pay me a stipend, and they arranged for a place for me to stay in Bombay. It's now called—what it's called now? Mumbai, but at that time it was still good old Bombay.

The Smithsonian [Institution] paid my way, gave me an around-the-world ticket because they'd asked me to go to the Geological Survey of India in Calcutta and take some samples from some [drilling] cores so we could, using the nuclear track method, try to do some dating of the glasses there, because they were trying to figure out if this was an impact crater, this lake was an impact crater.

So that was probably in some ways the most fun and adventuresome time in my life, because I spent a year living out of a suitcase. My father had a lot of connections in Thailand in particular because he'd had a lot of Thai students who came to [his] college to do mostly mineral [sciences], because they have a lot of mineral wealth and actually a lot of gems come from that whole part of Southeast Asia.

So on my way to India, I stopped in several different places and I stopped in Japan where Hans Suess, my dissertation advisor, had arranged for me to visit and stay with a family in Tokyo. Then I went to Kyoto. I stayed with another family. I visited another family that my father had collaborated with. I went to Hong Kong just because that's the way I had to go on to Thailand.

In Thailand I was the guest of the mineral sciences division of the government, or whatever it was called, and I had a car and a driver at my disposal for a week. I had to give a talk, and I had to visit [the labs], and I knew some of the students that my father had had, so I had a wonderful time there.

So that was great, and then I flew to Calcutta, and I did my work there at the Geological Survey, which was kind of an eye-opening experience. [At that time] I had an uncle and his wife who, ... worked for [AID] in India in the state of Orissa, which is the one south of Bengal on the eastern coast of India, the Bay of Bengal. They were worked for AID doing agricultural education in India.

So my aunt, well, they had sent me a telegram saying, "Don't come." This is after I had my ticket. It was about a week before I was going to leave, and they said, "Don't come. We're having a national election, and there's a lot of violence and bombs are going off, and the communists," (India's got about six different parties that are major parties). They said, "It's too dangerous."

Well, I just sent back a cable saying, "I'm sorry, but I've got to come because I've got all these other things planned."

So my aunt came up to Calcutta after I had been at the institute and met me. We went shopping together in the vast market there, but that's off the track. So I spent a few days with them down in their part of India, which was very rural, very interesting part of India. Then I went to Bombay and I did my work. I was there for about three months.

Then I went to Europe and I spent some time at the Natural History Museum working with another person who was a French [scientists], Paul Pellas, and he's also passed away, who

had another group that did nuclear particle track dating and stuff, and that was kind of fun. I was there for about six weeks.

Then I went to Germany and spent the rest of the year in Mainz, and that was a place that my dissertation advisor had arranged for me to spend a fair amount of time. It was a wonderful center for meteorite research, Max Planck Institute for Chemistry in Mainz.

There were two or three other Americans there at the time. They put us in an office complex in their new building, which we called the American sector because it was all Americans. There were about three or four of us there, so that was fun.

But my dissertation advisor had said, “Laurel, you think you’re so smart now after you got your Ph.D. degree, but if you don’t understand how science is done elsewhere in the world, you really don’t understand what’s going on.” So he really wanted me to do this, and he worked very hard to put a lot of the pieces in place.

It was truly a wonderful experience, and did learn a lot. I learned that in Germany every [Friday] afternoon we had a keg in the lab. [Laughter] So that was good, and that was fine.

I came back to the University of Chicago, where I did my postdoctoral work with Edward Anders, so I had worked with Harold Urey [who] suggested my dissertation topic—one side of the protagonist that I’d read about as an undergraduate, one side of the argument, and then I went to work for Ed Anders, the other side, as a postdoc for him.

Then I started looking for a job. At the University of Chicago, I read an ad in the newspaper and it said something about “woman geologist looking for woman colleagues” or something like that. So I answered the ad, and I met Miriam Kastner. Miriam, she was an Israeli woman, and I forget where she—she had been at some distinguished, one of those eastern universities like Harvard or Yale or someplace. She was doing a postdoc in the geological

sciences department or division, whatever it was called at Chicago. She was very upset because she had thought that she had been promised an assistant professor job. She came in as a postdoc, and then they hired someone else, a man, into the position that she thought was hers.

So she and I got together, and we looked—so I called every science department at the University of Chicago and asked how many women were on the faculty, and there were zero in any of them.

BUTLER: None.

WILKENING: I didn't include biology, but none of the physical sciences, math. None. Zero. So Miriam and I looked at each [other] and said, "We're outta here." [Laughter]

So she applied; she got a job, interestingly and kind of ironically, at Scripps Institution of Oceanography, back where I had been a graduate student, and she made her career there. She has been quite a prominent geochemist and mineralogist studying ocean sediments.

BUTLER: Good.

WILKENING: So that worked out well. But it was a terrible time to find a job because it was post Vietnamese—well, it was just the winding down of the Vietnamese War. A lot of people were looking for jobs. The job market was very depressed, especially in academia. But I was lucky because the University of Arizona decided to create a degree-granting department, the planetary sciences department, to provide access, I guess. It would make sense. They had this distinguished laboratory, Lunar and Planetary Laboratory. They had prominent scientists there

and people who wanted to study there, and they were having to send them [applicants] off either to astronomy or geology, depending on what their backgrounds were and what their proclivities were.

So they were in the process of establishing this interdisciplinary graduate program, and they wanted to hire some chemistry-related folks, and so they hired two of us. Mike [Michael J.] Drake, who is now the department head, and I were hired at the same time. That's where I met my husband. Because there was only one thing that you might reasonably call a chemistry lab in the building, aside from Bart Nagy, who had a biochemistry kind of lab, who been a student of Urey's on the wrong side of the argument. [Laughter] But he was there as a professor.

So I needed a chemistry lab to prepare my samples. I got the other stuff. I had room in the basement, but I didn't really have a sink, didn't have the stuff I needed, and it would take a while to get that set up. So they said, "Why don't you talk to Godfrey Sill. He's got the only chemistry lab that's not in Nagy's complex," and what I wanted to do would not have been appropriate to do in his area. He was also a lunar sample person, so he had all the security and all of this kind of stuff, looking at organic compounds.

So I went to Godfrey Sill, who at that time he was a Carmelite friar, a man of the cloth. He had decided to get his Ph.D. He had been a high school teacher and came to the Lunar and Planetary [Laboratory]. They'd advertised for high school teachers to come work in the summer, and they gave them various kinds of research projects. My husband had always been interested in astronomy and still is, a great amateur astronomer. So he decided he wanted to get his Ph.D. and become a real planetary scientist. So he was finishing his Ph.D. So that's where we met, but he was quite a bit older than I was. So we met, and eventually, within the first year, we got married. [Laughter]

So we became one of those couples. Then he had already technically been at the Lunar and Planetary [Laboratory] for about ten years, I mean off and on, and by the time we left he had been there twenty-five years and I had been there fifteen years. So that takes us up to that.

So now we better stop and let you ask some questions.

BUTLER: Sure. Well let me go back a little bit. You mentioned in your world trip, basically, which sounds like a fascinating opportunity—

WILKENING: It was. It was.

BUTLER: You said that Calcutta was a very eye-opening experience, and I was wondering if you could expand on that a little bit. Was it the cultural side of things or was it the science side of things or a mixture of both?

WILKENING: It was all of those things. Calcutta was one of the areas where there was a lot of activism around the election. That was my first place I had ever been in India, and most people find India a shocking place no matter where they go, although Bombay or New Delhi, I think are less shocking than Calcutta. Calcutta at that time was probably one of the top two or three in population, huge city. It's one of the places where people sleep outside, they die outside. The world knows more about this now after Mother Teresa became so well known and become a Nobel laureate for what she was doing there, but it is a place with desperately poor people.

In India at that time you would see people walking around, a lot of blind people, a lot of people with smallpox scars. Because, remember, this was in 1971, so, (A), it was a long time

ago and, (B), it's the world's largest democracy, and it's a wonderful place. I came to love the Indian people, very creative people and they have a kind of a sense of spirit that is quite uplifting and lets them endure sometimes really horrible conditions.

So there's the environment, and then there are the vestiges of the British colonial era, the big parks, a lot of the buildings. The contrasts of cultures is quite amazing.

Then in the Geologic Survey Institute, the conditions under which people were trying to do science were just kind of amazing. One of the things I remember, which I now know in developing countries is not unusual, especially in tropical areas, but there were no doors on the offices or the labs; they just had a hanging curtain. Well, it makes sense if you don't have air-conditioning and you'd like to have whatever breeze comes through, but I was thinking, jeez, this is a little weird, when I first went in there.

But they're, of course, very nice and very helpful, and I didn't have any trouble getting my samples. They had all the cores there and everything, but it just seemed like, how does this work? I mean, how can they do it? Because everything seemed like such a struggle in India. It had the vestiges of all that bureaucracy plus kind of the developing-country bureaucracy.

When I was in Bombay, Mrs. Lal said, "Come with me, because if you come with me to do a certain thing like to go to buy a ticket," she says, "I'll get much better service if there's a white person with me," which I thought it was really bizarre.

BUTLER: Wow.

WILKENING: Yes, very bizarre. So it had this strange mixture of the leftovers of the colonial era, this emerging democracy, and the assertion of the people of India. It was very dynamic and very

intriguing, but it was also sometimes just kind of overwhelming. There were a lot of beggars and a lot of people who were in bad shape. So it is shocking.

I fortunately had traveled with my parents quite a bit in Mexico in the fifties and sixties. Traveling in Mexico, especially in the fifties, it was people living in incredible poverty there. So it wasn't so much the poverty. I think in part it was the disease and the—well, I don't know. I don't know. It had its own atmosphere. I loved India. I swore I'd go back. I have never been back. I still want to go back, and I hope to do that before I die.

BUTLER: Hopefully you'll have that chance.

WILKENING: Yes.

BUTLER: See how many changes have come about.

So you mentioned that when you would go shopping, that Mrs. Lal said she'd get better service if you came with her as a white person. Was the reception then for you for as an American, even a single woman, pretty good?

WILKENING: It was pretty good. I lived in a very what would be considered probably a posh part of Bombay. I was working at the Tata Institute for Research, which is on the Arabian Sea. It's on the west coast, and it's down at the end of this peninsula which Bombay is built along the coast. At the very end there's the Gateway of India on one side, that famous gate and the famous hotel that is behind it, one of the great old Oriental hotels.

The Tata Institute has this prime location right near the end of the peninsula. Then there are apartment houses and a nice shopping district. The shopping district is behind the hotel, the Gateway of India hotel there. The Institute ran a bus, transportation. Taxi cabs were dirt cheap, and I have never felt threatened or uncomfortable alone as a woman in any Asian country I've visited in. But, of course, there's quite a few I haven't been in and so on, but partly because I'm very tall. When I'm in Japan, there's nobody that—I'm looking over this whole sea of heads.

BUTLER: Right.

WILKENING: In India, there are tall people, but they are very gentle, gentle people and very nice. I had colleagues who would invite me to go to their house or wherever they were living, take me to the movie. They wanted me to see all of the things that Indian people did. So I had a good time with them and I never felt any problem, and I learned how to handle the beggars.

The other thing is in that shopping area, the nice stores were frequented by the airline stewardesses to buy jewelry, because buying jewelry in India is really a good thing to do. So there was—I don't know how to describe it. The single white women who were there were very on their own, assertive, they could handle anything. So I mean, it wasn't like I had to blaze the trail. It wasn't like they'd never seen a white person before. It just was okay.

BUTLER: In traveling to all of these different countries that you did, did you have any language background or did you just—with your various contacts that you had at each places, were they the ones that were able to help you with—

WILKENING: Well, the language of science is pretty much English. In India, of course, English had been the official language in the colonial empire.

BUTLER: Right.

WILKENING: So all the people that I worked with in the Institute, which came from all over India, we all spoke English. Because, as they told me, “We can’t understand each other.” They said, “In your country, every state has a different flag. In our country, every state has a different language.”

So in India it was no problem. In places like Thailand, English was very, very common. Hong Kong, very common. Japan, a little less so, but again, most scientists know enough English certainly to communicate in science.

France and Germany were more of a problem, to tell you the truth, and I had studied both French and German, but I’m pretty much of a linguistic cripple. While at that time I could read pretty well in both languages, especially scientific work, I just never felt comfortable speaking, especially in Paris. It was just kind of hopeless. In that group, they all spoke English that I was working with. So it was more a matter of fending for myself when I had to go out and buy things to eat or to wear or whatever. In Germany, I studied German for a long time and I’m not really any good at German. But, again, the daily living was fine and there was plenty of English, so it was okay.

BUTLER: Was there a difference between the reactions toward you in particular, but I guess women in general from the Asian countries—India, Thailand—to Germany and France? You

mentioned in India how good the people were and how accepted you were there. Was it the same in France and Germany, or was that different?

WILKENING: I think it was pretty much the same. While women were not real common, there were women scientists or women technicians everywhere that I went, even at that time, or students, graduate students.

The Natural History Museum is on the Left Bank, and it's near the University of Paris [France], Paris 6, 7, I forget which one. They have all those numbered campuses. Pellas's group had students from the university who worked, and there were women among them, and there were women in that division of the History Museum, Natural History Museum.

The same in Germany, in the Max Planck Institute, there were women scientists on the staff there.

BUTLER: Even jumping back one step more, you had talked about the reception of some, when you were working on your doctorate. What was the ratio—and you mentioned in Chicago that they had no women on the staff in those key areas. What was it at San Diego when you were there? Were there some women?

WILKENING: So San Diego was interesting, because San Diego was home to—well, this is another story that's not my story, but it's a great story—Maria [Goeppert-]Mayer, who received the Nobel Prize in physics after she left the University of Chicago. Because she was married to a chemist, a University of Chicago faculty member, ... they gave her a no-salary appointment there and denied her the usual privileges [of faculty].

So this was how UC-San Diego became a powerhouse university. They went to Chicago and they lured a number of key scientists, including ... the Mayers, Joe [Joseph E.] Mayer and Maria, they [said], “You come here, we’ll give Maria, she’ll have a regular professorial appointment. She’ll be a professor.”

They moved there, and she got the Nobel Prize. That was a good shrewd move by UCSD.
[Laughter]

BUTLER: Absolutely.

WILKENING: So Margaret Burbidge, famous astronomer, was on the staff there at the time. So there were a couple of other faculty members, I think, in the chemistry department. The chemistry department had at that time a much more diverse faculty than a lot of chemistry departments to this day. So on that score, I have to say they were doing well.

BUTLER: That’s good. Were there a number of women students?

WILKENING: Oh, yes. Yes. There were some really interesting women students. I shared an office with one at Scripps. Unfortunately, I don’t know what happened to her, Aviva Brecher. She was married to another graduate student. I think she pretty much dropped out of science, but she was an interesting gal and very [smart]—I sorry if she did. I’ve just lost track of her. She may be in science, for all I know, maybe just doing something different. I’m not doing much science now anyway, so. [Laughter]

Tanya Atwater, very famous geochemist, was a student when I was there. So, yes, it was a good place to be.

BUTLER: That's good.

Okay. Well, I think we've covered most of the questions I had about what we've already discussed.

WILKENING: Early life, yes.

BUTLER: So you move now on to the University of Arizona.

WILKENING: Yes.

BUTLER: Met your husband.

WILKENING: Yes.

BUTLER: Which, that's interesting. You said he was a Carmelite friar.

WILKENING: Yes.

BUTLER: So you kind of drew him away from that.

WILKENING: I did. He had to leave the priesthood. It was a big decision.

BUTLER: Well, it looks like it's worked out well for you both.

WILKENING: Twenty-seven years.

BUTLER: That's wonderful.

WILKENING: Yes.

BUTLER: At that point, you mentioned that you were looking for a chemistry lab and setting that up. Were you also teaching classes then at that point?

WILKENING: Yes.

BUTLER: What were you teaching and what was—I guess still going a little bit with the theme of women—the reaction of some of the students in the department or the department in general, and then specifically what you were teaching some of the projects you were involved in.

WILKENING: Okay. I'll tell you a little bit about the University of Arizona then. The person who was in charge of the nascent department of planetary sciences was a woman, Pat Roemer, Elizabeth Roemer, famous cometary astronomer. So she was the one, actually, that arranged for my interview and my trip. She was chairing the committee. The department wasn't yet a

department. It was called an interdisciplinary committee, and she was chairing the committee. They were in the process of recruiting a department head, which they did at the same time. All of this was happening pretty fast. So it was in a couple of years they had recruited a new department head, several new faculty members, and so on.

We were teaching interdisciplinary—I mean, planetary sciences is very interdisciplinary, as you know, geologists, physicists, chemists, mathematicians. It expands the more that we learn. So part of forming that department was just for us to learn how to talk to each other, because, as you know, jargons of geologists are not the same jargons of chemists are not the same jargons of physicists. So it took us a while just to learn to talk to each other.

Then we had to teach the students, and our students, of course, were all coming from different undergraduate backgrounds, because we did admit students who had a background in chemistry or geology or physics or astronomy. So it was a challenge. I would say that that was the most challenging teaching, teaching those graduate students, that I have ever had to do, because we had a set of core courses that they all had to take. So this meant that in what we were teaching, Mike [Drake] and I were teaching cosmochemistry, most of us team-taught these courses. We would have chemists who would—because we'd be covering a certain amount of remedial chemistry—who were totally bored for at least half of the course. Then you'd have geologists or physicists who were struggling. Actually, geologists usually know more chemistry than physicists do.

So it was hard, because you always had part of the class who was bored, part of it who was really struggling to understand and learn all this weird stuff. It was hard. It's just hard to do that. I think that was the most difficult teaching I've ever done.

I also taught [undergraduates]. We all took turns teaching. We had an introductory planetary course and then we taught specialty courses as well, advanced courses, so then you were just working with the students who were basically in your area. They were always small classes, and that was always kind of fun.

But I always liked teaching undergraduates. I remember teaching our intro planetary course.... Elizabeth Roemer was teaching it the first year I was there. So I said, I'm going to sit in on her course because I know I'm going to have to teach this course one day, and I don't know any astronomy. I really had not been exposed to astronomy. Went to a small college; there was no astronomy or geology there. I did do an independent study in geosciences with another woman student who was interested in geology. So I felt at least I knew a little bit of the jargon of geology, and I'd worked with all those people down at Scripps, and I'd taken nuclear geology. I knew kind of through the back door quite a bit of geology. But I said, I've got to find out what this astronomy stuff is that I'm going to teach these undergraduates, so I sat in Pat's class.

So then we each did kind our own version whenever it was our turn. And I just love those students. They were so funny. I mean, planetary science is wonderful to teach because it's exciting and fun. But I remember giving them a quiz once, and I said something, I had a question on it, and I asked, "What and how old is the oldest known fossil?" One of them wrote on the response "Ronald Reagan." [Laughter] He had just been elected president. I mean, they were so creative in their—what shall I say—in their failure. [Laughter]

So I always have enjoyed undergraduates a lot. Unfortunately, I almost always taught at the graduate level, but that was fun. So I enjoyed that. I taught a nuclear geology course over in the geosciences department. I team-taught that with Paul [E.] Damon. And a variety of

specialized classes, but that core course in cosmochemistry and the undergraduate planetary science, intro to planetary sciences were the two. One difficult and one fun. [Laughter]

BUTLER: That's good.

WILKENING: I guess since this is a herstory, I should say a little bit about the University of Arizona. I told you Pat Roemer was chairing the committee. University of Arizona—well, I had been sensitized, having been at the University of Chicago and found no women colleagues except for Miriam. There was the two of us against the world. [Laughter]

So there was a Committee on the Status of University Women that was forming, and I must have read about it in the campus newspaper or something, so I went to the committee meetings. There I met women all across the campus who were in faculty positions all across the campus, and they became my best friends, and I became active in their work.

They were doing a lot of issues. The big issue was, they wanted to create a women's studies program. The other thing was, they wanted pay equity for women. I should say, when I went to the University of Arizona and this Mike Drake was hired at the same time, he was paid \$1,000 more than I was, and he told me this. He asked me what I was making, and I told him, and he said, "You know, you should go ask Chuck [Charles P.] Sonett," who by that time was the head of the department, "and tell him, you know, that this isn't fair."

I said, "Yeah, that's exactly what I'm going to do," and of course they changed it immediately.

BUTLER: Oh, good.

WILKENING: So that was nice. But I became active in women's issues. I'm still, now that I'm back in Arizona, doing work with the women's studies department on a number of projects.

But that's a very good program. It was [a stretch]. I mean, I was a scientist. This is not exactly what you would expect somebody to get involved with, women's studies or that kind of a project. But I did a lot of different stuff.

I did a lot of the statistical [analysis] for our first argument for pay equity across the campus. I was one of the people that advocated it to the administration and sat with one of the associate vice-presidents and went through all the computer printouts of all of the faculty members at the university. That was an interesting experience. [Laughter] So, yes, that was fun.

I participated in a couple of their semester-long seminars where they would do feminist reading, because I didn't know anything about the scholarship, the real scholarship in the various fields. So that was good. That was interesting.

BUTLER: Was the university pretty receptive to these suggestions?

WILKENING: Well, they created a women's studies program and appointed an excellent person, one of my best friends and mentors, to chair it, to start it up. It was a committee. Just like our department had been a committee when it first started, it's now a department at the university.

Pay equity was a much harder sell there. But when I became vice provost of academic affairs, this was given to me as a task. "Okay, Laurel, you figure out how to do a pay equity program for the University of Arizona."

So we did. We did one. I still think it was one of the best models. I haven't really learned [of a better one]—periodically and now I'm on another project for the University of Arizona trying to get more—well, pay equity is not really the goal. It's more equity in other kinds of less tangible ways.

So I worked very hard on that, and we started with women. We expanded it to minority faculty members. Then we said, "Anyone who doesn't feel that they are appropriately paid on the faculty can participate in this process," because the process was one of comparing yourself with similarly situated people. Because usually if you just do it statistically, statistics doesn't tell you everything that you need. I had been a department head and I'd been an acting dean, acting dean of sciences, so I had the other side's perspective. That actually isn't a trivial matter. It's fraught with a lot of problems of creating new inequities and creating bad feeling and bad morale. I thought actually taking it, having it done centrally, then at least leaves the deans and the department heads so they don't have to take the blame for it.

BUTLER: Right.

WILKENING: Although they were part of the process on the recommendations coming up to us. It started at the department level. But then it was the administration that would take care of it and pay for it, and so we did it. I think it was a good program.

I left that position before it was complete. They were still doing it when I left the position and became vice-president for research, but I thought that was an interesting experience. All of that was all very good. I loved my time at the University of Arizona in administration.

I got in there, I got doing administration, however, because the Department of Planetary Sciences, in its early development, as is not unknown to happen, got into some real intradepartment strife, conflict, serious conflict, and it was quite unpleasant. It was especially unpleasant for those of us who were untenured and hoping to get tenure, and here you had the senior faculty—and it was the big names that were like this [Wilkening gestures].

I asked a faculty member that had been a colleague of my father's, not directly but indirectly, I had asked him for advice. He was a known fair person. He was head of the atmospheric sciences department. I asked to meet with him because I said, "What should we do? There are several of us who are junior faculty members, and this department is a disaster right now."

So he gave me very good advice, and I also felt good just that I had let somebody know outside of the department. That had been the home base for our department's forming, because that Committee for Planetary Sciences was really kind of supported, came out of atmospheric sciences.

So what happened was I took an IPA [Intergovernment Personnel Act] and went to NASA Headquarters, and I got out of there for a year. But by then I already had tenure, so the tenure thing went fine, because that's what he had assured me. He says, "Look, we have a fair process at the University of Arizona," and he says, "I know all the people involved, and I don't think they will be—they won't use this. They'll be fair to you and your colleagues. But if you're worried about it, keep a diary or keep track of things that you might need to remind yourself of later." But that all worked out fine.

Not too long after I got tenure, I had a chance to go work at NASA Headquarters because I'd been working on—I'd served on a lot of committees that had to do with planning the mission

to Comet Halley, which was coming back. So I had planned in '81 then to be at NASA Headquarters, because that was the key time for getting a mission going, because you need lead time. Comet Halley was coming six years, seven years later.

So that was an interesting experience, and that was on what they called this Intergovernment Personnel Act, which is, if you work at a state university, you can switch places in the federal government and they can just move you back and forth without a whole lot of paperwork and you don't compete for a job and all of that kind of stuff. But they had an opening, so they wanted me to come be the division scientist, they called it, for the Division for Planetary Sciences.

That was right after—let me think about it. The person who was in charge of that division, whose name is escaping me at the moment, Tom [A. Thomas Young] something or another, he had been kind of the lead scientist, the golden person of the Mars landing program, our first great, wonderful successes in Mars. And he had been—before he went to NASA, I think he was at Martin Marietta or someplace, and he'd come to NASA, and he was just a wonderful person. He interviewed me and he recruited me, and by the time I got to NASA, he was gone.

I had—I'll have to think of his name, too—a guy who was from another aerospace company. Gus. [Angelo] "Gus" Guastaferrero, that was his name. So I showed up there, and Gus was my boss. I was there for a couple of days, and Gus says, "I think you'd better come in. I need to talk to you." So Gus says, "I know that you [expected] to be working for Tom," whatever his name was, Mitchell or Martin or something like that, he says, "and you're not going to be here very long. You're just going to be here through the end of the year, so I want you to know what my management style is." He says, "I am a stress manager. When you ask for

something, I will say no. But that doesn't mean that you should stop. You've got to come back with a better and stronger argument and you've got to keep trying to convince me, and if there is a final no, then I'll let you know. But basically," he says, "the rest of these people have to figure this out, but I'm going to give you this, I'm going to tell you this, because otherwise you'll just waste your time here, spend all of your time learning how to work here." He says, "I think that's a waste of your time. You're not a career employee, so I'm just going to tell you this."

It was weird. He *was* a stress manager, but I learned a heck of a lot from him, because he could sit at NASA presentations, especially at Headquarters, you look at these viewgraphs, there's this chart, and it's got a gazillion numbers in columns. It could be costs associated with mission or it could be performance data about some mission or it could be the annual budget, it could be—but it's a number place. He could sit there, and it wasn't like he was really super familiar with all of the programs going on, and he'd say, "What's that 340,000 doing up there in that column, that third column? Look down there. What's that about?"

Then the poor person who's making the presentation would say, "Well, I mean—," and either they would know that he had zeroed in on some problem or if they didn't know, they were in deep trouble. [Laughter]

So I learned a lot about how to look at numbers from a management perspective working there. He was really great. I wrote the column that we sent around to all the PIs [principal investigators] for the planetary division, and I really enjoyed that. Forever after in most of my jobs I wrote some sort of a newsletter or column or something like that. That was a lot of fun.

So I learned a lot. However, the whole comet mission crashed while I was there. It was an interesting lesson in politics, but it was very depressing, because I had set myself up to kind of segue out of meteorites into comets. I figured with Halley if we did a mission, then I would have

a lot to do. I had set up a conference on comets, a meeting. Out of that came my book. So I was ready to become Ms. Comet, but my platform collapsed.

So I had to do some adaptive thinking, which I'll maybe come back to later, but I want to say a little bit about my other experiences at NASA Headquarters, which were very interesting to me, a novice.

One was that Voyager I was on its way to Saturn, and NASA, in its usual wonderful way, had anticipated everything. As soon as I arrived there, they said, "We have got all of our assignments for the encounter, and, Dr. Wilkening, if there's a call from the White House, we want you to be the person who will go brief the White House on whatever they might want to know."

This was at the end of the [James E.] Carter administration. The election was in November. The election was right in the window of the Voyager encounter with Saturn, so nobody expected anything to happen. In fact, I completely forgot about it. I didn't even think of it.

Carter lost the election. The pictures were coming in. He went to Camp David, and the pictures are coming in on Veterans Day. I mean, it's just this era, just this time. Veterans Day was, I forget, on a Monday or Tuesday, something like that. It was a federal holiday. So I went into the office because I wanted to see the pictures coming in, and I was dressed about like I am today [in my jeans]. I'm sitting in my office, and there's this knock on the door, and here's this guy from the Headquarters PR department.

He looks at me and he says, "Are you Dr. Wilkening?"

I said, "Yes, I am."

He says, “Well, you need to be at the White House in one hour. President Carter’s asked to have someone sit with him. He wants to watch the pictures come in, and he wants our representative there.” [Laughter] And he says, “You will meet the science advisor at such and such an entrance to the White House, and you have to be there at XYZ.”

So I got a cab, went back to my apartment, changed clothes into my best business dress, “dressed for success” dress—suit, actually—went and met—there was Frank Press, who was the science advisor at the time. We trooped into the room which they use for movies down in the basement of the White House. I sat down, and I was sitting—here’s Jimmy Carter. Frank Press is on one side of Jimmy Carter, I’m on the other side, and Rosalyn [Carter] is sitting next to me.

The pictures start coming in, and at first we were the only ones there, because the Carter administration, the rest of the guys were, the gang, was out working on the budget. Because even if you’re the outgoing president, you have to submit a budget to Congress for the coming fiscal year in the fall, and they were going through all their budget process. They were sitting there, and then here come all of these people that you’d read about in the newspapers, TV, these weird-looking people who worked in the Carter administration, all these Georgians who worked for Carter. It was quite interesting.

So we’re sitting there, and we’re watching, and they were giving us the feed from JPL [Jet Propulsion Laboratory, Pasadena, California]. So they had, like they usually do to this day, they had a panel of scientists who were talking about what they were seeing, and one of them was Hal [Harold] Masursky. I don’t know if you know who Hal Masursky is, and he wore his hair down kind of long. These guys in the back rows were all saying, “What’s with that guy’s hair? What kind of a guy is that anyway?” They were totally taken with his hair. They didn’t know nothin’ about what was happening up there.

Carter, on the other hand, was very smart. He asked a lot of very good scientific questions. He didn't want to be briefed. He knew what was going on. So between Frank Press and me, we tried to respond to his questions, and he was just enthralled. He loved it. I have to say, those were fabulous pictures. It's so beautiful. So that was that. It actually worked out okay. [Laughter]

BUTLER: That's good.

WILKENING: But the comet mission, on the other hand, crashed, and I have one other funny story to tell about that, which was the mission had been that we wanted to do this rendezvous mission with Halley, which was pretty demanding and more or less impossible. So after they said no, that was passed, then actually the time window passed, then JPL regrouped and said, "We want to do a flyby mission."

I had been working, when we were doing the comet rendezvous mission, I had been chairing the science committee that was planning the mission, the working group. My [engineering] counterpart was Marcia Neugebauer from JPL. So it was two women who were in charge of this. This may not have been good for the comet mission. [Laughs] But in any case, so JPL let us know in the division that they wanted to do one more pitch for the flyby.

So it was arranged that Marcia and I would make the pitch to the administrator of NASA himself in his briefing room with just a few folks around. Jim [James M.] Beggs was the administrator of NASA at the time. Well, we had a pretty good story, and I doubt this affected his view, but we made one major goof, which it was funny in retrospect, but pretty devastating at the time.

At that time the impact craters, they were making the K/T [Cretaceous/Tertiary] boundary connection with the extinctions on the Earth. *Time* magazine ran an issue that had a dinosaur on it [the cover] and an explosion in the background, but then it had a cigarette hanging out of its mouth saying “The real reason the dinosaurs became extinct.” Okay. So we thought that was pretty funny, and we were trying to make the connection there may have been a cometary impact and blah, blah, blah, all this kind of—we just threw it in for a throwaway.

We were using [a] three viewgraph ... screen that’s in the administrator’s [briefing room]—so all your slides get loaded in the back, and we set all of that up. You have to go through a few slides before the people come in so you make sure. Okay, it was all set. Marcia and I go in there. It’s not very many people in the room, maybe fifteen, and in walks the administrator, who’s always the last person in, smoking, and he was the only person smoking in the whole room, and he smoked the whole time. And there was no way we could pull that slide. So that was a big oops [Laughter]

We certainly didn’t have a flyby of Halley either. So, as you know, the U.S. had no mission to Halley, and we collaborated with the Europeans to a certain extent and conducted the International Halley Watch.

So after that, every time I’ve had to give a pitch to anybody, I am insistent—or have people doing it—that they absolutely do their homework on everything, and no humor, because you can never tell how people are going to react.

BUTLER: Well, as you said, it probably didn’t influence his—

WILKENING: I don’t think so.

BUTLER: —thinking directly on the mission.

WILKENING: Right. Right.

The other thing, my time there ended kind of sadly because the—what was he called—associate administrator, deputy administrator, I don't know, but the person who was the head of all the science, this other famous geologist—I'm having a hard time with my names. This is not unusual. This has been a lifelong problem, but it's gotten much worse in my senior years.

In any case, this was the person who was—Tim [Thomas] Mutch. He went on this climbing expedition and fell to his death, and he never came back. Well, I had an appointment [scheduled] with him for the day after he got back for that [was to get back]. So that was kind of a sad ending to the whole time I was there, which had been very educational. I learned a lot from it, but, on the whole, if I hadn't been so young and enthusiastic, I would have been really depressed. [Laughter]

BUTLER: I understand that.

WILKENING: Right.

BUTLER: I'd like to pause briefly here and change out the tape.

WILKENING: Good. Good idea. [Recording Stopped]

BUTLER: We were just talking about your time during this one year up at NASA Headquarters, working specifically on the Halley mission, and you had mentioned at one point that it was a lesson in adaptive thinking for you. If you might expand on that and how that changed your process.

WILKENING: Well, I was going beyond my normal, my narrow track of scientific specialization, and doing various things like writing the newsletter and learning about the budgets and things like that. All of that was pretty new to me. When I went back to the University of Arizona then in December, I guess it was, I returned and found that the person who had been chairing the department had stepped down as chair. They were looking for a new department head, and the factions were still like in evidence.

BUTLER: If I could interrupt briefly, what had caused the factions? Was it the difference in thinking about how the department should function or was it more of a scientific difference?

WILKENING: I think it was mostly personalities, but in part it was the old guard versus the new guard. People who had been there, who were primarily astronomy-based folks—it was kind of the astronomers, Pat Roemer, Frank Low, the really outstanding people who were astronomers, but who basically focused on planetary kinds of astronomy. You probably know in astronomy there was this long history of anyone who studied the planets was merely studying the vermin of the universe, and that wasn't important. So there was a little bit of that.

And then people who had been used to things the way they had been under the Lunar and Planetary [Laboratory] ... and the new department head, Chuck [Charles] Sonett, had, I think

rightfully, tried to assert the importance of the department, get the department created, nurture the faculty that had been recruited for that, some of which were people who were already there. That's what led to—there was this kind of tension. It wasn't unreasonable, but it was pretty strong.

So when I came back, I had been gone for—I wasn't at NASA for a whole year, but I'd been gone most of the year, so I was the person who was the least tainted or associated with either side. So the dean asked me if I would be the department head. I was totally shocked at this. I think in the meantime I'd been promoted to associate professor. I can't remember. I mean, I don't remember exactly the timing. I could look it up, but—

BUTLER: That's okay.

WILKENING: —you could look it up, too. So I said—I did it. I said, “Yes, I'll do it.”

I didn't really ask for anything, except for reasonable salary. I didn't really ask the dean, whom I think is still there. He was the dean of liberal arts. At that time it was all one big huge liberal arts college. I remember his coming over and pacing the floor, smoking, and talking to the group about, “If you people don't shape up, you're acting like a bunch of kids,” kind of stuff.

But in any case, he appointed me department head. So I appointed a committee of associate professors, because I figured they were secure, they had tenure, they had the most to lose in the sense that their future [was at stake], they were earlier in their careers. And they were not the visible protagonists in these, what had really kind of gotten to be ridiculous, battles.

I basically made them kind of the center of gravity of faculty power, if you will, the kind of important decision-making. I tried to get them to essentially kind of take over the department,

which is okay, because all those full professors were off. Frank Low was off doing all these infrared cameras on all these fabulous missions and stuff. I mean, it's not like they really wanted to be deeply involved in it. A lot of the decisions that were important to the department had to do with students and curriculum and stuff like that, and the people who were associate professors were much more involved and interested in that.

And I hired some more people. The administration thought I was very good. I hired John Lewis. They thought I was very good recruiter for the University of Arizona. We brought some more people in. So we had kind of a change in the center of gravity, and so finally some of the people that were astronomy-affiliated realized that maybe the best thing for them to do would be to transfer to the astronomy department. So that was worked out, and that pretty much solved it. After that, then things went back to being more normal, and that worked out okay.

BUTLER: That's good.

WILKENING: So in the meantime, we had a change of presidents. We were about to have a change of presidents in the university, and the outgoing president, John [P.] Schaefer, decided that—and he had talked to the incoming president, Henry Koffler, about splitting up the liberal arts college because it was too unwieldy and too unmanageable, into what they called faculties, Faculty of Science, Faculty of Social Science, Faculty of Fine Arts, and Faculty of Humanities, Faculty of Social and Behavioral Sciences—did I say that?

And so John Schaefer asked me if I would be the acting dean of science with the sciences. So I guess somebody thought I had done a reasonable job of handling the Department of Planetary Sciences, I suppose, but there was another reason, which was that with the Lunar

and Planetary [Laboratory], with the high grant volume that we had in planetary sciences, they knew that I had the resources to take over this essentially what became a school of sciences, without their putting up a lot of money to hire staff and so forth. So I didn't really bask in any kind of glory in my own mind for any time. There was definitely a practical side to this. So I said yes.

The business manager of LPL [Lunar and Planetary Laboratory], Mel Simmons legendary fellow, and I handled the whole science school for, I don't know, six months or eight months or something, with no resources, no additional real resources. I got really ticked off, and so finally one day I went up to the vice-president for finance, and I took—because Mel kept every transaction that we did, he'd keep every purchase order, everything he'd put in a loose-leaf binder. I had, they were about eight feet worth of binders. I took a dolly and I trundled that thing, that pile, over to the vice-president's office, which was about a block away. I trundled it into his office, and I made my pitch, and I said, "I'm leaving this here until we get some money." [Laughter] There they had sitting in their office this big pile of copies of transactions.

So they then began to work on setting up the whole new structure, which they hadn't done partly because the outgoing president was leaving and the incoming president was coming in and so on and so forth.

So the new president came in, Henry, and so he started moving things along. I like Henry. He's so happy, so jolly, no matter what. He has this wonderful, incredible ability to keep smiling.

BUTLER: Yes, that's good.

WILKENING: Yes. He's kind of inspirational. He's not an intellectual heavyweight, but he has other qualities.

So after this had gone on for a while, I said to Henry, it was after a dean's meeting, and I said to Henry, I said, "Henry, I'm still acting dean of sciences." They had recruited a couple of the other deans. I said, "I don't think I want to continue to do this forever. I think you need to get this science college in regular shape, and you need to hire a real dean."

He says, "Well, whom do you think I should appoint as dean?" He didn't say, "Well, Laurel, I want you to be dean." He says, "Whom do you think I should appoint as dean?"

I said, "I think you should appoint Ed [Edgar] McCullough [Jr.]," who was the head of geosciences.

He says, "Oh, well, that might be a good idea," and goes away. Next thing I know, Ed McCullough gets appointed dean of sciences and he was dean of sciences for, I don't know, fifteen years, twenty years. He was incredibly successful. It's one of few talents I really think I have, which is picking out good people for the job.

BUTLER: That's good.

WILKENING: So that was fine, because I didn't really want to be dean of sciences.

Then I got into that associate provost job, which they didn't let me off the hook, they just did something else. So there was a new provost, and he was from the outside, University of Minnesota, and so he asked me—and he knew that the issue of salaries was a big deal and he knew that I had done some work on it. He said, "I'd really like to have somebody who's here, who's known widely around the campus," blah, blah, blah, blah.

So I did that for three years, I guess. Then the vice-president for research job came open, and for me that was what I had always considered the dream job. The person who had been in it, who created the job and been in it for a long time, had been a mentor of mine. He was in atmospheric sciences. He wasn't the person I originally went to with my concerns as a junior faculty member, but Dick Kassander, he was a great guy. I got to know him really well, actually, through the creation of the women's studies department, because not only did we create the women's studies department, we created a research institute on women, Southwest Institute for Research on Women.

I learned from Myra [Dinnerstein], who was chair, who was a consummate academic politician, that—and we figured it out, what mattered at the University of Arizona at the time was the research visibility. Myra was a great proposal-writer and grant-getter, and so we said we want to have a research institute. It's actually four states, still exists. It's a four state [research center]—covers Colorado, New Mexico—the four corner states—and Utah.

BUTLER: Okay.

WILKENING: So Myra and one of her colleagues put this together, and she always asked me to help her advocate. So I'd go with her to meet with the president or one of the vice-presidents. One other person that was very sympathetic and helpful and who had money to give us and who appreciated us bringing money into the university, was the vice-president for research.

So I got to know his office and his staff pretty well. We would take him out to lunch and tell him what we were doing. I realized later how brilliant that was of Myra, that was her strategy, to take these guys out to lunch. Because once I was in administration, I realized faculty

never take you out to lunch. You're expected to take them out to lunch if you ever have lunch together.

So I learned a lot from Myra. She's very, very sharp, and that was a very good strategy. So I had learned a lot about that, plus being in the sciences and so forth. I thought at that time it was one of the best jobs in the university. That's what Dick always said, "It's the best job in the university." But times were changing, and now it's really a regulatory job and it's a really terrible job for most people who are in it. But at that time it was a great job.

So I went in there. I did not follow Dick directly. There was an intervening person in the job, and then I moved in after him. He got in a lot of controversy for buying a very expensive desk, so when I had the job, people would come into the office and see me and they'd say, "Laurel, is that the desk?" [Laughter] So, yes, that was the desk.

BUTLER: What did your duties entail there? You said it was one of the dream jobs.

WILKENING: The research vice-president's job is basically to do all the management that relates to external funding, so, federal grants and contracts, any contracts the university has that support faculty research, foundation grants, all that come through the office. That does all the accounting, all of that, so there's a whole army of people that do the accounting.

But at the University of Arizona at that time, that person also administered most of the overhead and allocated the overhead to scientific projects, departments, new institutes. Essentially he managed a huge seed fund for the university. The university was growing in stature and had a lot of interesting stuff going on, and he says, "It's the Santa Claus job. How could you not love the job?" [Laughter]

BUTLER: Right.

WILKENING: So I did. I really loved the job, and I had a great staff. He had a wonderful staff that had not really changed at all from the time he'd been in the job and the other person was in the job and then I came in. They're a fabulous staff, loved their jobs. I had so much fun. It was great. It was great.

I got to know a lot of interesting things going on at the university, and it's fun. It's kind of creating new things, helping people do creative things. It was wonderful. So that was really cool.

So why did I leave? Well, that's a good question. [Laughter] I can't really think. There must be some more precipitating event, but I can't really think of one. I think it was more that I got this phone call asking me if I'd be interested in being the provost at the University of Washington. How that all happened, I don't really know, but I thought well, I didn't really—I didn't even think that I would get the job. But I thought, well, it might be good experience, the interview process might be good experience. I might learn something.

University of Washington's been one of the top five research universities in terms of grants and contracts received for twenty years. It's probably now up to thirty years, I suppose. They're really a dynamite place.

So I got on a plane for an interview. I flew out there. I'll never forget flying over Seattle. I went to school in Oregon, but I'd only been to Seattle a couple of times and that on the ground. The clouds were kind of drifting around, and driving in the taxicab from the airport, it was night, and the clouds parted, and there was the Emerald City. It really looked like—it was

dramatic. It was just the combination of atmospheric and night and the way the freeway comes down I-5, and I thought, “Wow. This is it.” [Laughter]

BUTLER: That’s neat.

WILKENING: Not to mention the fact I have to go through this interview process and they have this very strong pool of candidates and so on and so forth, but I did, and I was selected, and I know, I learned later that the women on the faculty were very instrumental in supporting my candidacy there. So that was nice.

I loved that job. I was kind of worried about it, because I was following a person who had been in the job twenty-two years, who had essentially run the university, because the president’s job was in many ways an external kind of a job. George—what was his name? Beckman, I think. He was this big giant guy, gruff guy, knew everything about the University of Washington, knew everything about the faculty. He’d been there longer than the president had. He’d been running the place longer than the president had.

So I was a little worried, but I knew I had the president’s support, because this was his first administration. By replacing [George], this was the last position where he had not appointed somebody, so he was inclined to help me be successful. It was a very important job, because the structure was the president, me, the provost, and an executive vice-president. The executive vice-president, he spent the money. I did the budget part, the getting of the money, state money, and he did the spending of it. So he managed all the internal finance, construction, personnel, blah, blah, blah, and I did the academics plus the budget.

So we worked together as a troika. On difficult things it often came down to if we weren't all in agreement, then the two out of three, that was the way we would go. I enjoyed my colleagues there a lot. I had excellent staff there, otherwise I never would have been able to do anything at all. I think I did some good.

After I left, the president called me.... Washington was ... having a lot of political problems with these kind of Proposition 13, these tax reductions, state tax reductions, which have a big impact on state-funded universities. He said, "Laurel, we're still living off of your legacy of what you did for undergraduate education at the University of Washington, the political goodwill that you created about the university."

Another interesting thing about it was when I was hired, I think they made the decision in March or April, between that time and the time I arrived at the end of August, the University of Washington had gone from one campus to a campus that was supposed to start two new campuses. So I got to be in charge of the creation of two branch campuses of the University of Washington. By the time I left, I got to attend graduation ceremonies at both branch campuses.

BUTLER: Oh, that's great.

WILKENING: Yes. So that was a really interesting time, too. I was the principal university advocate. I had a budget professional who was an advocate, and we had lobbyists, but I was the principal advocate to the legislature of our budget, explainer of the budget, and the person that got called on the carpet when people were really unhappy about what the university was doing. So it had its tough aspects, but it was a very rewarding job, and it's a wonderful university, and

the faculty there are quite tremendous. I mean, I had my problems there, but I really liked that a lot.

Now, it was during that time I went in to tell the president, and I said—well, I got appointed to the National Commission on Space when I was at the University of Arizona.

BUTLER: Did that come about through your work at NASA Headquarters?

WILKENING: Who knows? Nobody knows.

BUTLER: Oh, okay.

WILKENING: Tom [Thomas O.] Paine was the chair, and I was appointed vice-chair. I mean, I was totally amazed. But everybody on the committee was amazed that they were appointed. Nobody knew how they got appointed. Later, after I got to know Tom Paine, who was another wonderful mentor that I had—he and I got to be really good friends—I said, “Tom, I assume that you’re a Republican, because I’m a Democrat.”

He says, “I’m a Democrat.” [Laughter]

I said, “Well, the reason I’m asking this question is when I had to go through the security,” we all had to get high-level security clearances, and when they were looking, doing the screening, they said, “Have you ever been a member of NOW [National Organization of Women]? Have you ever been a member of Greenpeace?” I don’t know, they put out all these kind of organizations, but particularly the women organizations, and I’m just not a joiner, at least

at that time I wasn't. I didn't have time. I didn't join anything but scientific societies. So I said no to all those questions.

So we were amazed that [Ronald W.] Reagan, who was the appointing president, appointed the two of us as Democrats to the job. So that I can't explain. I went to see our congressional delegation after I was appointed, and went in to see Barry [M.] Goldwater, who was just about at the end of his time as senator. I introduced myself and I explained. He says, "Yes." He says, "How did you get appointed? I recommended Michael Collins." [Laughter] I thought maybe Barry had been instrumental in it, and that was vintage Goldwater. He was such a fabulous, straightforward, practical-minded guy. I thought that was just wonderful, "How did you get appointed?" [Laughter]

So that's what everyone on the commission said, how did we get appointed? Nobody knew. But I just looked at the report again. I hadn't looked at it for years. It was an interesting experience. I can't say it was wonderful, because we were in the middle of writing our report when *Challenger* exploded.

In fact, I was on the phone with George Field, who was also on the commission, when the PR [public relations] people from upstairs in the administration building at the University of Arizona came down, knocked on my door, and they said, "You've got to come up and look at the television. The Shuttle has exploded."

So I said, "George, go find a television. I understand the Shuttle has crashed."

So we were mostly done with the report, and so we went ahead and published it, but the climate—then there was basically a lockdown on the Shuttle Program.

BUTLER: Right.

WILKENING: So that was depressing. I think it was wonderfully done, and I learned a lot from Tom Paine, who really managed that whole process and very well. I learned from him, always think about the end game. What is it that you expect to get out of this, and who is your audience? Think about who are you trying to reach with this. But he had a wonderful style, and our meetings were orderly, but they had enough camaraderie that I think everyone felt very good about it.

It's unlike any other report that I have ever written or partly written or been a party to. I think it is a masterpiece. It's just too bad, it's really, I think, regrettable, it was too visionary for the time, it's clear in retrospect. Although on the science side, the kinds of discoveries that we anticipated, many of them have come to be true. But we foresaw the operation of Space Station *Freedom* in the middle nineties, and of course it's now 2001 going on 2002, so things did get slowed down quite a bit.

So I had been doing that. Now, one of the recommendations ... turned out to be funny—recommendations that came out of that was kind of a legacy of that and then was picked up by the Augustine Committee, was that the Space Council be reinstated and be chaired by the vice-president. That was model under Lyndon [B.] Johnson, when Lyndon Johnson was vice-president to [John F.] Kennedy. That, of course, was the golden era of space exploration when we were doing Apollo. That's when all the budget charts go like this [Wilkening gestures], and there's that peak around Apollo.

So there was this thought that, well, if you had vice-presidential level leadership, that that might be the way to pull it out of the kind of [bureaucracy]—under Reagan there was a kind of a committee, I forget what it was called, but it had the heads of all these different agencies and

various cabinet people that sat around and hashed out the space program. Well, they just never really got anywhere, but partly because the president I don't think was really that keen on it.

But when [George H. W.] Bush was running, there was a sense that Bush had a lot more interest in the space program, but that was later. That came later. So I'm getting ahead of myself here.

So the recommendations were to reestablish the Space Council under the leadership of the vice-president. Okay. So that was adopted. That was one of the few things in our report that was adopted. Then so what happens? Bush gets elected, and who was his vice-president? Dan Quayle. So Dan Quayle's in charge. [Laughter]

So that was kind of funny. So when I went to see President [William] Gerberding, my boss at Washington, I said, "Well, I've been asked to serve on this new Space Council committee." That was the Augustine Committee at the time. "I will have to go to Washington all the time. It will probably be on the weekends, but I just wanted you to know because I have a lot of responsibility here."

I explained to him that Quayle was the head of the Space Council, and he says to me—he was a political science professor—he says, "Well, Laurel, I think I've told you before about the unintended consequences of reform." Because I tend to be a reformer. In my administrative work, I've been a reformer, and he really thought I was too much of a reformer. So he got a huge kick out the unintended consequences of reform. [Laughter] That was very, very funny. He had a good laugh out of that.

Do you want me to say anything else about the Space Council? There are a number of interesting anecdotes about it. I mean, not the Space Council, but the National Commission.

BUTLER: Yes. Actually, looking back on it, you mentioned that Tom Paine was directing what is the end game, what is the audience.

WILKENING: Yes.

BUTLER: What was the directive that you were given? What was the purpose for establishing the commission?

WILKENING: Well, we were supposed to establish essentially a vision for the civilian space program. Have you seen our report?

BUTLER: Yes.

WILKENING: It's very forward-looking. That's what Tom says. This is the first time there's been a national commission on space. I mean, he was always one to exploit an opportunity. He says, "We should go for the whole thing. Let's just go for the whole—we're going to do the whole deal."

So we established the goal of settlement or at least human presence on Mars leading to ultimate settlement and then working back from that. I really like what [he proposed]—it was his idea to do that, looking back fifty years [from] where you are, looking ahead fifty years, and when you look back from '85 to '35, there weren't even transatlantic flights. Everybody's taking the boat to Europe, stuff like that, saying how fast—the pace of change, to show the pace of

change and to say that it's not unreasonable to think fifty years hence, by 2035, that we might have people living on Mars.

So that's the way he thought. He thought very big, big thinker, and he said, "Our audience is the president, because at this level there's only one person who could make this happen, and it's the President of the United States." So that drove a lot of the way we formulated [our goal] not what we did, because we went through all the science studies and the space transportation systems and all of that kind of stuff. We took public testimony in, I forget, six cities around the country or something like that. That was really interesting. But a lot of the way it is, that it was published as a book by Bantam Books, that it has all those illustrations in it, that you start out with pictures, the Wernher von Braun—[Chesley] Bonestall picture of their vision from whatever it was, sometime, of the Space Station, Space Telescope, and Shuttle, their version. But they said this is what could happen and then shown showing, well, it kind of was on its way to happening. All of those things that were kind of a sell—it was a selling document, what was at was, and it was intended to sell to the president.

And the more we got to know about the president, then Tom Paine says, "I think we'd better do a video for the president. He came out of the movies, so we can just put something that he can plug into his TV, his VCR, and he can watch it, and he won't have to read a word." We had Louis L'Amour as the narrator of the video, because that was the president's favorite author, and the president had been in all these western movies and all that. He was a westerner. He had his ranch, loved to go horseback riding.

So we tried to use that [background for] *Pioneering the Space Frontier*. We tried to pick and use that western mythology essentially as an analogy for what we wanted to do at Mars. So

all that came out of thinking about who is your audience. And this is an audience of one.

[Laughter]

So it's things like that that I really enjoyed learning from Tom. He was a wonderful human being, but he was very shrewd and never came across as being shrewd. He kind of came across as being just kind of an ordinary guy, but he was quite extraordinary.

BUTLER: Nice to be able to work with people that like.

WILKENING: Oh, I feel very fortunate that in my career I worked with a lot of interesting people.

BUTLER: So how would the process work? You mentioned that later when you were at Washington and the opportunity came up for the new commission, that it would be mostly a weekend thing. Was the National Commission on Space also a weekend thing or did you do it more frequently going back and forth to Arizona?

WILKENING: All of these commissions and committees involved people that have regular jobs, or most of them do. I mean, usually there are a few retired brains on them, but also men never really retire.

BUTLER: Right.

WILKENING: There aren't enough women to know whether they really retire or not. But in any case, so it makes it easier for attendance if you do it on weekends.

To tell you the truth, I don't remember the schedule. A lot of what we did couldn't be on—well, I mean, some of it couldn't be on weekends, but I know we did the writing on the weekend, because we did the writing at the University of Arizona, and we took over my office suite to do that.

That came at an interesting time, because Tom had figured out who he wanted for staff, at least they had in mind a couple of people and then we had more a open selection process for others. But we had pretty high-powered staff.

After we had had our hearings and our internal subcommittees had done most of their work, then we were facing the issue of writing the report. We already knew kind of that this had to be a document that would sell. We had to think out how we were going to do it. But we had these really great staff, and they were doing a lot of accumulating the information and stuff, and so they started writing.

They turned in a couple of drafts of various bits and pieces, and the commission members really didn't like it. It was one of those rare meetings that Jeane Kirkpatrick attended, because she was probably our most absentee member, but Jeane was there and the people on the commission were expressing their unhappiness with the material that was being written and that it really wasn't communicating what we wanted to do, and it was not living up to the demands of the audience of one.

So Jeane's taking this all in, because she hadn't probably been to a meeting or two. She says, "Well, I've been on a lot of commissions and a lot boards, and sooner or later you have to decide if this is your report or if this report belongs to the staff."

So right there, we decided this was our report, and so then we knew, we're going to have to get together and write. So people were given assignments, and I volunteered—and we wanted

to get out of Washington, and so I volunteered my office because I had a good office. I had a lot of computers. I had staff who would be willing to help, if we wanted them, and we did bring some of the staff from the commission out. We holed up there for a long weekend, and everybody was writing.

That produced the major text. Then out of that, we drew the other things that we used, the declaration for space and the dedication. We had already worked out pretty much the looking back and looking forward, and we had all the illustrations, but we needed the text, and we needed to support—we did use some, I think, staff text on a lot of the support stuff, but we needed—and formulating the declaration for space was pretty—we wanted to say it forcefully and right. So basically the commission took it over, and we were the authors, the whole commission.

BUTLER: So did everybody work on a particular section?

WILKENING: Yes, usually, and people read and critiqued back and forth, but there were people who had major responsibility for certain sections.

So that's how it happened. The fact that we were all coauthors is, I think, a very accurate—even Jeane. She made a key directional change for us. I don't know how long it would have taken us to arrive at that, but she just said, "Well, this is what you've got to do."

BUTLER: How did the decision-making process come about for the commission? You said you had staff that would help in gathering the research. You said you had traveled around the

country and talked to people, gotten a lot of information from different areas, and then would you just sit down with this and discuss it in the committee?

WILKENING: Pretty much. I think Tom had led us. I mean, he wanted the Mars goal. Every one of these commissions or committees I've been on, it's pretty hard to escape having Mars as a major goal, especially if you're doing anything with people, because Mars is really the only place besides the Moon—well, there's some asteroids you could probably put people on. Well, so there aren't very many things. So if you really believed in manned space, as they always said, if you believe in people in space, then Mars is where you're going to end up.

So that part usually doesn't take a group very long to get to and especially if the leader is leaning in that direction. So that didn't take too long to get to, and I think the public hearings helped, because the public relates strongly to the manned program. I mean, Apollo was so dramatic. It was really so dramatic and it captured the hearts and minds so of so many young people. As a teacher later on, I kept getting these students who said this was it. I mean, they were entranced.

BUTLER: Right.

WILKENING: We heard from teachers. A lot of teachers said the space program is the way to get young people interested. I remember I was at the [public] meeting in Boulder, Colorado, and that was one strong theme. The other was, interestingly enough, in terms of what's going on now, was space tourism and having non-astronauts in space, which NASA picked up to a certain degree, but then of course *Challenger* brought that to an end. That was a tragic—that part of it

really was a road block for being—I mean, the whole business of people in space was just called into question, and since that was a theme of our report, I think that’s the real reason [our report languished]—aside from the standdowns, there were no launches for all [that] time and everything while they figured out what was going on, the Ride Commission.

And then the steps to get there, once you decide that’s your goal, then you work through the steps, and then there are the inevitable arguments of over space transportation, which have taken place on every one of these commissions that I served on and probably still are, since we’re still flying the Space Shuttle.

So in some ways it wasn’t that precedent-breaking or it wasn’t a brand-new idea, but it was “Here it is and this is how we would do it.” I think it was more laying out the steps and talking about what it would cost as a fraction of the gross national product, for example, trying to show that if you did it over time and if you remained committed over time and if you avoided wasting a lot of money, then this was something that was doable. That’s really what we were trying to get people to start thinking, that this is something doable and thinking that people would identify with it and support the space program. So that was the attempt.

Then the other things that were follow-ons to that, I mean were basically follow-ons to that, the Augustine Committee. There were two committees that I was involved in that had really different kind of missions, sort of different kind of missions. One is I don’t think on your list and is not generally publicly known, and that was after Bush was elected, he put in place his transition team, and this was going to be the real revival of the Space Council in addressing, trying to address, pick up again after the disaster of *Challenger* and after we hadn’t gone anywhere.

One of my students had been a Bush supporter and got appointed to a Space Council staff job with a number of like-minded people. So they had supported Bush because they thought that he would be bullish on space, and they were right, with the only problem being that Quayle was the vice-president. But basically the climate, they saw this was a climate that was good, and they wanted to get out front very aggressively because July '89 was coming up. It was a significant anniversary, and they wanted Bush—that to be the opening. Bush was elected in '88, and so he took office in January of '89, didn't give them much time.

Now I don't remember exactly, but I think it was actually when the transition team was in place but before the staff were known, but I think it was before Bush took office that the word went out to NASA that they wanted NASA to propose a program for space, and they wanted a forward-looking program.

Well, NASA was under Admiral [Richard H.] Truly, and they were struggling with making sure the Shuttle was okay, and that whole mind-set was a very conservative mind-set. So this was the famous ninety-day study that NASA did. Basically when the Bush administration got it, they said among themselves, evidently—I'm just extrapolating here—"This is not really what we expected," and so they convened what they call a blue ribbon panel to review the ninety-day study. This in between. Augustine then came, but in between. This was not a long ongoing thing. This was essentially like a one-day or maybe two-meeting shot.

They asked me to chair it. So we were convened very early in the Bush administration to look at the ninety-day study. This was an interesting group of people. I don't remember who all was on it, but I will never forget the fact that Carl Sagan and Tom Clancy were both on it. And Tom Clancy was jealous of Carl Sagan. That was one of the most amazing things, because Clancy had already written [*The Hunt for*] *Red October*. He had all of these films out. He had

all of this stuff going, but there was somehow what Carl Sagan used to call science envy. I remember there was just in the way he behaved, Tom actually said something to me in the hallway about it or something. He asked me some question about Carl or something, and I just thought this is so astounding to me.

BUTLER: Yes.

WILKENING: Carl, of course, is just completely self-confident, oblivious of everything, so I don't think he ever knew what was going on. He was just holding forth in Carl Sagan manner. But that was kind of—then there were some of the usual suspects. Tom Paine was there and Pete Aldrich and some corporate folks. So it was a good group.

We reviewed the ninety-day study. They sent it to us. We got together in the Old Executive Office Building. We all looked at each other and said, "This is going nowhere." So we spent some time discussing it, blah, blah, blah, blah. The conclusion was, this would never do. It certainly wouldn't do for an administration that wanted to have a space program, and basically the feeling was NASA just pulled off the shelf some of their old studies, what they were doing now, and slapped it together and put it in a word processor and made it look like a study, but they hadn't really done anything.

Well, since I was chairing it, I got the nice job of telling Admiral Truly that this was not exactly acceptable, which I did.

BUTLER: That must have been a challenge.

WILKENING: He didn't get it.

BUTLER: Hmm. Interesting.

WILKENING: Well, I think he felt that he was still taking care of the Shuttle problems. This was not a time to risk, to go out on any kind highfaluting risk-taking, high-visibility kind of a program. He just didn't get it.

So it became clear that a new NASA administrator was needed. So, in the Bush administration you got [Daniel S.] Goldin. Truly's a very decent guy and I think he did do a good [job]—he was the kind of person that was needed for that period, but the Bush folks, they were gung-ho and this was just not what was going to work for them.

So then they pointed the Augustine Committee to flesh out a new version of space science. And there, of course, there's Norm [Norman R.] Augustine, that absolutely incredible person leading it. I again was the vice-chair. I felt always like the bridesmaid. [Laughter] But to Norm you could hardly complain. He's so remarkable, such an incredible person.

That was an interesting group of people, too, and at first I wondered why did they put me—you know, why was I there. Well, then I realized that I was really supposed to be the manned space advocate, because by this time Norm was very keen on Mission to Planet Earth. He was out in front of everybody. Now ecological tours and adventure touring is [common place]—here he was, the CEO [Chief Executive Officer] of Lockheed-Martin [Corporation], first, I guess, Martin[Marietta Corporation] and then Lockheed [Aircraft Corporation] and they joined. So here he is, this big CEO, smart like the best CEOs are really smart, and more so because of his books, his great wit, fabulous guy.

He used to go out—I remember his telling about he and his son going someplace in the Arctic where you get in these armored vehicles and you go out [in], these gigantic tall things, to be with the polar bears.

BUTLER: Uh-huh.

WILKENING: He would go off on those kind of adventures. That's the kind of stuff he was doing, and I think he really began to worry about planet Earth. Now, it may have come from somewhere else, but I think right at the time we were doing this, this was very much on his mind, and I now completely agree with him, although from space there are a lot of things you can do, but you can't do everything.

So he was a big advocate for the Mission to Planet Earth. I think I came across some notes that I had written for one of my speeches that I had to make to kind-of reinsert manned space. Space science was pretty much of a given in all of these things, but kind of the manned space part so that we had the Mission *to* Planet Earth and the mission *from* planet Earth. So that was good.

Norm was incredible. We went to testify before Congress, and he answered the science questions much better than I did. I mean, just incredible. A really, really fabulous guy, and working with him was a lot of fun. I thought that program was a pretty good program that we came out with. It was more tuned to reality and more near-term than the National Commission on Space. So that was those two, and the blue ribbon, which was kind of an unknown little group.

Then under Quayle, then towards the end of the Bush administration, the Soviet Union imploded and the cold war was over. Then the task in space, there was another task, which is what does the space program look like after the cold war, because the truth of the matter was, we were always in a competition with the Soviet Union.

Also at that time the existence of the national security satellite system was made public. Although most people knew that we must have had a lot of spy satellites, it had never been publicly acknowledged, and so there was an opportunity.

So I was appointed to chair the whatever it was called, Vice-President's Committee on Space Policy. We were given really a very broad charge. We were supposed to look at all of the space programs, the military, civilian, and the national security space programs and say what should we do now that we are no longer in the cold war.

In some ways I think that that work, from my perspective, was the most important policy work that I was every involved in. However, the fact that Bush did not get reelected kind of brought that to a halt, although I think a lot of the stuff had to happen anyway. I had a lot of generals on that group. I'd never had an opportunity to work with very many military people, but on all these committees and commissions we always had at least someone from the Air Force, if not the other services.

I became very impressed with these Air Force generals. It's amazing to me how the service promotes these people, how you get these really creative people out of a process that you usually think would be so—you know, would exclude creativity and out-of-the-box thinking, but some of these guys were just fantastic. They are often on the front line to be critical of the way the status quo is, even in their service.

So one of our recommendations was to completely rethink national security, how you do national security around the space program. They were very open to opening up, trying to be more competitive, space commercialization. It was a lot of fun. Then there was the usual, we had a subgroup that worked on the space transportation problem. Of course, we had a space science recommendation.

But the real meat of it, in my view, was really trying to figure out how to take advantage and how to think of the space program more in a holistic sense and not to have rivalries or duplications that weren't necessary. Of course, in the area where that's most obvious is space transportation. I mean, obviously the spy satellites are going to have their own particular stuff. But you want to share across certain kinds of new technologies, new developments and things like that. So that was interesting.

But after Bush lost, then I was called up and told, "Laurel, you have to ask for the resignation of all of your committee's members because we are leaving office." So I did that, and then right at the end ...—I think it was over the Christmas holidays, I went in to meet with the vice-president, and we had a photo opportunity, and he gave me their printed final reports and all of that kind of stuff.

So I don't know, I think my career in space policy, which kind of replaced my science, because I really pretty much had to leave science when I left the University of Arizona. I just was not able to carry on graduate [teaching]—the job at the University of Washington was a huge job and it was very consuming. One of my colleagues who was a senior professor and who had done a lot of space science and space policy says, "But the best thing is you choose between them, because you can't really do both." Since I had the opportunity to do the space policy, I did it. But I don't think it was a particularly successful career, but it was really interesting.

BUTLER: I'm sure it was. Well, and you did say that some of the things that you recommended were implemented.

WILKENING: Oh, yes, all the way along various things happened, and we always advocated for space science and I always did that, so I feel that's important. I mean, we still have a manned program. I believe in having people in space. I think that's a useful thing to do. I think you have to think about where it's useful, where it's not useful, but I think it has just good things that will come out of it. So I feel pretty good about that. You have a few other areas where we haven't made as much progress, but that's okay. These things take time.

BUTLER: That they do. That they do.

You mentioned on the—particular for the vice-president's space policy advisory committee that you were on that obviously Bush lost the election and the committee ended at that point, but you had made several recommendations along the way and that some of them were even implemented later or there were things that needed to happen anyway. Can you give a few more examples?

WILKENING: I don't know if I can, because I was not—at that point then I was also leaving the University of Washington and going to California and at that point to be chancellor. I figured I didn't have any time to think about this. In any case, there was no reason why Clinton would have appointed me to anything. It was a new administration, change of party. Even though I

was a Democrat, I'd had all that history of working with Republicans. And it was clear to me that space wasn't a focus of that administration anyway.

But of necessity, I mean, you do have to think about how you do things when the cold war no longer exists. I think that there has been space commercialization, the continuing use of satellites, not just for communication ...—there was some discussion in that group about the global positioning satellites. Well, now they're used everywhere in everything. I don't think we quite anticipated how ubiquitous they would be.

So that was kind of the thing we were saying. In space commercialization, there's a lot of opportunity here, and there will be opportunities for new companies, and we have to think about technology, not just that we try to hide everything or keep it super secret, but that there are technologies which can be used worldwide and would be for the benefit of being used worldwide.

We felt the same way about the space images, images of the Earth taken from space, that there were things there that would probably be very useful, and they're now used widely, I think more in research and in some planning like land-use planning and some things. There's probably a lot more that could be done there. But I think there's still a resolution limit on what they will make publicly available. There are a lot of things you can do with what is publicly available, and I probably am [not] up to date even on that. So those were some examples.

Another interesting thing was that we did foresee that, at least in our report we said we're moving from this bilateral, you know, there are two superpowers, and we said the kinds of planning that we have had for defense and national security monitoring, that system is not going to be appropriate anymore because we will move to a time of regional conflicts. At the time we'd already had [Operation] Desert Storm. I mean, we'd already had that conflict, so that was known

that there would be these ethnic or religious or other kinds of conflicts around the world that are more regional.

We said you've now got to not just monitor what the Soviet Union is doing, you've got to monitor the whole world. We didn't say anything about terrorists per se, but we did say we've got to move from just watching all those launch sites in the Soviet Union to paying attention to what's going on all over the world. That had a lot of implications for satellite deployment and monitoring and data collection and review and all of that kind of stuff.

BUTLER: Absolutely. Certainly an interesting project to be working on and to be investigating.

WILKENING: Yes, I think there have been people working on this, and I'm sure they're working it now.

BUTLER: I'm sure. I'm sure.

Did you at any point during this time, now that the Soviet Union had gone away, and, as you said, there wasn't a super power anymore, was there any discussion during this administration about joint programs?

WILKENING: Yes. There was quite a bit on international cooperation, and it was recognized that the Soviet Union was the logical partner, was the most advanced in terms of technology, and that collaborations—I mean, the idea had been long put forward that the Space Station should really be a collaborative effort and, after all, when we did Apollo-Soyuz [Test Project, ASTP], which

was the first real space station, that was joint with the Soviets. So they were obviously going to be collaborators on some of like the big projects.

But there was a recognition that there were a number of other countries who had space launch capabilities, certainly in the commercial area. I mean there was all kind of concern about the position of the U.S. as being competitive in the commercial launch business, because Ariane, the European group, was doing well, and China, I forget all of the countries that can launch their own satellites, but there are quite a few of them, or Japan actually has a fairly sophisticated [capability]—they've done a variety of things. But the Soviet Union clearly was way up there.

But then what we don't know, because the implosion hadn't completely taken place, so it wasn't quite clear who was really going to be running the show and how fragmented it would be. That was pretty much still, I guess, evolving. At least I think that was the case.

BUTLER: Well, looking back, you've mentioned this transition from the science to policy, and that as you left the University of Arizona that you just really didn't have the time and the ability to work on the science end of things.

WILKENING: Also, remember my comets had more or less disappeared.

BUTLER: Yes. Comets had gone away.

What are some of the differences between working in the scientific research environment to working in a policy environment, and is there a difference at the academic level? [Phone rings. Tape recorder turned off.]

BUTLER: Well, starting to ask about the differences between the science side of things and the policy side, and even the difference between working in academia versus working with the government, if you could compare some of those.

WILKENING: Well, the science is indispensable. I mean, if we weren't learning anything from going into space—if it were just a joy ride, I wouldn't be involved. But the scientific life has to be pretty focused. You have to really be focused on what you're doing. It's a collegial and competitive world. You have to pretty much stay with what you're doing if you're really going to make progress. You have students to mentor, you have money to raise. It's a big job, especially in the academic environment. It's quite a lot of work because you're also teaching, and I think it's become more and more stressful over the years. I think in some ways funding becomes more competitive. There are more regulatory issues and more pressures from all directions. That's what I've learned, watching and doing.

So that's a demanding job, but it's a rewarding one, and for many people it provides the rewards that they need. It certainly provides a greater good. We learned a lot more. For space exploration, it's indispensable. I mean, we just have to have people doing the science and the engineering.

Now, space policy is kind of fun. In some ways it's important, but in some ways it doesn't seem as important as the science, but on the other hand, unless you have the right policies in place, you're not going to get the funding, blah, blah, so it's kind of this chicken and egg thing.

So for me, the switch from space science, partly driven by I had kind of positioned myself to move in one direction, could have gone back to working on meteorites. I mean, at the

time I would have had to spend some time thinking about how I was going to redirect my program. I had one student who was working on one direction, but it really wasn't going anywhere. So I needed to rethink what I was doing, and so I had thought that working on comets would help me get connected with a lot of things I was interested in, but I could have gone back to working on some other aspect of meteorites, but at that time I had the opportunity to do other things, and I got into administration, which is also time-consuming.

So in the end, it seemed to me that the space policy was much more compatible with my life as an administrator, required a lot of the same kinds of tasks, desk work, which I'm now allergic to.

BUTLER: Can't blame you there.

WILKENING: Presentations, you know, it's the meetings, it's the usual kind of activities. So that actually worked out pretty well, especially when I was doing a lot of the—when a lot of the high-level space policy stuff was being done on weekends. So it made it possible to do, although it's a heck of a long trip from Washington, D.C., to Washington state.

BUTLER: That is a very long trip.

WILKENING: That was pretty tough. I don't really have much more to say about that, unless you want to follow up in some specific direction.

BUTLER: Not specifically. I was just curious about the contrast between the two. It's different areas, but, as you said, you need both to really have—well, you did move on from Washington to become chancellor at UCI.

WILKENING: Yes.

BUTLER: How did that opportunity come about for you?

WILKENING: Well, I was pretty happy at Washington, although I felt I had accomplished quite a bit there. I had pushed. I had looked at what was going on in the university. I mean, there were many things that were right there, so in some ways it wasn't that easy to do much except help it along.

But one of the things actually grew out of my experience at the University of Arizona, which was that I felt that undergraduate education was being neglected. At the University of Arizona, it was more glaring to me when I was in administration that I wasn't so focused on the education part, but I knew what is called now student life or student side of things, that clearly had been put at a lower priority than research and the kind of pure academic side, pure academic teaching side of the university.

The world was changing. I mean, that was fine in the sixties where the students didn't want you to do anything, but things were becoming more conservative through the latter [era]—after the Vietnam War and you were in the post baby boom era, and there was a little bit more expectation on the part of all society that things would work right, that people would do things for you, that you would help people who needed help, stuff like that, instead of everybody being

out on their own, flower children. So that was beginning to impinge on universities, and I could see that the University of Arizona students complained about a variety of things, like their dormitories, stuff, all kinds of different things.

At the University of Washington, what I learned was when they did big cutbacks in the seventies, that's when Boeing had a big cutback, and at that time Boeing drove the economy of Seattle, and they had the famous billboard "Last person to leave Seattle, turn off the lights." The university had had severe cutbacks then, and part of what gave was undergraduate education.

For example, I think it was—now here's where I may be factually not quite remembering correctly, but I think it was true in chemistry that there was no chemistry lab for the first [quarter]—they were on the quarter system—until you got to either the second or third [quarter] chemistry in your freshman chemistry. And I, being such a lab-based person, I had a hard time imagining this.

BUTLER: That is hard to imagine.

WILKENING: So I started investigating, and found that it wasn't unique to chemistry, that there had been a lot of cuts in the very beginning undergraduate program. At the University of Washington, all the students are in the liberal arts college for the first two years. You don't get to go off into your specialty, like if you're an engineer, you're formally in the liberal arts college for the first two years, or arts and sciences, I guess is what they call it there.

So that seemed to provide a little bit of an opportunity for addressing this, because this is where the problems were, because it wasn't in the advanced programs. Junior, senior levels seemed to be much better off. Nothing's ever perfect, but.

I could tell that the legislature was not happy about this, and the HEC Board, which is the Higher Education Coordinating Board, which was kind of an intermediary on some statewide educational issues between the universities and colleges and the legislature, they had quite a fair amount of power [and they were critical of our program]. They approved new programs and they recommended initiatives to the legislature and so on.

So we put together a proposal for more money for undergraduate education, and I can't remember now, actually I'm sure it had a sales wrap around it, and we got the money. I made it available. I didn't decide how to spend it, except to say that "This money is available to the top ten departments in terms of numbers of freshmen that they teach. College of Arts and Sciences, you figure out where this will do this most good, but it better do some good so that the complaint level from students goes down and the learning experience goes up."

So when President Gerberding said to me, "We're still living off of the legacy of your undergraduate education initiative," that's what it was.

The faculty liked it, because faculty, they care about what students think of them and they care about their coursework. I mean, they're not there to do a bad job, but they simply did not have the resources to do an adequate job. Now they probably still don't have the resources, but it was a big help. It was a substantial amount of money. So that was one of the things that I did there. So I felt good. We started some other initiatives. I felt very good about it. But it would be hard not to feel good about it, I think, although they've had a lot of budget problems recently, so maybe the provost doesn't feel so good, I don't know.

President Gerberding had told the Board of Regents—I went to all the Board of Regents meetings, and he had told the board that he would step down at age sixty-five, and that was coming up. So I said to him, "Bill, what is the best thing for me to do? I know you're going to

resign. Is the best thing for me to stay during the transition and then see how it goes, [and] leave after there's a new president in place? I've been here for five years. Should I think about looking around so that a new president can put a new provost in place? Advise me. I don't know. I don't know what to do in this case."

He said, "Well, Laurel, I think you're ready to be a president, if you really want to be one." That was an important question that I didn't give enough consideration to. He said, "I'll be happy to nominate you for a job. Is there any job that you're interested in?"

I said, "Well, I've always wanted to go to the University of California system, if I could, but I never thought I'd have the chance." Well, he had come from UCLA. He's big-time connected in the U.C. system. So he nominated me for the position at the University of California-Irvine.

Well, at the same time, they were searching for a provost of the U.C. system. So one day this fellow who was the acting provost calls me up. I later got to know him pretty well. He was another UCLA person. He calls up and he says, "Laurel, we'd like for you to come interview for the provost job here in the U.C. system office."

I said, "Murray, why would I want such a job?"

Murray says to me, "Well," he says, "I'm sitting in my office. I'm looking out. There's this beautiful lake in front of me. It's northern California. You can see the hills, the Oakland hills. This is a great place."

I said, "Murray, I'm sitting in my office. I'm looking at Mt. Rainier. I can see the Seattle ship canal over here. Why would I want to come to Oakland?" [Laughter] Then I said, "What ever happened to the job at Irvine? Has it been filled?"

He says, "No, we haven't filled it yet."

So the next thing I know, about a week later, they said, “Okay, well, the committee’s interviewing candidates for the Irvine job. Come on down to the L.A. airport. Your interview time is scheduled at X.”

Despite the fact I went to school at UCSD and I driven through Orange County on my way to L.A. any number of times, I had never actually been on the UCI campus. So this is right before Christmas. My interview was, I think, right after Christmas. So as happened quite frequently when we were in Seattle, the Huskies were in the Rose Bowl. So we went down to the Rose Bowl, my husband and I, with the football team and administration and everybody.

I think it was the morning—no, it wasn’t the morning of the Rose Bowl. Because we were down there for a few days. So one of the days when we didn’t have something else to do, it might have been the day after the Rose Bowl, we rented a car and drove down to the Irvine campus and walked around. The place was totally deserted. There wasn’t a soul there. Maybe it was New Year’s Eve. I mean, it was one of those days where nobody’s—if they’re going to be gone, they’re definitely going to be gone on that day.

We walked around. We walked around. We drove around a little bit in Orange County. I said, “God [my nickname for my husband], this is the most plastic place I’ve ever seen.” I mean, the campus is absolutely beautiful and immaculate, but it was like a ghost town, and it was just kind of weird. I said, “I don’t know if I could stand it.”

Then we were driving back up to L.A., and I saw a sign that says “Little Saigon” pointing to the right. I said, “Oh, Little Saigon. Let’s go to Little Saigon.” So we went to Little Saigon. Here’s all this activity, action, all these Vietnamese people, all these restaurants open. We go into a restaurant. We had a wonderful lunch.

I had gotten to know—in Seattle we lived south of the ship canal. We lived in a very diverse area of Seattle, and we were not far from what they call—what do they call it? — the international district, which where they had clumped all of the foreigners, so to speak. You think of Seattle as a pretty liberal place, but when you get right down to living patterns, no place is very liberal.

But I got to know Vietnamese food pretty well. So we had a wonderful Vietnamese lunch, and I said, “Actually, being here wouldn’t be so bad. This is not bad. This is pretty good.” I said, “The campus is gorgeous and it’s neat and it’s been growing. It’s still a new campus.” So I thought it was kind of a possibility.

So then I had my interview, and then they called me and said, “Well, we hope you and your husband can come to the Regents’ meeting next week, because we’re going to announce you as being the chancellor of the University of California-Irvine.”

Well, I really had no idea what I was getting into, but I felt I was prepared for anything because I had done every administrative job that there was in a university to do, and I’d done them at big universities and public universities.

So off we were to Irvine. This should have tipped me off. There was a lot of prearrival publicity in the *L.A. Times* and the *Orange County Register*. I knew this, but I didn’t get it, but I knew it was true of Colorado, the word in academia is never take a leadership job if you can avoid it at one of the public universities in Colorado, because the newspapers are always warring with each other, and the easiest target is the university system. And you don’t want to be caught in that. Well, that was one of the aspects of going to UCI that I had not appreciated. I figured that the *L.A. Times* would pay all of its attention up to UCLA and I wouldn’t have to worry about it because UCLA’s got enough stuff going on to take care of four or five papers.

But they were trying to building their readership in Orange County, because Orange County is affluent, growing, a lot of stuff was going on there, and they were in this big competition with the *Orange County Register*. So that was kind of interesting, so I was in the honeymoon.

Well, that was in '93. The country had been in recession. Everything came out of it except California, and California's budget was a disaster. The economy was a disaster, and that continued on into the mid-nineties. So the first thing I got to do was preside over budget cuts, which was the first time my campus had ever had budget cuts in its entire existence, because it was a growth campus serving a growth population. Well, you can imagine the faculty were not thrilled by this. This was a bad scene.

I started a planning process, and I had a listening process. I went around to all the colleges, met with the faculties, met the deans, the usual stuff, had ice cream with the students, because I knew that UCI had kind of an inferiority complex, which is not unusual for a newer campus in the U.C. system, but [Irvine] they [were] always being unfavorably compared to UCSD, which got started around the same time that UCI got started—it's like building a campus out here [in the middle of the Arizona desert]. There was nothing there, really. There were some towns around, San Juan Capistrano, Newport Beach, the playground of the rich, but that was not exactly university environment.

San Diego was built on the basis of Scripps Institution of Oceanography, and then you had these other kind of quasi-scientific and medical things going on in the vicinity, and they had the navy [research] in San Diego, and that combined with oceanography, that was a big [deal]—they built on something substantial. They did not walk in and start building out on a cow

pasture, which is what happened at UCI. I mean, I knew this, but the faculty always felt that they were just unfairly compared with the other [campus], and they had this inferiority complex.

It also was a very wired campus. Anybody could send in comments via e-mail. We compiled them all, appointed a faculty committee to run the whole show, and so on and so forth. So then we compiled it, and I ran it around past a variety of people, and we came out with a mission statement or a vision statement or “Here’s what we’ll do” thing. So we got that done pretty fast.

So I had kind of set it up pretty well, and I knew some things that I could do that would help. But having budget cuts, it was a problem. So that was a problem. Then the other thing that happened there was that about not quite a year after I got there, the university attorney said to me, my campus attorney said to me, “Laurel, I’ve got to talk to you. We’ve got some problems in the medical school.” Then that’s when this big fertility clinic thing first came to my attention. So I said, “Well, Diane, what shall we do?”

Diane’s wonderful. She’s a Stanford law [grad], African-American woman, very savvy woman. These were allegations from former employees and so on. She said, “I think we’d better investigate.”

So we launched some investigations, and our internal investigations found that these guys [fertility doctors] were violating every law, ethical consideration, everything in the book. I never thought I would find really criminal activity going on in a university with university faculty, but there was.

In the meantime, the people who were the whistle-blowers, who had raised the issue and our own internal [auditors]—we had our own internal audit program and they started their own investigation, felt that things were dragging on, and they started going to the newspaper. So the

newspapers got hold of it, so then it was just a competition between the *L.A. Times* and the *Orange County Register*, which ended up getting a Pulitzer Prize out of their coverage, which we basically provided to them.

But in any case, so now you had the faculty that not only had no money or was having budget cuts and the U.C. system withheld salary increases for X amount of time. They offered early retirement, getting rid of people. I mean, it was really horrible. Okay.

Then on top of this came a regent by the name of Ward Connerly, who proposed ending affirmative action in the U.C. system. This was another major big deal, national press thing. That was kind of interesting, too, because the chancellors [attend] the Regents' meetings, which are systemwide, they meet once a month but not every month, but they meet maybe eight times a year, nine times a year. So when they meet, they sit around a big table. There are a lot of them, twenty-four, something like that, or twenty-eight, I don't know, some huge number of Regents. Then the chancellors at that time nine, now ten, sit in the front row right behind, right next to the table, and then there's the audience and everything is police control and everything else. Certain people can sit above the line and below the line, and I don't know. I mean, it's so [bureaucratic]—the world headquarters of the University of California is what I used to call it. It was an incredible bureaucracy system to be in.

So we chancellors got to sit on the front line during all of this debate, and then when they were about to take the vote, then we had Jesse Jackson show up to testify. I mean, it was history in the making. Then the whole place erupted in a riot. Some of us stayed to see what would happen in there. Others had figured out that the Regents were going to reconvene and vote in another secret room, which is what happened. So, all of that.

Well, this then precipitated on my campus the longest hunger strike that there has ever been on a U.C. campus—two weeks, right outside my office. So we had that.

But right towards the end of my time there, the budget started coming back. The students' hunger strike ended. They were arrested, which is what they wanted, and released immediately. The fertility docs, [two] fled the country. One was arrested in the country. So all of those things and two of our faculty won Nobel Prizes. I advocated with all the people I knew, because I knew a lot of the people who were voting, that we be admitted to the AAU, which is this kind of club of the sixty best universities in the U.S. and Canada. We were admitted to that.

Then we had totally redone our fundraising approach. We started raising significant amounts of money. We signed an agreement with the neighboring—the big developer of Orange County and the person who had given most of the land for our campus, to develop a research park on the adjacent property and to let them develop it, since they are experts in doing it and universities always screw it up. So now it's got, I don't know, a dozen buildings on it, probably.

So all of that finally came out of all those bad things, and good things started happening. I said, "You know what? I think I've done enough of this university administration stuff. I think it's time to have a new career. I'm outta here." So I resigned and left in '98.

BUTLER: As you said, you certainly had a very memorable time there.

WILKENING: I had a very memorable—it was so memorable. [Laughter]

BUTLER: Even though you had big challenges for a while, as you said, there was a lot of positive that did come out.

WILKENING: Oh, yes. We did a lot of things that I liked there. So, you know, it wasn't all bad. But if you read the newspapers, you would think it was all bad.

BUTLER: Well, you decided it was time for a new career.

WILKENING: Yes.

BUTLER: What was the first opportunity you moved on to then? Was that when you came here?

WILKENING: Yes. What I really wanted to do was, I was at a point where I said, "Well, I don't want to boss anybody and I don't want to be bossed. I mean, I don't have to have a boss, and I don't want to be a boss." So I didn't really want to do anything except what I call good works.

We had just finished building this house, and so there was stuff to do. My parents are elderly. I had neglected them. I neglected my husband. I mean, when I was at Irvine, he didn't really like living in Orange County. He spent six months out of the year here [in Arizona]. My parents were getting quite—my father was not in good health. I said, "I have put myself first or my career first for a long time. I need to try to get more of a balance in life and I need to redress the balance."

My parents are in New Mexico, and it's about a six-hour drive over there, so I could drive over there, so I did that a lot. My husband and I did some traveling together that we had never been able to do because we could never be gone more than a week.

Then I started doing some volunteer work here locally, and I was still on several boards that I had been on, and they said, “Well, Laurel, now you’re retired, you can do more work.” [Laughter] So I got more involved in some of those, although I did resign from The Planetary Society [TPS] last year, from the board, because in some ways it was [time]—we had recruited a bunch of new members to the board, and I really felt it was pretty much time for the old guard to go. Although I wasn’t as old guard as Bruce Murray, who had been there since the beginning, and, of course, after Carl died, we needed to make sure that the society would live, because basically it was Carl Sagan’s invention. He and Bruce and Lou [Louis] Friedman had basically run the thing out of their pocket, and Tom Paine had been on their board. See, I kind of took Tom Paine’s place. That was kind of how that happened. But that was before Carl died. So I was on the board for, I don’t know, a couple of years probably before Carl got sick.

So after Carl passed away, it was important that we maintain continuity, that we expand the board, which we did. We had really good people. We had really good discussions, but I also thought “We’ve got to get the past out of there so that this group can forge new directions.” Lou Friedman had a lot of good ideas about what to do. So I had said I wanted to step down as vice-president.

Well, time, I think it was over a year passed and nothing had happened, and I said, “Okay, I’m leaving. You guys have to get serious about this.” So they appointed Wes [Wesley T. Huntress, Jr.] as vice-president, and now he’s moved up to president. Bruce had said that he was going to step aside or step up as chairman, as they say, but that he also wanted to spend more time on some of his family and other things.

So I think their having made it through the transition, I think the society [TPS] is quite healthy. And one of things that we also agreed on, new and old members of the board, was that

we would not take government money and that we would start doing partnerships with private sector. I think that was a really good decision. I think it will work out very—I mean, it's already working out in interesting ways. So I felt very good about that, and I thought it was time to leave, and I needed to decrease my obligations, because I was starting to get involved in things here.

I said I'm working on a couple of projects with the University of Arizona, so they recruited me for a fundraising project and for an equity study of their faculty, broadly speaking, not just women, but kind of was motivated by women.

Unfortunately, one of the things I like most was volunteering for one of the local Nature Conservancy preserves, but that is easier not to do that than it is to do some of these other things once you get expected to do stuff.

So now I'm in this phase again of trying to think about what I want to do, because I really wanted to do some writing, and I like to write, but now I don't even have time to do—my husband says, "Well, this is getting to be like a job, only it's several jobs."

I said, "Yeah. One of the things I always said was being a volunteer, you can just walk out." So I don't know, I think I'm going to have to walk out because now I've adjusted sufficiently. Things are more or less in order. I need to get my volunteer work in order. So that's where I am today.

BUTLER: Well, you're—certainly seems like everything seems to be going well, even if it's still a little too much, maybe. But your work with the vineyard obviously is something that's very important as well.

WILKENING: Well, it's my husband's vineyard. He's done a lot of interesting things in his life. This one he has stuck with a lot longer than I ever expected, through a lot of adversity. Being a farmer is a hard job.

BUTLER: Oh yes.

WILKENING: I mean, when I met him, in addition to having the only chemistry lab, he was building an airplane from a kit. So he had as a major external hobby airplane-related things for quite a while. I sold the kit. He called me up. He was on a senior fellowship over at JPL, and he sends me a tape, because we were sending tapes back and forth occasionally. He sends me this tape, which is this love letter about an airplane that he saw out at Bakersfield at this kind of famous airport where the Gossamer Condor—where a lot of experimental airplane stuff happened. The Gossamer Condor was built there. That was the human-powered—

BUTLER: Uh-huh.

WILKENING: You know about all that. Okay. Plane that went around the world, I guess, and won the prize for human-powered flight. But that's now over. We didn't get any Gossamer Condors. He found a Luscomb, which is an old post World War II [plane], this is going to be the airplane in everybody's garage, so to speak. He had learned to fly a Luscomb. You know, this tape just went on. I still have it. He says, "Well, do you think we can afford to buy this airplane?" I'm an assistant professor. He's on a fellowship over at JPL.

I said, "Well, can I sell your kit, your BD-5 kit?"

He said, "Yeah."

I thought this would be impossible, but Tucson is a big aviation town, so with the Davis-Monthan Air Force Base [Arizona], a lot of retired air force people. It's perfect flying weather. So, put an ad in the newspaper, get this phone call, these guys come, they take all this aluminum that is all over the backyard. They take everything and they haul it off, and they give us money for it.

So then I went to the bank and I said, "Can I have a loan for a recreational vehicle?"

They said, "How much do you want?"

So I told them. In today's terms it was modest, \$10,000.

They said, "Yeah, we think we can do that."

I was shocked. I didn't expect that that would work on the first try. So Godfrey bought his Luscomb, and he used to fly it. For the rest of that year, he'd fly it back and forth about once a month, taking our previous dachshund with him. Then we had a lot of fun flying around in Arizona after he came back and was working here. So that was one phase, the aviation phase.

Then he'd been in the high school teaching friar phase, and then he finished his degree, and he was doing the research planetary astronomy phase. Then we got into this vineyard thing, and it just keeps going on.

BUTLER: Well, that's good. It sounds like he's successful in each of these phases.

WILKENING: Yes.

BUTLER: So that's good.

WILKENING: Yes. Yes. He's a really nice person. I don't know where he is. Maybe he's sitting outside on the back porch. I'll have to go recruit him, because we should eat lunch.

BUTLER: Sure.

WILKENING: Do you want to stop and let me go find—

BUTLER: Sure.

WILKENING: How are we doing?

BUTLER: We're good.

WILKENING: Okay.

BUTLER: Okay. Well, you've mentioned some of the activities that you've gotten involved with since retiring from at least the academic world, but I did want to talk a little bit about The Planetary Society and how you became involved with that and then what some of the major projects were that you worked on while you were there.

WILKENING: I think I mentioned that Tom Paine had been on the board of The Planetary Society, and when he stepped down, he probably recommended that I replace him, and so in any

case, that's about the time I joined the board. During those years, those first couple of years while Carl was still alive and we were kind of in the status quo, I mean, we were doing things that people expected. We supported and advocated for SETI [Search for Extra-terrestrial Intelligence] and funded some other projects that were pretty much out of the "Carl portfolio."

Then about the time that Carl got sick, it was clear that there were some opportunities on the NASA missions, kind of the golden era, the smaller, faster, cheaper missions, but there were some opportunities to piggyback something that was either privately funded or fundraise for. One of those things that did come to fruition, except that the mission failed, was the Mars microphone, which was supposed to be on the Mars Lander, which failed.

But that whole process, Lou Friedman realized that [potential] and I think he's really the one that got it first, although I think that Carl saw some potential for this, to keep the public involvement. Because you have this organization that has, well, we usually say a million, but it's like 900,000, plus or minus, members worldwide, and we have the magazine, which is a nice magazine, and there are some things through the magazine that you can do. But you're always wondering, well, what can our members do. There was a lot of interest in reaching out to young people and giving young people an opportunity to get involved somehow.

One of our early private partners was [The] Lego [Group]. Lego was very interested in [the space program]. They've moved to more scientific information, high-tech kinds of things. I guess they liked the connection with The Planetary Society as a way of promoting some of their stuff, and we liked the idea because Lego was Lego. So there were some ongoing collaborations with them around children and things to do that would aim at the children's audience.

We were also doing those Planetfests, the festivals, usually in southern California. That's near the home base, and there's a big base to draw on. So it was a variety of different kinds of

things, but the Mars microphone made it clearer that we could actually fly hardware, I guess is what I'm trying to get around to, and that that has a special appeal for the members.

So after Carl's death, his widow was one of the new members of the board, Annie Druyan. She's a very remarkable and creative woman, and so she decided herself after Carl passed away that she would go in an area in which she has considerable experiences, writing, and she has done a little bit of producing. So she's created essentially her own production kind of activity, and that made it clear that there would be some opportunities or some connections that we could make through her not only to get hardware launched or specific little projects done, but that we could connect with a broader audience.

So the current example of that is this solar sail demonstration flight, the first of which the first—what was it, the test flight failed, but it is being photographed by A&E [Television Network] so that they are going to be able to do [a program], and actually it was kind of good to have the failure, I think, because if everything goes perfectly, it just seems too easy.

BUTLER: That's true. [Laughter]

WILKENING: That's not like the real world.

BUTLER: That's very true.

WILKENING: So that was one of the things. Lou Friedman, I first met Lou Friedman when he was an engineer at JPL when we were doing cometary rendezvous planning, and he was the engineer advocate, the lead engineer on the solar sailing as one of the alternative propulsion

techniques that they were looking at. So he's been in love with solar sailing ever since I've known him, and this was a collaboration with the Russians to launch the vehicle in an ICBM [intercontinental ballistic missile] from a submarine or—I mean, the whole thing is kind of astounding.

BUTLER: It is.

WILKENING: So that is, I guess, kind of the best example that encompasses all of the things that we've done, but I was at the Planetfest. Was that—I can't believe it's two years ago. Was it two years ago that the Mars [Polar] Lander failed? Anyway, we were having a Planetfest in Pasadena at the time, and I think I'd only been to one once before, but I hadn't been to one in the current era, and it was just impressive. All the private sponsorship, private involvement, the large number of people, it was really good. Even though the Mars Lander was kind of supposed to be the main draw, the whole world went on without—and Planetfest kind of hardly missed a beat, which was kind of interesting that there's enough momentum and there's enough interest in maybe what may not be so good, but the kind of—what shall I say—the television view, the movie world view, those kinds of—it's almost like science fiction, space fiction.

But it's kind of close to fact, and some of it is fact. But I think it has the potential for bringing in young people, which is what we decided was one of our goals, which is to make sure that now that they can't see the sky, at least they know that space is there and get them involved in other ways, in ways that are kind of more compatible with the world they live in, and to do that through the media is one way to do it.

I mean, there were other interesting things like the screen saver that processes the Search for Extraterrestrial Intelligence data. There's a lot of creative things, and I have to give Lou a lot of credit for having an open mind and being willing to try to figure out how to make these things work. I really enjoyed working with him. It was very good.

So it was a good team, I think, but I think the transition is great. Neil [de Grasse] Tyson is a fabulous guy. He's the new vice-president, and he's the director of the Hayden Planetarium in New York that just built this fabulous new theater. Have you been there, by any chance?

BUTLER: Unfortunately, no, and I can't wait to go.

WILKENING: It is wonderful, and Neil is absolutely astounding. I am so glad that we talked him into joining our board at a time when he wasn't quite the celebrity that he has become. I mean, he was a celebrity, and he's much sought after. He really got into The Planetary Society. I remember when we had lunch. I think Bruce and I—I can't remember if Lou was there. I think there were two or three of us and Neil, and Neil says well, I'm not sure—something like this. This isn't a quote, not as much of a quote as some of the things I've said. "Why would I want to be on this when I don't agree with your goals on manned exploration of space?"

Lou says, well—I think it was Lou or maybe it was Bruce says, "Well, we think that debate is worth having within The Planetary Society."

So I think Neil understood that we didn't have a single view. We used to have more of a single view when Carl was the guiding light, and we pretty much were focused around Carl. But Carl had this very expansive philosophy. So instead of having one Carl Sagan, now we have a lot of people that are very creative, and I think having Neil there is really wonderful.

BUTLER: That's good.

WILKENING: So it's a good, good group of folks.

BUTLER: Absolutely. Certainly a lot of interesting projects, as you said, have come out of it.

WILKENING: Yes. I know. It's kind of amazing to me. I think they will just continue and become even more interesting. That was one of the things I felt happiest about at the Society, moving in that direction.

BUTLER: Okay. Well, I just have a few general questions, more looking back over your career actually—or, no, sorry, I take that back. I do have one other—am I correct that now you're working with Seagate Technology?

WILKENING: Seagate Technology was a public company until exactly a year ago, went private. I was on the public board, and the public board was dispersed, dismissed, and thanked, which is typical. That's normal. So I was with them for about six, seven years, I guess.

BUTLER: What was that focus on for that company?

WILKENING: Seagate's primary product are disk drives for computers. That's what how it got started and that was its primary focus. But in the nineties, early nineties and on through, the then

CEO and founder, Al Shugart, decided that this software revolution was important for a company like Seagate to pay attention to. Since we're always trying to figure out—I mean, if you're selling disk drives, you want people to buy more and more capacity. That's what you're selling, basically. So you have to think of information intensive uses that will require them to buy more hard disk drive space.

So Al's point was, well, there's a lot of data storage. There's a whole lot you can do with data, so we just need to align ourselves with some companies possibly that are leaning in that direction that will essentially not directly bring us business, but indirectly bring us business. Some of them were more closely [related] technologies that were close to what we were interested in, so there was software, and then there was allied technologies. Basically what we did was we invested in them, like we would own part of them or we'd help them prior to their what they call an IPO, their first offering of stock.

One of those companies that we became—well, then we did a deal with one of the companies because we had purchased and helped get going a certain number of software companies, and the ones that were closest to data storage or data mining or that kind of stuff, we decided we should try to own outright, and so we bought some of these companies.

We had put a person in charge of making them into Seagate companies, essentially making them part of our corporate culture, putting together two or three of these small companies that were doing similar things, may have been rivals, and getting them to do a product. That was successful beyond our wildest dreams. One of these companies is called Veritas Software, and what happened was we had developed software that was good for data storage that addressed the kind of the PC, the Mac, the Gates world, what am I trying to say?

BUTLER: Microsoft?

WILKENING: Yes, the Microsoft, the PC. Really the PC world. Veritas had been really working on the high end, the big servers, Sun and IBM and the big [machines]. So they had covered a certain part of the field with their data storage and recovery techniques, and we had the desktop kind.

So we had developed this desktop stuff, and it was kind of neat, and Veritas said, “We’d like to buy that because then we’ll own the whole world. I mean, we’ll have all the platforms.” So it was a buy on a stock swap. Both of them were. We ended up owning a significant amount of that company. Then that company, I mean its stock was one of these glamour stocks of the tech boom. It went from, I don’t know, twenty-five to a hundred and twenty-five or something incredible. So our stake in their company became so large, it was larger than the value of our company. I mean, the whole thing was so weird, and that tech boom was really weird.

So the disk drive business is a cutthroat, very difficult, competitive business. Our leadership team there felt that they could do better if they were a private company. Veritas didn’t really like the idea of another company controlling a huge fraction of their stock, so another transaction was arranged in which Veritas bought out, actually on paper bought all of Seagate. Seagate then was resold, the disk drive part, and some other miscellaneous things, sold to a new set of investors, but private investors. Veritas is still public, and it got its stock back from the transaction.

So that was the end of Seagate, but that’s what Seagate was about. It’s a company with a real interesting background, and it came out of IBM when IBM first started putting hard drives

and on our board was the engineer who worked at IBM who essentially was the inventor of the disk drive.

BUTLER: Oh, interesting.

WILKENING: Yes. I remember that transition so well because it was such a wonderful change. You're too young to know this, but to get your computer going, you had to put in these floppy disk and you had this mystery commands that you had, the various colons and letters and things to get it to read that, and then finally it would come to life. You couldn't just press a button and it would come alive. It was so [arcane]—what a change.

Then you could keep all the information and data on it, and you could keep all these software programs on it, and I remember how it was before. So this was such a revolution. So I enjoyed a lot working with Seagate.

There was another thing I liked about it. We did a lot of our manufacturing, like a lot of companies, offshore. Because a lot of it required—it was labor intensive, and we did a lot of our manufacturing in southeast Asia, and Thailand was our area. Thailand and Singapore were our areas of biggest operations. But one of the interesting things about it was I liked the philosophy of the CEO, which was he says, "We will be environmentally friendly, we will be people friendly, and we will take care of our employees, even though we pay them very low wages." This is true, that's why we're there, but they operated 24/7, as they say nowadays, and most of employees were women.

The alternative—and most of the women came from the rural areas, young women. The other alternative for them was to work in the commercial sex trade for which Bangkok was very well known. So I thought this was a wonderful, wholesome alternative—

BUTLER: Yes.

WILKENING: —for these kind of women. We had an on-site physician. We had twenty-four-hour [services]—they could eat three meals a day because we served four meals a day in the twenty-four-hour clock.

BUTLER: Good.

WILKENING: All of those kinds of things. I thought, I understand a lot of the concern about not paying your workers in foreign countries what looks like less than anybody could possibly live on in the United States. Well, the United States is the worldwide consumer of everything. We live to excess.

But then what you don't realize is that we provided dormitories so they had basically all their basic living plus their health provided. So the money that they earned they could keep or they could send home. Most of them sent it home.

So anyway, that was partly the good side of the corporate America that I saw there, which was nice. Then I saw how wonderful cutthroat competitive corporate America, which is also kind of interesting.

BUTLER: It is that. That's a good word to describe it. Well, you certainly saw several different aspects. You've seen the academic side, the government side, and the corporate side.

WILKENING: Yes.

BUTLER: Looking back over all of these experiences, what would you consider your biggest challenge and then also your most significant accomplishment.

WILKENING: Oh, my gosh. Am I interviewing for a job here?

BUTLER: No, no. No, no. It's just something we like to ask everybody, just kind of a—

WILKENING: Let's see, my most significant challenge. My most significant challenge was probably trying to deal with those fertility doctors at the University of California-Irvine.

Accomplishment. Well, let me see. I don't know. I guess it's hard to say. I mean, what I feel really good about were being an advocate for undergraduate education wherever I went. I enjoyed, I did do some freshman seminar teaching when I was at UCI. I really enjoy young people, and that's what I miss most about not being in the university environment or not being in an educational environment. But I have a lot of hope for these next generations.

So I don't know. I mean, it's not what I would consider a single achievement. In my scientific career I think what I feel pleased by, unlike my husband who he can say, well, he figured out that the clouds of Venus were made out of sulphuric acid, kind of a one-liner that you put in an encyclopedia. I don't have anything like that.

But what I am proud of is that I identified in the lunar dust these fragments of carbonaceous chondrites, which are a type of meteorite. I published a paper about it, and I had found in meteorites. I had found inclusions in one kind of meteorite of these carbonaceous chondrites, and I inferred that this carbonaceous debris was widespread in the solar system.

Everything that's happened since, although most people don't cite what I wrote, which doesn't really bother me at all, is that that idea has been reinforced, reinvented, and verified repeatedly. I still am hoping that some day they'll figure out that a lot of the so-called dark matter in the universe is this carbonaceous kind of stuff. So that's kind of what I think of all of the things I did. I'm a good observer, and that was strictly by basically looking in the microscope at a lot of different stuff and trying to figure out what it was.

BUTLER: Well, you certainly have had a lot of notable accomplishments throughout your career.

WILKENING: I enjoyed it. I'm very lucky. I enjoyed it. I had good support from a lot of different people, starting with my parents.

BUTLER: Well, I've certainly enjoyed you sharing it with me. I appreciate it. Thank you very much. It's been very interesting.

WILKENING: Well, it's been fun. I enjoyed it, too, and I wish you good luck wherever your career takes you.

BUTLER: Thank you.

WILKENING: But planetary geology is a pretty good place.

BUTLER: I think so. I think so. There's a lot of exciting stuff happening out there right now, so it's—

[End of Interview]