Donna Shirley

Former Manager of Mars Exploration at the NASA Jet Propulsion Laboratory

Chapter 1 – Introduction

Announcer: Donna Shirley grew up in Wynnewood, Oklahoma. Her interest in Mars and space exploration began when she read The *Sands of Mars* by Arthur C. Clarke. She took flying lessons at age 15 and soloed at the Pauls Valley Airport the next year, earning a pilot's license at 16.

She enrolled in the University of Oklahoma as an engineering student, even though her advisor told her that "Girls can't be engineers."

Donna worked at the Jet Propulsion Lab from 1966 to 1998 and was the only woman among the 2,000 engineers who had an engineering degree.

Her 35-year career as an aerospace engineer reached a pinnacle in July 1997 when Sojourner–the solar-powered, self-guided, microwave-oven-sized rover–was seen exploring the Martian landscape in Pathfinder's spectacular images from the surface of the red planet. She was the leader of the mostly male team that designed and built Sojourner–the first woman ever to manage a NASA program.

Listen to Donna's oral history interview, as she talks about the thrill of seeing the first Mars images, how she became a trailblazer, and whether there is life on Mars on the podcast and oral history website, VoicesOfOklahoma.com.

Chapter 2 – 6:51
Born to Fly

John Erling (JE): Well, my name is John Erling, and today's date is May 21, 2025. So Donna, would you state your full name, please?

Donna Shirley (DS): Donna Lee Shirley.

JE: Got to ask you about the name Shirley. Like you have two first names...

DS: Three. Yeah, Donna Lee Shirley.

JE: How did Shirley...

DS: It's an old English name. You know, it's there—if you look, when we used to have phone books, if you looked in a phone book, there'd always be, in a city, like half a dozen to ten Shirleys. It's not that uncommon.

JE: And your date of birth?

DS: July 27th, 1941.

JE: And your present age?

DS: 83.

JE: When people know you were involved in the exploration of Mars, what are the maybe one or two questions they'll immediately ask you?

DS: They often ask if we found any life on Mars. That's one of the common ones.

JE: So we'll talk about that later on in our interview—life on Mars. “Are there Martians?” Where were you born?

DS: Paul's Valley, Oklahoma.

JE: Did you grow up there or some other place?

DS: No. We lived there for three or four years after I was born, and then we moved to Seal Beach, California during the war because my dad was in the Navy. Then after my dad got out of the Navy, we moved to San Jose because he was a doctor, and then my grandmother had health problems, so she persuaded us to come back to Wynnewood, Oklahoma. So I grew up in Wynnewood, population 2,500.

JE: Did you have brothers or sisters?

DS: One sister, younger, four years younger.

JE: Your mother's name, maiden name, where born, where she grew up?

DS: Ada Brooks was her name, no middle initial. She was a preacher's kid, and she had five brothers. He was Charles Brooks, Doctor Brooks, and he built churches all over Oklahoma—small towns and things like that. My dad and

mother got married right after the war, World War II. Anyway, she ended up in Wynnewood the rest of her life, and so did he. They both died young.

JE: How old?

DS: He was 52, believe it or not, and she was 64.

JE: What was her personality like?

DS: Well, she had high expectations for me. She was kind of one of the leading ladies in the town of 2,500 people, and she did things like form a Girl Scout troop so my sister and I would be able to be Girl Scouts. She was the Garvin County Red Cross water safety chairman, so she taught swimming and recruited me to teach swimming when I was 10 years old.

JE: Well, she was forming your personality already, wasn't she?

DS: Oh yes, very, very high expectations.

JE: Your father's name?

DS: Edward Thornton Shirley.

JE: And what did he do for a living?

DS: He was a doctor.

JE: What type of doctor?

DS: Medical doctor. Actually, he wanted to specialize in heart disease, but in Wynnewood he was one of only two doctors, so he was a general practitioner.

JE: Did he have high expectations for you as well?

DS: Yeah, not quite as much as my mother did. No, he was always very supportive. For instance, he paid for me to have flying lessons when I was 15, as it says in the book.

JE: Right, and we can say about your book Managing Martians—was published a number of years ago, and I have it right here on the table. I'm going to refer to that.

DS: Okay.

JE: How old were you when flying or space was fascinating to you?

DS: Well, it was flying because there was no space when I was a kid. Sputnik didn't go until 1957.

JE: But weren't you interested in flying planes at a very young age -- six, seven years old?

DS: Oh yeah, all I could remember—I wanted to fly airplanes. You said space, and I was very interested in science fiction, so I read a lot of science fiction, but I was always interested in doing something with airplanes.

JE: And what was the name of the science fiction book that inspired you?

DS: One of them was Arthur C. Clarke's books... Sands of Mars

JE: Sands of Mars. And that was fascinating to you.

DS: Oh yeah. In fact, I still have about 100 science fiction paperbacks.

JE: Oh really?

DS: Maybe 200. One room is full of books.

JE: It's interesting how we're born with this chip in our brain, I'm gonna call it. You were not influenced about flying at all by your parents. They had high expectations for you, but you were born with this.

DS: Oh yeah, I was always gung-ho for airplanes.

JE: And then even at 10 years old, you wanted to build airplanes or be an aeronautical engineer?

DS: Right. I was the only girl to take mechanical drawing, for instance, instead of home ec.

JE: Would you be considered a tomboy about that time?

DS: Of course. Big time. (Chuckling)

JE: (Chuckling) But somehow you had a dream of exploring Mars. Why Mars and not the moon?

DS: Well, the moon's very dull. I mean, there's no atmosphere. And of course, science fiction Mars is different than the real Mars. In fact, have you seen the movie The Martian?

JE: No, I haven't.

DS: Well, it's a pretty good movie. It's got a few flaws, like the atmosphere is too thick. In fact, right after I read the book—it's based on a book—I called the author and said, "You've made a mistake. The atmosphere would be too thin to blow your spacecraft over." And he says, "I know. I know that, but it makes it more interesting."

JE: (Chuckling) Right.

Chapter 3 – 8:50
Miss Wynnewood

John Erling (JE): So let's start with your education. The first school you attended.

Donna Shirley (DS): Well, when I was, I guess, kindergarten age, my mother and my sister and I lived in Seal Beach, California while my dad was in the Navy. There was a private kindergarten in Long Beach, I think, California, and so I went there for a year, and it was an excellent school. By the time I got out, I was way advanced over normal public schools. Then we moved to San Jose and had a very bad experience there because the second grade teacher didn't like smart kids.

JE: (Laughing) Really?

DS: Yeah, really. No kidding.

JE: And probably because you pushed her, probably?

DS: There was a little boy who was an excellent artist even though he was seven years old, and she didn't like him either. She just didn't like smart kids.

JE: I hear you. OK, so then you went on to other...

DS: Well, then we moved back to Wynnewood when I was in second grade. Public school was not the best in the world—town of 2,500 people—but I ended up graduating from Wynnewood High School, and I was valedictorian of a class of 49 kids.

JE: Did you find the work pretty easy then for you, didn't you?

DS: Right. And then I went to college and didn't have such a good time.

JE: What year did you graduate from high school?

DS: '58.

JE: So then in high school, the subjects you took?

DS: Well, I majored in engineering—aeronautical engineering—because there was no aerospace in those days. Sputnik went up in '57, so there was no aerospace until '58, '59, something like that.

JE: Math had to come easy for you from an early age?

DS: Not particularly, no.

JE: Really?

DS: In fact, I only made two B's in high school, and one of them was in Algebra II, and the other one was in typing. (Laughing) I was never a wonderful typist.

JE: (Laughing) Well, some people, if they found math challenging, they say, "OK, well then I'm not going to go into that field," but that didn't dissuade you at all.

DS: No, I was interested. I wanted to build airplanes. That's what I wanted to do originally, and then later on I ended up at JPL and got in the space biz.

JE: Let's talk about your flying lessons at age 15. Was that a nervous time, or you felt confident about yourself, or how was that at that age?

DS: Oh, it was very exciting. It was incredibly exciting to fly airplanes. I learned to fly in Paul's Valley. It had a little airport with a—actually with a long runway. I don't know why it had a long runway. I think it was training for World War II pilots or something.

JE: When you soloed, that was a big deal for you?

DS: Oh yeah. Well, it's a big deal for anyone who is into flying.

JE: That's a pretty young age to be soloing, but maybe there are a lot of kids that age that do that?

DS: Oh yeah. Sixteen—you have to be 16. There weren't all that many young kids who were flying because it was expensive. Most people couldn't afford it. But my father was a doctor, and he was relatively wealthy and could afford for me to fly.

JE: And the fact that he was so supportive of that was key to you, that's for sure. But he also knew that you apparently had this strong interest in this, so...

DS: Oh yeah.

JE: Better support it. I know you said you were a tomboy, but you carried the title of Miss Wynnewood.

DS: Yeah, my mother wanted me to do that. I was not very enthusiastic about it, but you have to understand, in a town of 2,500 people, there's not too many high school-age girls who can be Miss Wynnewood. I don't know if I mentioned it in the book, but I ended up in the Miss Oklahoma contest, and I think I came in last.

JE: What was your talent? Did they have a talent then, that they would feature?

DS: Oh yeah. My talent was I wrote a poem about flying and read it. All the other girls were from much bigger towns and they sang and danced and ...

JE: ... played instruments...

DS: ... and things like that. My sister was actually in a Miss Wynnewood four years after me. She also didn't win, but she did a lot better than I did, and her talent was playing the French horn and dancing.

JE: OK. All right. And what's her name?

DS: Margot.

JE: OK,

DS: Margot Lynn. Yeah, she passed away a few years ago.

JE: OK. But you studied flying—you got your license in single engine, land and sea?

DS: Single engine land and sea, multi-engine land, and flight instructor.

JE: How old were you when you became a flight instructor?

DS: Must have been 20 because I was in school. I flew all the time I was in college in OU.

JE: Back then, did you have a mentor that you looked up to?

DS: Yes, I had a sorority sister whose name was Gen Nora Stumbaugh. She was a pilot and really a professional pilot—ended up being a pilot all her life. She was my hero. She was the one who persuaded the Gamma Phi Betas to pledge me because I was a pilot and she was a pilot. You know, “We got a precious girl—she's a pilot!”

JE: Exactly Right out of high school you went to OU.

DS: Yeah.

JE: What subjects were you taking then at OU immediately?

DS: Well, physics and chemistry and English and all the normal things that freshmen take. It turned out I was much better at things like English and literature and stuff like that -- history -- than I was at the engineering classes. You have to take that stuff to get through school.

JE: Isn’t that interesting? That was a struggle for you.

DS: Yeah, I was very good at history and English and Shakespeare and Chaucer.

JE: Because somebody else might have just given up the physics and so forth and gone into liberal arts.

DS: Well, as a matter of fact, I did.

JE: Really?

DS: I didn’t flunk out of engineering, but when I was a junior, I got engaged. My fiancé was also an engineering student, but he wanted to be a doctor.

So the idea was that I would change majors and just graduate however I could, and I ended up in journalism. He changed majors to get into chemistry. Then it turned out we broke up, so that didn't work out.

JE: And how did that change your...

DS: Well, I ended up graduating in journalism. I didn't graduate in engineering until after I graduated. I went to St. Louis to work for McDonnell Aircraft as a specification writer, which I was very good at. After I was there for a year or so in St. Louis, I decided I really didn't want to do that, and so I went back to OU and finished the aerospace engineering degree.

JE: And was that a struggle for you?

DS: Not then. I was much more mature and I wasn't madly in love with anybody.

JE: Can get in the way. That's right. Did you ever marry?

DS: Yes, but not till much later.

JE: OK.

DS: I married a guy from JPL.

JE: But you graduated from OU, I guess, about 1965?

DS: Well, no. I graduated twice. I graduated in, I guess, '62 in journalism, and then worked as a specification writer for two or three years, and then went back, finished the aerospace engineering degree, and graduated in '65 with that degree.

Chapter 4 – 5:07
How to Land on Mars

John Erling (JE): And then you went to Southern California?

Donna Shirley (DS): Right. The Jet Propulsion Laboratory advertised for an aerodynamicist, which was my specialty. So I went back, and I don't remember —it's in the book—but there was an airline strike when I was

supposed to go back and have an interview. So they sent me a telegram and said, “Don’t come because there’s an airline strike, and we can’t guarantee you can get on a plane.” So I just went down, got on a plane, flew to California, and checked into the hotel they had already reserved for me. I said, “I’m here. Do you want to interview me?” A guy named Joe Spiegel, who was my group supervisor, was kind of nonplussed, but it turns out that his boss was so interested in me—because I had the nerve to fly during this strike—that he made Joe Spiegel hire me.

JE: Yeah, she says, “She has nerve.”

DS: Right.

JE: What did you say you were? Aero...

DS: Aerodynamicist.

JE: What is an aerodynamicist?

DS: That’s people who study how things fly through the air.

JE: And there’s a long study on that?

DS: Well, yeah. If you’re going to fly airplanes, you have to understand how wings are designed and how airplanes work. There are people who study structures, people who study engines, and then there are people who study how you can take off and land. At JPL, my first job was how to land on Mars. One of the NASA centers—it’s called Langley Research Center—had a wind tunnel, and we built models of different shapes—pointy shapes, flat shapes, or whatever—and saw which ones would be stable and have enough drag going through the atmosphere to slow down so you could land. At the time, nobody knew what the atmosphere of Mars was like. So we tried all these different shapes and came to the conclusion of one of them that turned out to be the one that’s always used now on Mars.

JE: Yeah?

DS: It’s a blunt sphere-cone, which means it’s kind of cup-shaped, like a Chinese coolie hat. It has to be stable or it’ll turn over and crash. So we did a lot of studies of those, took pictures, and analyzed the pictures to see -- frame by frame -- to see what the shape, the little models, were doing.

JE: And that's still being used today?

DS: The particular shape that we came up with is the one that's pretty much used today.

JE: Wow. Nice to have been in the beginning of all that, isn't it? So you worked at JPL—Jet Propulsion Lab—from '66 to '98. Thirty-two years?

DS: Yup. Thirty-three, actually.

JE: All right. I think when you joined JPL, weren't you the only woman among about 2,000 engineers?

DS: Yeah, the only female engineer. Yes. There were other women—lots of secretaries—and then there was a group of women... Have you seen that movie Hidden Figures?

JE: Yes.

DS: We had a group like that. Only they weren't Black—they were all different colors.

JE: That was a great movie.

DS: The group leader of that group was Asian, but everybody else was white. But they were mathematicians and things like that. They weren't engineers.

JE: I should have continued on with that—you were the only woman who had an engineering degree out of those 2,000. That's what set you apart. And tell us about those early days. Were there challenges because you were a woman? Even though you were hired, were the other engineers civil to you?

DS: Well, yes and no. Some of them were, and some of them weren't. I was kind of a pushy broad. I didn't take a lot of guff from anybody. (Chuckling)

JE: (Laughing) You seem like a sweet lady here.

DS: No, I'm not. I can be civil, but I'm not necessarily sweet.

JE: That's good. I like that. I like that.

Chapter 5 – 4:06
First Mars Images

Donna Shirley (DS): My first space project was Venus-Mercury Mariner 10 in 1973. And my contribution to that was to pick the launch date. So what I did was interview all—there were seven different science instruments—and I interviewed all the science people, interviewed them and interviewed them, and had a process worked out to decide which date would be the best to launch. And I came up with November 3rd, 1973. The project manager picked that, so that was my first contribution.

John Erling (JE): And what was that mission again? Mariner 10?

DS: Mariner Venus-Mercury.

JE: And what did they accomplish?

DS: They flew by Venus, took pictures of Venus and saw that you couldn't see anything because it's completely shrouded with clouds. And then it went by Mercury three times, taking pictures of Mercury and doing a lot of other science things—like there's no atmosphere on Mercury, but what the mass of Mercury was, and what it was like—because nobody had ever seen Mercury before. Only two missions had ever been to Venus.

JE: You continued your association with Mars research that led to July 4th, 1997.

DS: That's right.

JE: Tell us about that.

DS: That was Pathfinder. Pathfinder was a demonstration project to demonstrate that you could land on Mars cheaply—for not too much money, relatively. Well, there's a lot of stuff in the book about how I didn't... I was in charge of the little rover, which was about this big—

JE: About the size of a microwave oven?

DS: Right. So I had a team that built the rover, and the rover was being carried by the lander. The lander was being managed by a guy I didn't get along with at all, and so a large part of the book is the battles that he and I had.

But we ended up—Pathfinder was successful, and the rover was successful. And now there have been several more rovers, only much, much bigger, and there are currently two functioning up there: Curiosity and Perseverance.

JE: They're functioning currently?

DS: That's right, and they're nuclear powered.

JE: Let's bring you back though to these moments that are so special—when the rover Sojourner landed on Mars and you were waiting for the signal. Was there a big hype? Were you nervous? You wondering...

DS: Well, of course.

JE: Tell us about that.

DS: I was talking to CNN when the actual landing happened.

JE: So that was on the landing.

DS: That was the landing.

JE: But then you have to wait for the signal to come through.

DS: Yeah, but that's 20 minutes.

JE: But you weren't sure it was going to come.

DS: Oh yeah. Yes, it was very stressful.

JE: What was the first image that you saw that you remember?

DS: The main pictures were taken by the lander, and they were spectacular. I mean, you know, there were rocks, and the geologists were going, "Rocks! Look at those rocks!" They were so excited. And then there were two little mountains in the background that you could see, which ended up being called the Twin Peaks. And it was very, very exciting.

JE: Oh, yelling and screaming and...

DS: Oh yeah, jumping up and down and hugging and...

JE: Oh, my.... Yeah, you got in on that. Just a wonderful experience.

DS: Oh yeah, absolutely one of the highlights of my life.

JE: I'm sure it was.

Chapter 6 – 9:43
Rovers

John Erling (JE): The rover Sojourner—you'd have no problem with it jumping up and down and gravity not holding it down?

Donna Shirley (DS): Right. No, the gravity was fine. The trick was to get it to land without smashing, and that was up to the lander. So the rover was a passenger on the lander.

JE: The lander then—what, opens the door? And the Sojourner goes up...?

DS: Yeah. It actually opened in petals, like a flower, and the rover was sitting on one of the petals.

JE: And then were you able to see Sojourner come out?

DS: Oh yeah.

JE: Oh man, I get the chills just thinking about it.

DS: Oh yeah. It was the best.

JE: So then what did you learn? What analysis—I suppose the rock and soil analysis—from that?

DS: The reason the rover got a ride—because the project was Pathfinder, and that was paid for by the science part of NASA—and the rover was paid for by the technology part of NASA. So we were hitching a ride, and in order to get the ride we had to do some science

JE: Of course.

DS: So the science was—we carried an instrument called an alpha proton X-ray spectrometer. It would come out—it was stored in the rover—and then it would be put down on the soil and do an analysis of the chemistry of the soil. Then it would come back, and then we'd put it on a rock. So it had

three functions: rock, soil, and lander. It had to take a measurement of a rock, a measurement of the soil, and a picture of the lander. We could do that in a week, and it worked like a charm.

JE: Did they bring back any soil?

DS: No, it's not a return. We've never had a sample return.

JE: OK.

DS: We're getting ready for a sample return, but that is a big deal. That's very, very difficult.

JE: So did Sojourner just die on Mars?

DS: Yeah. Well, we don't know, but she's certainly not sending back any information.

JE: But she could be sitting there?

DS: Oh yeah, I'm sure she is. In fact, all of the landers—like the two Vikings, for instance—are just sitting there. But they don't move, so that's why everybody wanted a rover. Here's these landers—big, expensive landers—and they took pictures, but they couldn't touch anything.

JE: Right.

DS: So that's why they wanted a rover.

JE: So it paved the way for future rovers like Spirit, Opportunity, Curiosity, Perseverance.

DS: Right.

JE: Those were the other rovers. These are kind of like people to you after a while, aren't they?

DS: Oh yeah.

JE: And you referred to it as "her." Are they always female?

DS: Well, I decreed—I mean, I was the rover manager—so I decreed that rovers are female.

JE: Because…

DS: Just because.

JE: That experience boosted the public's interest in Mars exploration.

DS: Yeah. Yeah, we had... It broke the internet. In fact—well, it didn't break the internet—but it was responsible for... The internet was just starting at that time, and it just took off. You know, gazillions and gazillions of hits and people taking pictures. They came up with a toy—I should have brought it with me—a little toy rover. Hot Wheels, done by Mattel. And they were the most popular toy in the country.

JE: I imagine. Right. But that public interest also had to encourage more funding for exploration.

DS: Yeah. And Pathfinder being successful led to... Well, that's a sad part of the story. It led to follow-on missions, which then failed.

JE: Why is it important to continue the exploration of Mars?

DS: A bunch of reasons. One is that people are fascinated by Mars because it's the red planet and it's up there and there's been all this science fiction written about it. People can visualize that we could live on it. Elon Musk, for instance, is absolutely nuts about living on Mars.

JE: Do you think that's possible?

DS: It's very difficult.

JE: Why?

DS: It's way out there.

JE: Yes (Chuckling).

DS: It takes six to nine months to get there. For instance, each one of the current rovers is about a billion dollars, and a human and a sample return is going to be more like $2 billion. They want to do a sample return so they can figure out which part of Mars would be worth going to.

JE: Isn't the likelihood we'd be living on the moon more—sooner—than Mars?

DS: Not necessarily. Mars does have water. It's not easy to get to, but there is frozen carbon dioxide on Mars, and there's also water on the moon. But it's difficult. It's returning—it's not easy. Bringing stuff back is very hard.

JE: Wasn't there a discovery—discussion—that if you could find water, say, on the moon or Mars, that maybe there was some form of life?

DS: There's been lots of that. No, there's never been any speculation that there's life on the moon. I mean, the moon has no air at all.

JE: OK.

DS: Mars—there's been all sorts of speculation. There was a meteorite discovered on Earth that had come from Mars, and they know that because they analyzed stuff with the Viking landers, which were in '76.

JE: How would a meteorite…? Would it have broke off of Mars and…?

DS: Yes. The idea—the belief—is that an asteroid hit Mars, knocked pieces of it off, and they flew around for a while and ended up crossing the orbit of Earth and landing on Earth in Antarctica. I actually have a piece of Mars.

JE: Really?

DS: Yeah, it's about that big (Gesturing). Pieces land in the desert, and then people find them and sell them. So I bought one.

JE: Pieces from Mars are landing in the desert? And why aren't they landing in Tulsa, Oklahoma?

DS: Well, they may be, but it's hard to find them. If it landed right out there, how would you know? It needs to land someplace where it's obvious—like Antarctica, where there's all this white stuff.

JE: Where it would jump out at you.

DS: A black rock. The last one that I remember finding was a black rock sitting on snow.

JE: There have been so many scientific studies from the moon that have actually enhanced our life. Could the same be said about Mars?

DS: There's a bunch of things. Like the space station, for instance, has science going on all the time and technology going on all the time. All the moon missions—and now, of course, the moon missions are being flown by other countries, like India just landed one on the moon.

JE: Somebody said that when you served as mission analyst and later program manager for the Mariner 10 mission, quote, “You left glass all over the floor from that shattered ceiling.”

DS: I know people have said that.

JE: Well, it’s true, isn’t it?

DS: Well, I don’t know.

JE: It is.

DS: No—in fact, I was recently corresponding with the gal who is now the deputy director of JPL, a gal named Leslie Livesay. She said I was the trailblazer.

JE: Yes! Right! Don’t you see yourself as being that?

DS: Yeah, I do.

JE: OK. I’m trying to give you credit here. (Chuckling) But I mean, I suppose you were just looking… I didn’t even think about it at the time. It’s when we get older we can reflect on these things. But at the time it was, “I need to get this job done.”

DS: Oh yeah. But I led a study, later than this, where I had representatives from all the centers. And we came up with recommendations on how NASA could improve its management structure. I gave a presentation to all the top managers of NASA, including the director, and I got yelled at by everybody. Because my team was recommending that we do things like cooperate more, and they didn’t want to cooperate.

JE: (Laughing)

DS: … You know, “I’m going to have my mission, my projects, and do this.”

Chapter 7 – 6:03
Trail Blazer

John Erling (JE): Why continue to explore Mars? What good does that…?

Donna Shirley (DS): The scientific explanation is to try to figure out what happened to Mars, because Mars apparently sometime in the distant past had running water. I mean, we can see the streambeds from space. You can see where there's been water. Where did it go? All of a sudden, there was hardly any atmosphere and hardly any water, and what happened? And could we do that to the Earth? See, that's the big question. So the more we know about what happened to Mars, the more we can hopefully avoid doing the same sort of things to Earth. That's one of the reasons.

JE: So you'd want to study and wonder, “Why did that water disappear?”

DS: Yes. “What happened?”

JE: Right.

DS: Because if you look at a picture of Mars, you can clearly see these big streambeds. So they're collecting samples to find out what's left of where the water was, and where did the water go is one of the big questions.

JE: They've been trying to figure out an answer now for years and years and years.

DS: That’s right.

JE: Do you wish you were younger and were involved at this point, or were you satisfied to have been at the beginning?

DS: Oh, I was satisfied to be in the beginning. I left JPL because it just got to be so politically untenable. We were being asked to do things that were impossible for the amount of money they would give us, and so I quit. I mean, I couldn't stand it. So that's when I ended up doing OU College of Engineering for four years, and then I built the science fiction museum for Paul Allen in Seattle. That took a couple of years. And then I came here, because my daughter lives here.

JE: I don't know if this is a fair question. How did working on Mars missions affect your view of Earth and humanity?

DS: Well, I learned a lot about people and how they interact, and how you can get things done using people. In fact, I wrote a book called Managing Creativity, and for a while I made a living teaching classes on how to manage things and how to manage people.

JE: Oh, really? You wrote a book. How many books have you written?

DS: This one, and that one.

JE: OK.

DS: But there's a friend of ours—of my partner's and mine—who wants to write a book, and he wants me to collaborate with him. I don't even know what the subject is. I've written lots of papers.

JE: And maybe you've commented on this—is there a story or a moment that you feel captures the spirit of your work?

DS: Yeah. I came in at a period of time where I was a trailblazer. Now there are all kinds of young women doing things and older women doing things. Like I said, this woman who's now the deputy director of JPL called me a trailblazer.

JE: Because you were a trailblazer, and now there are many women in the business. And women like you back then—you served as a role model for these women.

DS: That's right.

JE: And that had to make you feel good.

DS: Yup.

JE: If there are any—yes, there are special projects—but we can't forget that one either.

DS: No, I coached a lot of women. When I was assistant dean of engineering at OU, I had women in my classes who are now successful engineers. Yes, it's been diverse.

JE: And a feeling of accomplishment?

DS: But it's also frustration. Like the two '98 missions that failed. I knew they were going to fail. I told them they were going to fail. It made no difference.

JE: And those missions were called...?

DS: The two ‘'98 missions. There was going to be an orbiter and a lander in 1998.

JE: Is that what they called them, “The '98 missions”?

DS: Yeah. They didn't fly enough to have names.

JE: Oh, OK. So those '98 missions failed.

DS: Yup.

JE: And you told them it was going to fail.

DS: Yup.

JE: And why did they fail?

DS: They failed because there was not enough money. They failed because they were understaffed. They were underfunded. The people who were working on them were killing themselves.

JE: But did they try to launch the mission?

DS: Oh, they did launch.

JE: Why would they launch a mission if they weren’t spending enough money on it to make it correct?

DS: Because they would not admit that they weren't spending enough money.

JE: So your advice to them was—but maybe they didn’t have any money. Nor did you when you said that—it was going to fail because they didn’t have a big enough budget, right?

DS: Yeah.

JE: Right. And so the only thing that could fix that was more money.

DS: Right.

JE: And they thought, “Well, we can go ahead and do it anyway.”

DS: That’s right. You got it.

JE: So did you feel vindicated?

DS: No. Are you kidding? It was horrible. I mean, I knew those people that were building and flying the darn things.

JE: And they had poured their life into it.

DS: That's right.

JE: Did anybody come back to you and say, "You were right"?

DS: Not really. There were lots of people who said that was the problem. You know, they have review boards.

JE: After an event like that?

DS: Any failure like that is thoroughly reviewed.

Chapter 8 – 4:15
Life on Mars

John Erling (JE): So the big question is, is there life on Mars? Are there Martians?

Donna Shirley (DS): No. We know that if there's any life on Mars, it's itty-bitty, teeny-weeny life.

JE: It could have been itty bitty—something about a Martian bug?

DS: Well, there are—no. So far, what they've found is chemistry. And there might be enough chemistry to say, "Oh, water once ran here," or, "This chemical is deposited here because of something," but they haven't found anything like life. Periodically, they have a big press conference and say, "Oh, we think we found life," but then it turns out to be...nothing.

JE: Nothing. But we're fascinated with UFOs—unidentified flying objects.

DS: (Chuckling) Oh, yeah. That's right.

JE: What is your thought about all that?

DS: I always defer to Neil deGrasse Tyson. He's the head of the Hayden Planetarium, and he's kind of the modern-day Carl Sagan.

JE: And so you refer to him, and he says what?

DS: Well, so far he hasn't said there's any life on Mars.

JE: But what about the UFOs? Is it possible we're seeing unidentified flying objects?

DS: Well, I have a friend—or I had a friend, he may be dead by now—who believes that he saw a UFO land in his yard when he was a kid. But I have no way of verifying or not. But he's a very smart guy, so...

JE: There are plenty of people and organizations that are very serious about this.

DS: That's exactly right. I'm agnostic on the subject.

JE: Do you think even that there could be other planets out there that we don't even know about—

DS: Sure.

JE: ... that even people could be living on?

DS: Yeah, well, I don't know if they're people or not, but...

JE: Well, there could be life on, and we—we have never been able to explore and may never know.

DS: That's right. And the two Voyagers, for example, are still going. I mean, talk about remarkable—those things were launched in '71, and they're still going. They're spacecraft.

JE: Spacecraft.

DS: They have flown past the heliopause. They've flown out of the sun's influence, so they're beyond where the sun influences—within general space. Yeah, look them up. Boy, they're interesting.

JE: And so what's keeping them flying?

DS: Well, they're nuclear powered. The plutonium is degrading and degrading. I mean, they're very old, but they're still going. And they have a little team of people who fly the Voyagers.

JE: "They fly"—explain that.

DS: They're flying out there, and they have to be maintained. You have to, for instance, make sure that their solar panels are in the right—well, I forget exactly how they're designed—but you have to take care of them. And so now they're turning off instruments. They're trying to keep the most essential instruments alive by turning off the non-essential instruments. And the thing just keeps ticking along.

JE: So are we learning something from them?

DS: Yeah, about space. Space—outer space. Really outer space, beyond the effects of the sun. And they have this little team of people, run by a woman.

JE: Oh really?

DS: Yeah, her name is Suzanne Dodd.

JE: And where is she?

DS: She's at JPL. They have this little team.

JE: And they maintain it every day and make sure everything's right?

DS: Well, I'm not sure how often. I mean, it takes days to contact it because it's so far away. But there's two of them, and they're going in different directions.

JE: Isn't that amazing?

DS: It is amazing.

JE: So how many years have they been up there?

DS: Well, they launched in '71.

Chapter 9 – 2:38
Donna's Laws

John Erling (JE): OK, so as you look back with Pathfinder—with a rover—that's the first time that had ever been done. And when the rover, she—did you name her?

Donna Shirley (DS): Yeah, Sojourner.

JE: Sojourner. Started moving out—had to give you goosebumps. That certainly was one of the biggest highlights of your career.

DS: Absolutely. I always say it was equivalent to my daughter being born.

JE: There you go, right, right. You have a daughter?

DS: Yeah.

JE: What's her name?

DS: Laura Thomas.

JE: And is she interested in any of your kind of work?

DS: No, she's a psychologist. She has a PhD in psychology.

JE: OK.

DS: And she and her husband and the two boys live here. That's why we're in Tulsa.

JE: At the end of your book, you said, "These are some of the things I learned, expressed as Donna's Laws: The customer isn't always right. He may want something that can't be done for the money."

DS: Yeah, like the '98 missions.

JE: Right. "A really creative team will probably be as contentious as it is brilliant."

DS: That's right.

JE: And we've kind of talked about that, haven't we?

JE: "You may have to give up credit for an idea to see it happen." Boy, that's a strong statement.

DS: Yeah.

JE: And you had to do that.

DS: Oh, sure. Everybody has to do that.

JE: "There is never enough time and money, but you'll have to get the job done anyway."

DS: Right.

JE: "Everything is a big hassle. If it isn't a big hassle, you probably don't understand the situation."

DS: (Chuckling) Right.

JE: And finally, "Work should be done playfully as often as possible."

DS: True.

JE: And then you write, "I'd like to apply these hard-earned lessons to accomplish other things. I can't see the future, but I can see what I'd like it to be: people learning to work together to solve their problems instead of killing each other in xenophobia frenzies; people going into space accompanied by their trusty robots; people tending to the Earth with care. The question is only: which passion do I want to pause? Stay tuned."

Anyway, I think that's a great way to end your book.

DS: Thank you.

JE: And to end this. Well, I want to thank you for sharing your story.

DS: OK.

JE: And now we'll elevate it so that the universe—that takes another word when I say that to you.

DS: Right.

JE: And they can hear your story. And I appreciate it very much.

DS: Okay, well, thank you.

JE: Thank you.