



ORAL HISTORY PROGRAM

Ramona Graves: Finding Opportunities and Breaking Ground in Industry

PREFACE

The following oral history is the result of recorded interviews with Ramona Graves conducted by Vicky Jackson Nielsen on June 30th, 2023. This interview is part of the AIME Oral History Program.

ABSTRACT

Becoming an engineer was never her plan as a young woman, but an unexpected conversation and her go-with-the-flow attitude introduced her to an unwavering passion for engineering that changed the course of her life. As a student, professor, department head, dean of Colorado School of Mines, and life-long SPE member, Dr. Ramona Graves has used her strategy of tough love and hard truths to encourage hundreds of students on the path to success and has been an integral part of numerous industry-changing projects including the Space Laser project which came to fruition in 2023. However, her biggest goal in industry has been to change its image into one of acceptance, diversity, and eco-friendliness. In a time when women were discouraged from becoming engineers, Dr. Graves became the role model she always wished she had. Her love of geology and innovation and her dedication to the betterment of industry have taken her around the world and given her countless opportunities. Her outstanding work in industry has earned her numerous US and international awards, including the Distinguished Achievement Award for Petroleum Engineering Faculty and the Hart Energy Pinnacle Award. However, she is most proud of the scholarship for the School of Mines in her name, created by her students to recognize the incredible impact she has had on their lives and the potential impact she can have on others for years to come.

Readers are asked to bear in mind that they are reading a transcript of the spoken word, rather than written prose. The following transcript has been reviewed, edited, and approved by the narrator.

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00:00:15 Introduction

Nielsen:

Good morning. I'm here this morning with Dr. Ramona Graves, professor emeritus from the Colorado School of Mines. I'd like to give a few moments for Ramona to introduce herself, tell me about herself a little bit, and then we'll get into the interview. I'm Vicky Jackson Nielsen, and we're here on campus today, having an interview with Ramona on June 30th, 2023. This recording is a part of AIME's [the American Institute of Mining, Metallurgical, and Petroleum Engineers] oral history capture program.

Graves:

Thank you, Vicky. I'm looking forward to this interview. I'm retired, as Vicky said. I'm an emeritus professor of petroleum engineering, and I love that people are starting to think about our history. We've got a great history in this industry, in AIME, in mining, in metallurgy, in petroleum engineering, and in manufacturing, and that the recognition is now there. It's important to remember our history, not only to honor the people who have come before us but also to help the young people see that there were people before you. To appreciate all that has been done by those who came before you.

00:01:22 A Golf Trip, New Friends, and a Life-Changing Introduction to Engineering

Nielsen:

Graves:

About myself. Thank you, Vicky. It is my favorite topic. You know that.

Nielsen:

I'm aware.

Graves:

Yeah. So, as you well know, as everybody well knows, I grew up in Nebraska. Now, I grew up in a town of 350 people, not 350,000, 350. Well, 349 now because I moved, but not many have. I'm 72. I don't mind; I'm very proud of my age. I grew up in the 50s and the 60s, very isolated in rural Nebraska. Back then, I didn't really realize there was the Vietnam War. It was a farming community. Growing up, I basically had three choices. I could become a nurse, I could become a mother, or I could become a teacher.

Nielsen:

Yet you became an engineer.

Graves:

I know, and that's an interesting story how that happened. That may be a question later on, too. So, I didn't want to be a nurse. The odds were good, but the odds were really, really odd for the marriage situation. So, I decided to go to school and become a teacher. I was always good in math and science; I

love math. I went to a liberal arts college in Kearney, Nebraska. Now, it's part of the University of Nebraska. I got my teaching certificate, and I taught high school for four years. I'm going to fast forward a little bit because I ended up spending my career in education. Sometimes, I don't even think of myself as a petroleum engineer anymore. I think of myself as a professor, as a teacher, as an educator, and it just happens to be that I'm educating about petroleum engineering. So, I got a job and started teaching high school, and I hated it. I hated everything about teaching.

Nielsen:

That's surprising because you were one of my favorite professors of all time, despite the fact that I didn't do so well in your class. But we can talk about that later.

Graves:

We will talk about that later. It's about failure and success. I'm just going to bring you in as a personal example. But the thing is, I didn't like the students; they didn't want to be there. I didn't like the parents—too demanding, too engaged. I really didn't like high school sports in Nebraska. I really didn't like administration. There was not much about it, and I'm going, what am I going to do? Well, I went on a golf tournament in Ponca City, Oklahoma.

Nielsen:

Wow.

Graves:

Have you ever been to Ponca City?

Nielsen:

I have not. I have, in fact, spent some time in Oklahoma, but I've not been to Ponca City.

Graves:

Okay, Ponca City, at the time, it was Conoco, not Conoco Phillips. That was their main refinery, and we drove into town, and I said, "What is that smell?" And the guy I was with said, "Well, that's the smell of money." And I said, "Well, not where I'm from." The smell of money is different in farming country—cattle country. He said it's a refinery. The people we were staying with he was an engineer for Conoco.

Nielsen:

Okay.

Graves:

I was telling him about how I didn't know what I was going to do for a career, and he said, "Why don't you become an engineer?" I had no idea what an engineer was. I didn't know I could be an engineer. So, we spent the whole weekend golf tournament talking about what an engineer does, you know, why I've

got the right background, the right education, to be a successful engineer. But there was one caveat: I had to be a chemical engineer.

Nielsen:

Why was that?

Graves:

Because women can only be chemical engineers. Now, remember, this is the late 60s and early 70s, and women could only be chemical engineers. So I went, okay, I guess I'll go. By now, I'm teaching in the Omaha area, so I started going to the University of Nebraska in Omaha, and I'm taking chemical engineering courses, and boy, I love strengths. Anyway, we call it Mechanics of Materials now. I love statics. Oh, I'm going; I'm loving this stuff. Then, I took organic chemistry.

Nielsen:

How'd that go?

Graves:

Not well. Not well. About as good as Rock Properties when you went.

Nielsen:

Thank you.

Graves:

Organic chemistry. I teach Rock Properties, by the way. That's how I first met Vicky, and it was horrible. [Not horrible that I met Vicky, organic chemistry was horrible.] I just hated everything about it, and I thought, I can't spend my life doing this. In this organic chemistry class, we had to write an article or a paper; I can't even remember what the topic was, but I decided that I was going to pick the evil oil industry. Okay?

Nielsen:

Did you claim it? I mean, is that how you called it?

Graves:

Yeah.

Nielsen:

Nice.

Graves:

Yes, it's because it was. It was evil. Remember, this is late 60s, early 70s. The oil industry had caused the city of Long Beach to subside 30 feet. The oil industry had started the Cuyahoga River on fire. We were doing some really—not environmentally sound things during this time, so I'm going to get to them. Some of the people watching this video won't [understand] —I have to always explain this to students; I went to the library—that had books.

Nielsen:

Microfiche?

Graves:

Huh? That's right. So, I went to the library, and I started getting into the petroleum engineering or petroleum literature, *Oil and Gas Journal*, *World Oil*, those magazines, and I fell in love. It's as simple as that. I loved what the industry was doing, not how they were doing it so much, but I loved what they were doing. I loved the impact they had on society. I went, I want to do this if I can. So, I thought, well, I'll be a chemical engineer, and I can work for the oil industry. But then I looked in a book, and I found out there was a degree in petroleum engineering. I never knew there was such a thing. So, I looked up another book, and I found out the three top schools were Stanford—at that time—Stanford, Texas A&M, and the Colorado School of Mines. So, I got accepted at Stanford and Texas A&M, and I got rejected at the Colorado School of Mines.

Nielsen:

I didn't know that.

Graves:

Oh, it's a great story. And I went, oh geez. So, I quit my job. I mean, I had a good job, you know, as a tenured faculty member and teaching high school. I had done that for four years. And I went, okay, Texas cowboys or California crazies? I guess I'll go to the Texas Cowboys. So, I accepted graduate school at Texas A&M.

Nielsen:

Wow.

Graves:

I quit my job, and I moved back to my hometown; 350 people again now because I moved back. I was there, and I got a phone call; it was a recruiter for the Colorado School of Mines, and they said, "Enough people have dropped out that you've moved up on the list." Vicky, you know me, Last-Minute Lucy. I mean, I'm just doing everything, and I got my application in late. At that time, the School of Mines had quotas. You could only have at that time; I think it was 2000 students total. So, I hadn't gotten the cut-off, but enough people had dropped out that I moved up, and they said, "Do you still want to come?" I went, oh yeah, Colorado skiing, weather, close to home, I want to come to Colorado. So, I put a few clothes in my car, I put a plant—I love plants—I put a plant in my car, and that was about it.

Nielsen:

Had you ever been to Golden?

Graves:

Well, no. I had one time out here skiing. The guy I was skiing with had a friend who lived in Golden, so I knew where that was. But I was staying with my college roommate's sister, okay? They lived in Littleton or someplace, and I found my way to— Oh, and I forgot about this, I was driving a green Firebird. Oh, I thought I was hot. It was a bright green Firebird. So, the first day of class, I got here, and I parked, and I can remember the outfit. It was a gray and brown striped skirt, a little white top, and a little gray sweater. And I walked into the building where my first class was.

Nielsen:

Which building was it?

Graves:

Chauvenet

Nielsen:

Okay.

Graves:

It's still there. It's been remodeled some. But—

Nielsen:

Not much, probably.

Graves:

Not much. So, I walked in, and there was the—at that time, they were called secretaries. I said, "Excuse me, could you tell me where the women's restroom is?" Pat Jewet was her name; I'll never forget it. She said, "Yes, go out the door, go one block down, two blocks left at the student center, there's a women's restroom."

Nielsen:

Wow.

Graves:

I went, "Pardon?" She says, "Yes." And I said, "Class starts in five minutes, and I have to go." She said,

“Well, there's a unisex on the top floor, but the lock's broken, so you'll have to get one of the guys to hold the door for you.” I went, “Okay.” So, I went up there, did my thing, sat down, and I looked to my right, and I looked right into the engineering hall next door. Right into their classroom. There were a bunch of guys staring back at me, and I went, okay, this is going to be interesting. What did I do? I quit a good-paying job. So, I go into the classroom, and I'm the only woman in there, and I'm older. Not that much older.

Nielsen:

But you weren't 18.

Graves:

I wasn't 18, wasn't 20. And they were all guys in jeans, and they looked just scruffy. And I've got my little skirt on, and my sweater, and my little purse.

Nielsen:

You fit in instantly.

Graves:

My little pocketbook, and they're all just staring at me. I walked in and sat down, and I'll never forget the instructor. He was C. Sam Miller, and C. Sam said, “Okay, my job is to make men out of you boys,” and went on a tirade about how he was going to make me a man. And I go, oh my God, what did I get into? There are no bathrooms; I've got to become a man. And that was the start of my 45-year adventure at the School of Mines. It started like that.

Nielsen:

That's impressive.

Graves:

So, how did I become an engineer? No, it wasn't well thought out; it wasn't well planned, and I made it.

00:12:16 Mentors, Anti-Mentors, and Sponsors – Guiding My Students to Success

Nielsen:

Wow, that's an awesome story. So, along the way, did you have any professors mentor you in any particular way that you would like to discuss this morning?

Graves:

Is there such a thing as an anti-mentor?

Nielsen:

Yes, there is.

Graves:

Okay, thank you. Let's go with the anti-mentor first. It's really a big thing in industry now. You have to have mentors, you have to have sponsors, and there's a big difference. A sponsor helps you along your career path. In my mind, a mentor is somebody you look up to; they've got the qualities that you want to have, you admire what they do, and you trust their advice. They could be older than you. They could be younger than you. But there's a real difference between mentoring and sponsoring. I had several sponsors who helped me along my career, but I didn't really have any mentors. Part of the issue was there were no women in the field. I was the only woman in most of my classes all the time, and I was the older woman. So, people still come to me saying, Oh yeah, I had X class with you, and I go, I don't know, there was me and all these guys. I don't remember them.

Nielsen:

It's still familiar today.

Graves:

Yes, I still don't remember them. So, I was much farther down the road in my career before I realized the importance of having a mentor. A mentor is just someone to talk to, okay? Mentors change over time, and I've never really had a professor who was a mentor.

I've had people who worked for me. The Mining Department head, Steve Enders. Granted, I hired him, I was his supporter, but you know what? I think of him as my mentor. I trust his advice. I like to speak with him. Jennifer Miskimins, the Petroleum Engineering Department head and the current AIME president. Even though she was one of my students, I consider her one of my mentors because I trust her advice. I want to know what she's thinking. How would you react in this situation? So, faculty mentors? No. I'll tell you one more story, and you're going to find out a lot of what I talk about during this interview— People find it hard to believe that our industries, mining, metallurgy, petroleum, I don't know so much about manufacturing, made it really, really hard to be a woman in the industry. Especially in the 70s and early 80s. In the early 80s, things started becoming more friendly, but it was tough. It was tough. The department head at the time called me in his office. I said, Yes, Dr. X? And I swear to God, he had endangered species alligator boots. At that time, you could smoke on campus; he had a cheroot.

Nielsen:

No pipe, though?

Graves:

No, it was a cheroot, and I think the dark liquid he was drinking was probably bourbon. I don't know. And this is almost a direct quote. He said to me, "Little Missy."

Nielsen:

My least favorite name, by the way.

Graves:

Little Missy.

Nielsen:

Little Missy.

Graves:

"I've done some checking. There has never been a woman who's gotten a PhD in petroleum engineering in this country in history, and I will not have that shame happen on my watch."

Nielsen:

Wow.

Graves:

True story. He said, "You can hang around as much as you want. I've checked; I can't get rid of you."

Nielsen:

Did he leave before you got your PhD?

Graves:

Oh, yes. As a matter of fact, that was in April or May because the semester was almost over, and I thought, guess I'll spend the summer thinking, what am I going to do next? By that time, I was pretty well committed, and when we were talking about sponsors, the alumni said, We can't have this type of behavior in our department from where we graduated. They got him out and put in Craig Van Kirk.

Nielsen:

Oh, I didn't realize he was the department head when you got your PhD.

Graves:

Yes. So, Craig, when he called me in his office, then in August or September, he said, "Ramona, I know you've gone through some hard times here." He said, "And I know it's not just the department head, it's a lot of the faculty. And I'll tell you, I can't change how they think, but I'll guaran-damn-tee you"—he could swear in words [— I can change how they behave]. That was so good.

Nielsen:

Yeah. Yeah.

Graves:

It's a good quality. "I'll guaran-damn-tee you that I can change how they behave."

Nielsen:

That's excellent.

Graves:

And so, I owe Craig a lot. I would not have gotten my PhD and had the career I had without his support and sponsorship. Simple as that.

Nielsen:

Yes. I feel the same way about you. I remember asking you a question one time. I was about 30, and I thought about going back to get my PhD, and you commented, well, you made two comments. One, "I'm not sure you're smart enough," so thank you for that. And the second comment was, "Are you sure you really want to quit the really good job that you have and go back and do that?" So, I thought a lot about it, and I ended up not going back and getting a PhD. I've had a great career since, but I've always considered you a mentor from the first time that you almost flunked me in Rock Properties; I deserved to flunk in Rock Properties.

Graves:

No, but you almost flunked yourself. See—and failure is not bad.

Nielsen:

No.

Graves:

You have to fail and then go back and succeed because then you aren't afraid to try. As long as you fail at some point in your career, and Mines is pretty good at that— You know, Vicky, I have had so many alumni come to me after 40 years of teaching and thank me for being as direct with them as I was with you. First of all, a good example is one guy came up to me, and he stopped me at an alumni function not long ago, and he said, "It changed my life." He said to me, Oh, I can't do this; I can't, and I said, "Well, you're smart enough, else you wouldn't have got in here, but you don't have any work ethic." I said, "Do you know where you could get some work ethic? You know, I heard the army is always looking for a few good men." I said, "I bet I could find the Army recruiter number. So, if you don't want to buckle down and work, I think that would be a good option for you in the future." He said, "Scared me to death." He said, without that conversation, you were just that honest. And that was the end of the conversation. Next.

Nielsen:

That's excellent.

Graves:

Yeah.

00:19:06 Becoming a Professor and (Reluctantly) Welcoming New Opportunities

Nielsen:

So, let's go back a little bit, back into, kind of, post-masters or PhD program. How did you get into the industry? You obviously didn't go directly into teaching, and what did you do right out of school?

Graves:

I didn't work a whole lot in industry. When I took the job as an assistant professor at the Colorado School of Mines in Petroleum Engineering, I was working for a consulting firm in Denver. This was in the early 80s, and things were good in the oil industry. We were doing a lot of the consulting for Central Bank. It was fun. I told you earlier, putting on airs, Midland, Texas. I was on the frack jobs in the Permian Basin. This is the early 80s, '81, '82, and [I was] just having a great time, and I got a phone call from Craig Van Kirk again. Again, he was a very important sponsor in my life. He called, and he said, "Your advisor just walked out and quit." This is August, and he said, "I need somebody to cover his classes, Rock Properties and Well Testing." I think I've explained how little I like teaching. Right?

Nielsen:

We already discussed that.

Graves:

And I said, "Oh, you know what? I owe you, Craig. Let me think about it." I said, "I'll let you know Monday." This was a Friday. And he said, "Now I've talked to your bosses, and they'll give you a leave of absence."

Nielsen:

Wait, wait, wait, wait. So, before he talked to you, he actually asked your boss whether you could come to work for him.

Graves:

Yes.

Nielsen:

That seems odd.

Graves:

Well, it's not odd when you think these guys were all Mines graduates and Mines alums, and it was a Mines company, and this was for their alma mater. You know how loyal we are. So they said, yes, we'll keep a place, and she can do part-time here and do that, knowing full well I'm going to say no. So yeah, so I had that guarantee, okay, fine, fine. That night I went home, told my husband at the time what the offer was, and he said, "Oh, you aren't going to do that." That was Friday. Saturday morning, I woke up with morning sickness.

Nielsen:

Uh oh.

Graves:

I was pregnant with my second child, my daughter Lacey, and my son Jacob was three months old.

Nielsen:

Wow.

Graves:

I thought maybe it's time to rethink. I was doing a lot of work in Algeria and traveling down to Texas. I thought, maybe I could do this for a year until the baby's born, whatever, and kind of get our life together. We just bought a new house. It would be a nice thing to do for a year. I can suck it up and do anything for a year.

Nielsen:

How many years later?

Graves:

About 41. [Laughs] I finally retired. So, I called Craig on Monday and said, "Yeah, I'd be happy to do it." And I think it was halfway through the first semester—

Nielsen:

The timing would have been perfect because she would have been born in the summer, right?

Graves:

April.

Nielsen:

April. Oh, close enough.

Graves:

Yes, in April. Yes, it was perfect. So, I said, "Yes, I'd be happy to do it." And I think it was halfway through the first semester when I went into Craig's office, and I said, "I want to do this for the rest of my life."

Nielsen:

Oh, wow.

Graves:

It's the only time, I swear, in my entire life— Because I didn't have a master plan. I think it's good to have goals and objectives, but you look at opportunities when they come up, and you have to adjust your goals to match—and your objectives to match the opportunities. This was not at all in my goals, my objectives, to spend 40-plus years of my life at the School of Mines. But it was right for me, and it was the only time I think I've ever made a real conscious decision that I really want to do this forever. He said, "Okay." And so, the rest, I guess, as they say, is history.

00:23:05 You've Got to Keep it Simple – A Consistent Challenge Throughout My Career

Nielsen:

Yes. What have been some of the biggest technical challenges you've experienced in your career, within either teaching or outside with industry?

Graves:

Yes, I had [someone at] my first consulting job; I would consider him a mentor. Doug Patton—phenomenal. He's won several SPE awards. And by the way, I'm here representing the Society of Petroleum Engineers for AIME, one of the subgroups of the mothership. I always call AIME the mothership of our professional organizations. But Doug was really a true mentor to me. He said, "You know, petroleum engineering, it's a lot of science, it's a lot of technology, but mostly it's luck, common sense, a little prayer because you're working with systems that you never see and you'll never fully understand."

Nielsen:

I tell the story of your Rock Properties class. When you do the math, and if you came up with an answer that was more than within a million significant digits, you would get an F on the answer because you don't know half of what you're looking at.

Graves:

You don't know any of the variables. Yes, and that was really good advice. So basically, he said, keep it simple; use common sense. I mean, there's a lot of equations; there's a lot of data. We have so much data now. So, the biggest challenge has always been it's unknown. And I'm a rock geek. I love rocks. I love rock properties, as you know, as everybody knows. I love my rocks. They're just amazing because I can look at this inch of rock and next door to it is a different set of properties, a different set of

properties. And I take these little core samples, and I try to describe something the size of Golden.

Nielsen:

Yes.

Graves:

With this little sample. How close can it be? So, you have to be really connected to geology. I found out I love geology and the description of that. So, the technical challenges have always been, in my mind, I tell the students, too, "You've got to keep it simple." We don't know any of the variables. You see what's most important, where do you want it, because it's all about economics. Well, economics and society have the license to operate. But you have to keep it simple. Make your best guess, use experience, and ask questions. So, the biggest challenge, I think, whenever I've worked with either consulting—or consulting throughout my career while I was teaching, has always been to try to have people keep it simple. No, I don't need that information. No, I don't need that data. No, I need what's your best guess? What's your opinion? Why? Ask, ask, ask. Ask questions. And that's probably been the most difficult thing because people in our profession, Vicky, how well you know, when they know something, they know it.

Nielsen:

Absolutely.

Graves:

And they do; they know the answer. And they don't know the answer because we work with systems we'll never understand. So that's always been a challenge. But the question leads me to probably one of the most fun, research, interesting challenges I've worked on in my entire career, and always will be, and that was Star Wars drilling with lasers.

00:26:43 The Star Wars Space Laser and New Innovations in Industry

Nielsen:

Yes. Tell us a little bit about that and how you got into it, how it evolved, and some of the ongoing work in that space.

Graves:

Look, I'm smiling just thinking about it because it's another one of those opportunity things. I was out here working with a gentleman by the name of Darian O'Brien. You know Darian, I'm sure. He's still in the Denver area. A former student. Darian and I were working on putting together a short course, I believe, and we went to lunch. And he said, Hey, did you see that Congress has just mandated that all this secret, high-powered laser stuff needs to be open access to all the population, to all the people to get applications of high-powered lasers into industry? He said, "Wouldn't that be really cool? Maybe we could drill with lasers." And I went, "You know what? Wouldn't that be fun? You know what else? Coincidentally, the Gas Research Institute just came out with a call for proposals to revolutionize drilling.

Let's put in a proposal to revolutionize drilling by using high-powered lasers." Oh, yes. So, unfortunately, or fortunately, we put in this proposal, and later on, talking to the people who made these decisions, they said yours was the only one that was revolutionary. The other was drill faster, drill smarter.

Nielsen:

Yes. Incremental step change.

Graves:

Incremental. This was, throw out what we know, and let's put these high-powered military lasers to use, and that's how we got into it. We had a lot of support from Halliburton, Conoco, a lot of industry people, and the Department of Energy. We did a lot of work and started a company, 40 [four zero] Energy. They're developing laser technology to not only drill but to perforate, to also work submersibles. It's been amazing. And I got into [many] military [laser] labs in this country, [I got to work] with the COIL laser in Albuquerque at the Air Force Research Lab.

Nielsen:

Oh, outside of Los Alamos.

Graves:

Yes. And we were there, and they said, "Oh, look at that. There's a 747 over there." And they said, "Yeah, that's what we mount the coil on because we fly around so we can zap into rocks." And I said, "Why would you want to do that?" They said, "Well, there's a lot of caves in Afghanistan and whatever that we might want to use." Oh, okay, military application. We talk about drilling in feet per day. They talk about lasers in kills per day. You know, it's a different world. But it was amazing some of the things I got into, I got into — because these were Star Wars, it was all so secret, and our only competition was Russia.

Nielsen:

That's interesting. What era was this? What time frame?

Graves:

This is the 1990s.

Nielsen:

Okay.

Graves:

Late 1990s. Yeah, '98, I think we got the first money proposal.

Nielsen:

Where is that technology today?

Graves:

Vicky, I'm not through with my story yet because that was just one.

Nielsen:

Keep going. Keep going.

Graves:

The other one we had, there had been some work done at one of the national labs. I can't remember if it was Los Alamos or Sandia. Wherever it was, they'd tried lasers, and they said, well, it's not going to work because of X, X, X. So, I had a little bit of data. So, I took that data and extrapolated it. I'm a petroleum engineer. I can make anything a straight line. Linear paper, log-log, semi-log, I can make a straight line. So, I extrapolated the two data points, a straight line up here, and I think it was on semi-log.

Nielsen:

You had two data points. Of course, it's a straight line.

Graves:

Yes, but on log paper, no less semi-log paper. So, I drew a straight line and said, okay, I've got to have the miracle laser, which is the highest-powered [megawatt] laser in the Western Hemisphere, because again, we don't know what's going on in Russia. The army had that one in White Sands, New Mexico. So, we went there, and I calculated it. And the military wanted to give us their technology because that was mandated by Congress. So, I had these rocks and calculated, and I said, "Okay, let's try it. Let's see if we can zap this rock." Still don't know what happened to that rock. I mean, it just vaporized. Oh, that extrapolation was a little bit too much. Come to find out, we don't need a megawatt laser. We can use a few thousand kilowatts to actually drill. But anyway, there again, be careful of your data. So, I got to do some really exciting things, and I got to spend a lot of time in Russia with a lot of the Russian laser people.

Nielsen:

Obviously, that was post-1992.

Graves:

Yes, it was the late 90s. And I mean all these things happened at the right time.

Nielsen:

Yes, correct.

Graves:

So, where is it now? I'm excited to be one of the first to tell you one of my former students, my PhD students, did a wonderful job, Sammy Bartarseh. I think you know Sammy. Sammy went to work for Saudi Aramco, and they hired him for his laser expertise. Aramco wanted to be the first major oil and gas company, energy company, to use lasers for oil and gas production. They've had their first application of high-powered lasers—

Nielsen:

Oh, wow.

Graves:

—in the industry. We're writing a paper about it. It'll be first published at ATCE, in where? San Antonio.

Nielsen:

Okay. This coming year?

Graves:

2023.

Nielsen:

Nice. Excellent.

Graves:

But look, that's 25 years, which is about how long it takes technology in this slow-moving industry to come into play.

Nielsen:

What other technologies do you see on the horizon?

Graves:

Boy, I think if you go by what you read or see— You know, the reason we have professional societies is to share technology, right? To stay current. Everybody's talking about data. Data analytics. How do you use this data? How do you manipulate this data? I'm not sure that that's where— Though it's something that we need to do and understand - how to use our data. But I think what we need to do is spend more time looking for all the oil, not looking for producing all the oil we know is there.

Nielsen:

I would agree.

Graves:

There is so much technology [that] needs to be developed. Look at what George Mitchell did with horizontal drilling and hydraulic fracturing to start this unconventional revolution. It's technology, but it's not— It's mechanical technology. Let's get out there and work with these unknown systems. Let's see what we can do. So, what's that new technology? I don't know. I have no idea. But we have to because we know where so much oil is.

Nielsen:

Especially in the unconventional space.

Graves:

Oh, yes. We just need to get it. So, that's where I see that we aren't spending research dollars on this. We aren't spending a lot of time on it. But I think we'll come around to it.

Nielsen:

Yes, I would agree.

Graves:

We'll come back to it. Oh, good.

00:34:05 A New Perspective as a Role Model and Working Mother

Nielsen:

Let's shift a little bit, go back a little bit to what we were discussing earlier. You were a new mother who decided that you were going to start teaching. How did your work impact your family life along the way?

Graves:

Thank you, Vicky; very good question. Being a mother yourself, being a professional woman, having now raised two beautiful sons, and having a supportive husband, and you've had a phenomenally successful career. But I know many women your age who have had a phenomenally successful career. I didn't have any role models. I didn't have any mentors. I didn't have any idea how to do it, and I had nobody to give me advice or talk to about it. There was just—there were no people. There were no women. All the men in the industry either treated me as their daughter or their younger sister. They didn't quite know what to do with me and how to help me with my two babies, my family, my career, and my traveling. This career is phenomenal. I've had so much international experience. That's another point we may get to. But I stumbled through it, much like I stumbled through how I ended up to be, you know, because I didn't know any better. And I had a very supportive husband at that time, as you well know. The School of Mines requires every student to take a field session to get out there in the field in the summer between their, usually, junior and senior year. That was usually 4 to 6 weeks. And I had to do that as

part of my job, so I had to be gone.

Nielsen:

But I also remember that by the time your kids were a little bit older, they came to field session the year that I went to Massadona, and the dogs.

Graves:

The kids and the dogs because I was breaking ground. There was no maternity leave policy at the School of Mines, and my daughter was due in April, and they said, nope, you just don't get paid. Take sick leave. You don't get paid or whatever; you use up your sick leave. And again, Craig Van Kirk, and I'll tell you, Billy Joe Mitchell, our drilling professor, really stepped up. Bill said, "I'll teach your classes. Let's not tell anybody over in administration that she's not here."

Nielsen:

Wow.

Graves:

He said, "The only thing I ask of you, Ramona, is that you call me half an hour before your class so I remember to teach it."

Nielsen:

I don't find that part surprising.

Graves:

No. And I went, okay. So that was April; there was about a month left of school when I had Lacey, and so the guys just covered for me—

Nielsen:

That's fantastic.

Graves:

—and didn't tell anybody. I mean, that's the kind of support. That's one of the reasons I retired is to spend time with my grandkids, because I feel that I didn't spend enough time with my children. Now, my children don't feel that way. I was the Girl Scout troop cookie director. I was a Boy Scout leader. You know, I did all those things. But Vicky, I wasn't present. Most of the time, I was thinking about other things, what I had to do, and my career as it moved along. So, I really feel like I could have been. As a mother, you know what I'm talking about, to be present for your kids.

Nielsen:

Do you feel you judge yourself more harshly than you probably should in that regard?

Graves:

Yes, according to my kids and my family. But it always worked on me that I should have done that. But on the other side, they used to come to class with me. The guys were really open about that. One time, right after I had Lacey, and the semester started in August, I had Jacob on my back and Lacey on my front. [Laughs] I was carrying two babies as I was teaching. Okay, the role model. But I think Lacey was 3 or 4, and she was in the back of the room, and they were coloring or something. And one of the guys bent down to her and said, "Are you going to be an engineer like your mommy?" And she looked at him and said, "No, I want to do something other girls do."

Nielsen:

Wow.

Graves:

At 3 or 4, she had already decided that she couldn't be an engineer because women didn't do that.

Nielsen:

Thankfully, it's changed. Slowly.

Graves:

Slowly. It is changing. But that was really an awakening for me, and that how my role is not to teach petroleum engineers; my purpose at the School of Mines is to be a role model. To show that women can be successful, that women can be in this industry, that women can be leaders, that women can be managers. I know so many women my age who are the best technical people I've ever worked with. But there were no real women to model. I hope, and it's not a matter of hoping, I know I've had an impact on the females in this industry because I was there. So, yes, it was hard to balance. But my kids, like I said, when I'd take trips with the kids, I'd start talking about meandering streams[laughs], and their potential as reservoirs. I can remember my son Jacob saying, "Oh God, Mom, don't ruin another vacation."

Nielsen:

Exactly.

Graves:

Yes.

Nielsen:

My kids say the same thing. "Stop talking about geology, Mom."

Graves:

It's true.

00:39:57 Membership Societies – My Fondest Memories of Industry

Nielsen:

Yes. Speaking of community, how has membership in both AIME and SPE benefited you and your career, and how do you see that has really helped others as well?

Graves:

AIME is a very interesting organization. It really is. I always think of it as the mothership with four satellites around it; we used to all be one. The satellites broke out as the organization became more specialized. AIME has been around for 150 years.

Nielsen:

Is it coincidental that the Colorado School of Mines has been around for 150 years as well?

Graves:

No, I don't think so. The Colorado School of Mines started with metallurgy, then mining, then geology, then petroleum, and then extractive metallurgy. No, that's who we are. I mean, there was a need for that because the industry was starting, like there was a need for AIME. I've got an interesting story about AIME. When I first came to Mines, AIME had not had the impact on me personally like SPE, the satellite one. But AIME is so important as a conduit to keep mining, metallurgy, petroleum, and manufacturing—to understand the inner linkage of it. The reason we are a developed society, the reason we have quality of life, is because of these four disciplines. That's why I love this. Our world would not be what it is today. We wouldn't have these cameras. It's just amazing what these industries do that the everyday person has no idea.

Nielsen:

I would agree with that.

Graves:

So, it's really amazing. AIME is so important to bring all this together, to have us in these disciplines, to remember that we're all interdependent, from finding it to developing it. When I first came to Mines, I think they had a faculty orientation, and one of our trips was to the library. Okay, this is a library. And they had a big vault there, and they were so proud because they had a copy of *De Re Metallica* signed by Herbert Hoover.

Nielsen:

Wow.

Graves:

And I'm going, wow. *De Re Metallica* is still on the stage at every graduation at the School of Mines. That's how important that is. Even though — when was it written? Whatever it was, 1550, 1560. But Herbert Hoover, our president, was a mining, metallurgist type of person, and that's what his career was, and so was his wife.

Nielsen:

That's fascinating.

Graves:

So, *De Re Metallica* was written in Latin, and she [Lou Henry Hoover] was a geologist, and her second area of expertise was Latin. So, the two of them [Lou and Herbert Hoover] translated *De Re Metallica* from Latin to English.

Nielsen:

Wow.

Graves:

And that's our president. So, I'm going, this is amazing. So again, went to the library, got a book about Herbert Hoover to learn about him. By the way, it wasn't at the School of Mines library. I think this was probably Jefferson County. But I read about it, and I thought he was a president of AIME. He was instrumental in shaping this society into what it is right now. This is the president of the United States.

Nielsen:

That's amazing.

Graves:

Today, one of my former students, the Petroleum Engineering Department Head at Mines, is the president of AIME [Jennifer Miskimins]. Another colleague, friend, and mentor, everything, is DeAnn Craig. She was the first woman to be a president of SPE. I think she might have been the first woman to be president of AIME, also. She was just an amazing woman. So, AIME has been just important to the global society in general, and keeping these four individual professional societies linked together. So, yes, I think it's an interesting story of how our president, Herbert Hoover, got me interested in AIME.

Nielsen:

Yes, that's interesting. You mentioned that you've probably been more involved specifically with SPE. What were some of the benefits that you got from SPE? Other than the obvious Tuesday night dinners that we always had during the SPE convention every year.

Graves:

And the alumni functions.

Nielsen:

And the alumni functions.

Graves:

Yes. I was thinking about this when I was thinking about this interview last night. I think, in '78 or '79, that was the first time I wrote an SPE paper. A technical paper. And that's been really—the technology and keeping up to date in technology, without SPE, we wouldn't have this, just to know, to share technology as best we can. But I've never missed an annual convention except the Hurricane Katrina [August 2005]. Remember, it was canceled?

Nielsen:

Hurricane Georges [September 1998]. Katrina might have been canceled as well, but Hurricane Georges it also got canceled.

Graves:

Did it really?

Nielsen:

It did. I was actually in New Orleans for a class beforehand, and they canceled it, and they evacuated the city.

Graves:

Maybe. Maybe that was the one. Maybe it wasn't Katrina. Maybe that was the one because they've only canceled one because of a hurricane in New Orleans.

Nielsen:

Yes, it was that one. Hurricane Georges, yes.

Graves:

Oh, yes. That was amazing. I even attended the COVID-19 one, which is all online. But we didn't get in person. But that was really amazing. You know what? Probably my fondest, fondest memories of this industry are when I worked with people in SPE, be it the staff or the other professionals who were engaged. Between that and the School of Mines professionals, it set the standard for how I wanted to lead my career. The friendships I've developed, the international nature of this industry, and the travel I've gotten to do. I was actually on the SPE Board of Directors, and I was the international director of

education. I got to travel around the world and visit universities globally, so there is some consistency within the industry in education. So these people can go out and be prepared to be functional, competitive, productive petroleum engineers. The people in this industry are just the best. The people I've met within SPE and the opportunities I've had because I've been engaged with SPE have just shaped my career.

00:47:13 Being a Woman in Industry and Education Opportunities Abroad

Nielsen:

And that's fantastic. You mentioned a lot of international—I know you've taken part in helping other universities form their petroleum engineering departments. Would you like to comment on that? Like, what kind of benefits have you seen from that, and how has that helped shape your career as well?

Graves:

Yes.

Nielsen:

I'm sorry this one was off-script.

Graves:

No, no, no. But it's interesting because I did want to talk about that. That's another thing—I was going to just get my master's here, and my advisor at the time, Charles Kohlhaas, said, "No, you've got to get a PhD because you'll never be able to work in industry in this country, okay? You'll have to work globally. They're much more accepting of women in the global market." I went, "That's okay. I want to work internationally." And he said, "But, they only respect a PhD."

Nielsen:

Okay.

Graves:

They respect the title, not the gender.

Nielsen:

Okay.

Graves:

And I saw that happen so many times when they introduced, say, this is Mr. So-and-so and Doctor—They'd be looking at the man, and the minute they said Doctor or Professor Doctor, they turned to me, and I was the focus of the rest of the meeting because they respected and honored what it took to get a PhD in petroleum engineering. So, yes, the opportunities have been phenomenal. Yes, I helped start

schools in the Middle East, be it Kuwait or Abu Dhabi, and Southeast Asia, Kazakhstan. I retired in 2019, but I agreed to come back to work in 2021 to help start a university in Uzbekistan. So, there's been a lot. Oh, and in South America. I worked with [many countries]. Just globally, I've had so many opportunities. In Angola, in Africa. The travel and getting to see people— You know what, Vicky? One of the things that has come out of this is people are good everywhere.

Nielsen:

Yes.

Graves:

I mean, they really are. There are good people. They look different, their customs are different, and they eat differently. But it was easy for me to travel as a woman internationally and to do my job. So, yes.

00:49:35 My Heart Has Never Led Me Wrong – A Promotion to Dean and Retirement

Graves:

If I talk a little bit more about myself, I've got to circle back because I haven't talked about myself in a minute. So, I became a professor and then associate and full professor, yada, yada, the normal academic. Then, some people in the alumni asked me if I would be the petroleum engineering department head after Craig Van Kirk retired. I went, "Oh no, I don't want to be in administration." Well, I'm the department head, okay? It just happens. Then, the president of the university at that time, Bill Scoggins, who was a petroleum engineer who worked for ExxonMobil from the Mobil side for decades, said, "I want you to be the dean of the newly formed college." And I said, "No, I don't want to be dean. I'm happy in this administrative position." And that's when another mentor came up to me—and I would be remiss if I didn't mention Steve Cheesebro in this interview.

Steve has been so important to my career. When he was on the Petroleum Advisory Board and I was a lowly assistant professor, he was the only person, he and Mick Morelli, who treated me as a professional. Not as a daughter, not as a woman, but treated me as a professional. President Scoggins called Steve to come and talk to me, to ask me to be the dean of the college. Steve sat me down and told me I had to do this because of X, Y, and Z. And I said, "No, I don't want to." And he kept telling me I was going to do it. I owed it to the university. I owed it to the discipline. I owed it to petroleum engineering, on and on and on. So, then I started to cry. I said, "But I don't want to." And he said, "Man up." It was the exact words, "Man up, you need to do this." And I went, "Okay." [fake crying] So, yes, I ended up being the dean, and then I ended up being the vice provost of international initiatives because my career is so international.

Nielsen:

Correct.

Graves:

Let me tell you one more thing about the dean. When Steve talked me into being the dean, again, the disciplines that reported to me were obviously petroleum engineering, but also mining engineering. And

I'd worked a lot with the mining engineers in my laser research. It all comes together in life. So, I've spent a lot of time with SME [Society for Mining, Metallurgy & Exploration]. But, the technology that I had to use on the microscopic, on almost the atomic level, to see how the lasers react with rocks, I worked a lot with the metallurgists. I was over there all the time using their equipment. They know how to melt things, and I needed to melt rocks. So, I got to work with metallurgists. But I had mining, petroleum—well, geology, because geology is our mother. Then, I had geophysics. Okay. That's exploration and development. But unless there's an economic reason to do it, I don't care how good our reservoir is; we have to have the economics to do it. So, I had economics and business. But then my other discipline I had was where we are in society today, which is so good, is I had the liberal arts. Humanity, arts, and social science reported to me. I don't care how much money you can make, unless you have a social license to operate and respect the people, the culture, and the society where you're working—

Nielsen:

And the environment.

Graves:

So, it was just the perfect group of people, and that all linked together in what makes our global society work. So, I loved being the dean. I loved being department head, but I loved being the dean, working with all these disciplines.

Nielsen:

How did you manage to retire right before COVID-19 and then not come back until we went back in? Was it chance, or was it— Did you know something the rest of us didn't know?

Graves:

Yes, wisdom here. No, I knew it was time to retire. I had an accident, broke my foot, and I had to take about three months off to recover. I never knew what I was going to do because I'd worked my whole life, and I found out I could do nothing. I could read. Well, I was still the dean, and the other deans would come up to my house and keep me in touch, but I kind of liked this having a lot more free time. By that time, we had a new president, Dr. Paul Johnson, and I said, "I'm thinking about retiring." And he said, "Stay with me for a year." Well, which turned into 2 or 3 years. But he said, "I just need your experience and help me through this," starting this, you know, becoming the new president of the college. But then, in 2018, 2019, I said, "You know what? It's time." I want to spend time with my grandkids. Three lovely grandkids: Oliver, Hazel, and Charlie. Charlie just turned three. Oliver's ten. Hazel's five. They're beautiful kids, and they live right here. I wanted to be present for my grandkids.

Nielsen:

What do your grandkids call you?

Graves:

Oh, Grandma.

Nielsen:

Well, there are lots of iterations of Grandma.

Graves:

There are, and I said no. I thought I would never be a grandma. So, I said, I will wear that title with pride. It's Grandma. Okay, so it's Grandma. My daughter gets upset because I'd asked them to call me the fun grandma. She says they've got another grandma, too. I said, "Yeah, but I'm the fun grandma." And with my mother, who's 96, I wanted to spend time with her. And so, it was just the perfect time. So, I retired, and boy, weren't those good [retirement] parties?

Nielsen:

They were great parties.

Graves:

They had retirement parties all over the country for me, our alumni, and our foundation. It was fantastic.

Nielsen:

Do you remember the crazy guy at the Houston party?

Graves:

Yes, the Houston party. Again, we've got to focus it down. But there was one really crazy guy at the Houston party. Yes, there's a lot of them in the industry, especially when there's alcohol involved.

Nielsen:

Yes.

Graves:

But no. So, it was just timing. But remember, Vicky, I've kind of stumbled through life looking for opportunities, not goals, objectives, whatever. The opportunity was there, and it felt like the right time for me to retire. It just felt that way. And you make your decisions. I've always made my decisions with my heart instead of my brain.

Nielsen:

Has that served you well, or have there been occasions in which you wish you had used your head a little bit more?

Graves:

Probably only in my personal life. Not in my career. No, my heart has never led me wrong.

00:56:32 Technology, Role Models, and Attracting Young People to the Industry

Nielsen:

Okay. Excellent. Excellent. So, we talked international a little bit. I have just a quick question. There's been a lot of discussion recently about attracting young people into the industry and how do we do that. Do you see that differently in the international spectrum than you do in the US? And what can we do as an industry to attract more people in the extractive minerals, but also just in engineering in general, right? That's also been a struggle here lately, including my own kids, who don't want to go to engineering school.

Graves:

Yes. Nor did mine. But also, it wasn't their passion.

Nielsen:

Correct.

Graves:

That's true. You want to go with your heart. Go with your passion. If we want to attract diverse engineers, remember, we don't want diversity because we want more women, or more people of color, or more blah. We want diversity because we want diversity of thought. People think differently, and women think differently than men. Somebody from Africa thinks differently than somebody from Asia, than somebody from the US. And just because we're both women, you think very differently than I did because we've got the generation experience. Diversity of thought in these complex industries is so critical to be successful. So, how do we attract younger people? Well, for one thing, it takes as much or more technology to drill a horizontal well than it does to place a man on the moon. We don't sell technology.

Nielsen:

We do not.

Graves:

We don't sell technology. We are the most technical industries. Mining, oh my God, the stuff the extractive metallurgists are doing is just amazing. We do not sell technology. It's not in our makeup. It's not in what we do. We need to sell technology. We need to have role models. We need to be positive. We need to be way more careful with the environment. We can't have something like, well, the Exxon Valdez. We were up there. You and I were in Alaska together and got to see the spill site. We have to be so careful, but we have to change our image, which is really tough.

Nielsen:

It is.

Graves:

It is. And as far as attracting more women, or people of color, or diverse people, whatever, you need role models. You really do. Say, hey, you can do that. We don't want any more little girls saying, "I want to do what other girls do."

Nielsen:

Yes. We also don't need forklift drivers saying, "Hey, Little Missy. You should be home cooking cookies."

Graves:

It's all the way from the support staff, through the field people, through the professionals, through the CEOs, through the boards. It has to be a systemic change in how we present ourselves.

00:59:29 The Greatest Gifts My Students Have Given Me – Recognition for My Work

Nielsen:

So, you mentioned role models. So, you have been one of mine, my entire career. So, one of the things I'd like to ask you a few questions on is of some of the honors and awards you've received over your career. Just a few highlights, and then, if you could, which one meant the most to you?

Graves:

There have been a lot. There really has been. I had to do my resume for something else, and at one point— I've really gotten a lot of Mines awards, US awards, international awards, a lot of recognition. Which award or recognition means the most to me? I've got to tell you, probably— Vicky and I had coffee together before we started, and I said, I don't know the answer to this question. I decided the answer about 30, 40 minutes ago during this conversation. The best honor I ever had was when you, Bobby, Bruce, Julia, and all my former students banded together. They were young in their career, and they weren't real successful financially at that time, but these young engineers came together, due to Vicky and Bobby Poirrier's leadership, and started a scholarship in my name. That was huge. That was huge.

Nielsen:

And she cried when she got the award, too. Again.

Graves:

Oh, yeah. I'm an empathy crier. Just to have that recognition from your students is just amazing. The second one is—I'm the first female in the Petroleum Engineering Department to have a named chair given to them, again, by a former student, and this student was not the best student. He worked hard, but he was really successful. Bill and his wife Fiona said, "We've been successful. We want to pay

something back and to thank Ramona for all her guidance." So, I have a named chair. Yeah.

Nielsen:

That's fantastic.

Graves:

The other awards that people from outside have given me, just by whatever, it's not the same as the awards that the students have given me.

Nielsen:

I've been present for a few of them. Distinguished Achievement Award for Petroleum Engineering Faculty. I think the one that I liked the most, I think, was the Pinnacle Award given by Hart Energy. That was a very, very nice affair and very, very well received.

Graves:

Yes. Hart Energy selected me as the most influential woman in the energy business, and had a big award ceremony. That was just out of the blue, and that was really an outstanding award.

Nielsen:

The other thing I remember the most about that is there wasn't enough food for lunch. Do you remember that? It was a little tiny salad.

Graves:

No, no, because that's when I had the broken foot, and I was in the cast. I had the boot, and I had my crutches. So anyway, no, that was a good one also.

01:03:03 You Have to Be Big – Advice for Young People

Nielsen:

Yes, so I have a whole laundry list of other questions, but is there anything that you want to share that I've forgotten to ask?

Graves:

Can I check my notes here? Absolutely. For those of you who are looking at this, if anybody reads them, you'll remember these. I do have boxes of [computer punch cards] because when I came back to school, I had not I had to take a punch card to this and a slide rule class because they weren't quite sure the computers were going to take off in the industry. So I've got boxes of these [cards], and they are lovely for taking notes. So let me see. Let me see if I have any more notes on here that because I think, Vicky, you've done a great job.

Oh no—it's easy for me to forget things like saying thank you, as my kids bring up. I want to thank AIME for selecting me for this. It really is another honor that I will add to my list to have your societies and your professional organizations recognize you. It's the pinnacle. I mean, it really is. So, I want to thank AIME for having me do this. For Jennifer and Michele for organizing, and for the photographer, Marcus. For you for coming up from Houston to do this. It's really, really special. But I can't just stop here because I'm a teacher, I'm an educator, and I know so much, Vicky. I'm old, so I have to leave with some advice. Okay? So, the biggest one that I always say is, "Don't be afraid to fail." Okay? Vicky took my class when she was a sophomore or junior.

Nielsen:

Junior.

Graves:

Rock Properties class, and boy, I didn't think she was going to make it. She just didn't get rocks. I don't think she gets rocks to this day. And look at what a successful career she's had. But the important thing is when you fail and you come back, then you aren't afraid to try new things. And that's what this industry needs. I talked one time to Mick Morelli, again, phenomenal, phenomenal man, and that was always his mantra — "Don't be afraid to fail," because you can come back. So that's really huge. The other thing, especially for young women watching this, is some good advice I got, and I can't remember who I got it from, but it was great advice. When you go into a meeting, and it's all men, and to this day, Vicky, you just came from a meeting in Wyoming that was all men. We are still sitting in men—make yourself big.

Nielsen:

I'm a spreader. I take up all the space in the room.

Graves:

You make yourself big, you stand tall, and you think big. Make yourself big. If you just make yourself big in your mind, it comes across. I love that advice. So, whenever I go into a situation, I always say, "Okay, I'm going to make myself big." The other things that I think—the reason I've had the successes I've had are a few things. One, I say, "I'm sorry." Okay? Because you do make mistakes, and you do hurt people, and you do hurt things. You say you're sorry. Number two, you have to be able to say, "I don't know." So many young people, especially young women, they pretend they know. You have to say, "I don't know." And along with that, "I don't know," you say, "I need help."

Nielsen:

And you need to work in a culture that allows you to say that.

Graves:

Allows you to say those things, and this whole culture. So "I'm sorry," "I need help," "I don't know." Those are huge, and people will respond to you. They'll respond to the honesty, the humility. And, of course, you have to be technically strong and work hard and make good choices, but those are just kind

of some very simple things that I like to impart to the students and to anybody who will listen to me.

Nielsen:

Thank you.

Graves:

Thank you, Vicky.

Nielsen:

All right. So, what type of advice would you give to a woman who is very interested in a profession that is predominantly male? What would you tell them? Like I have a passion, for instance, I want to be a nuclear engineer. I don't know if that's predominantly male or not. I don't have any idea, and it's a predominantly male industry. What advice would you give to them going into it to say, this is my passion; I'm going to follow my passion regardless of whether the fact that there are no women in that industry?

Graves:

Vicky, that's a really good question. And in hindsight, looking back to give advice, it's always easier because I didn't realize that I was going into a male-dominated profession until I hit the School of Mines. And I did; I almost left a couple of times because it was obvious that I wasn't wanted. But again, I had the passion. You said it well. My advice to younger women and really even younger people, any diverse, is to find somebody to talk to in that industry that you trust. Vicky, you would talk to any junior high girl that you wanted to tell them all the great experiences you had as a petroleum engineer. All the opportunities, how you were able to have it all. You still run, you're still an athlete, you have a family, you have everything. You can have it all. Okay? And women are so good, especially at multitasking. So, I would say to especially young women, talk to another woman who's had successes. Cold call. Just cold call. Find this woman. You've got Google now. You can find these women, and they'll want to talk to you. The other thing is, again, it's this fear factor, and it's impossible to get over fear unless you face it. Okay? To not be afraid to make yourself big, to talk to people. Understanding that if you really have a passion for this business, it doesn't matter if they're all little green Martians you're working with. If you have a passion for what you're doing, if you are happy, that's all that really matters. And so, I guess that's pretty fluffy advice, but I think that's what I do. The one solid piece is to talk to other women in the industry.

Nielsen:

I've found in my career playing up the diversity is actually helpful, right? Making sure that my voice is heard at the table, making sure that I sit, in the words I can't claim, Sheryl Sandberg's *Lean In* quotes, but, you know, "Take the seat at the table. Don't sit in the back row." Right? Always assume that you are part of the answer and part of the solution, and not part of just somebody else who's sitting at the table.

Graves:

And the other thing is, be there, but also be yourself. It's like when you look at a lot of these interviews, and some of you will, everybody else is dressed in gray, black, brown, whatever. That is not me.

Nielsen:

Most of them have a tie on, too.

Graves:

And a tie, too. But I am, as my daughter says, "Your fashion style, Mom, is 'look at me.'" I love color. So, I'm the only person at a table many times who has color. That's okay. That's who I am. I am present. They look at me; they know I'm there. I am not trying to be necessarily like them, be that way. I am one of them. I am part of the team. But I'm me. And like you said, the *Lean In* book, it really is. You have to have confidence in who you are. You have to know yourself, and you have to be true to yourself, and you have to be honest with yourself.

Nielsen:

Yes, absolutely. Thank you.

Graves:

Thank you for the question.

01:11:43 Final Thoughts

Nielsen:

I just want to wrap this up. If you don't have any other comments, I just want to thank you for this interview. Thank you for thinking of me to be the interviewer. I've never had this privilege before, and I think it's been fantastic. We didn't rehearse any of this, and I think it probably, hopefully, didn't come across as ad-libbed as it was. But I knew as well as I know you that this was something that we could do naturally and obviously did not have to script it. So, I just want to thank you for your time. Thank you, AIME, for allowing me to do this interview. And you know, Dr. Graves. Funny story, I want to end on one note. So, when we were in college, it was always Dr. Graves. And once you graduate, you're allowed to call her Ramona. But do not call her Ramona unless she gave you a degree. Absolutely, Dr. Graves.

Graves:

Let me tell you why on that one. I don't know why I was so adamant about this because when I started in the industry and started teaching, people would say, "And this is the petroleum staff doctor, Dr. Bass, Dr. Hilchey, and Ramona." I was always "and Ramona."

Nielsen:

Yes, that's wrong.

Graves:

It was wrong. But they thought of me as "and Ramona." Not my title, not my position, but "and

Ramona." I was never going to let that happen again, so I would call people on that. I thought, well, if nothing else, let's have that. If you don't respect me, respect the title.

Nielsen:

Absolutely.

Graves:

So, oh yes, so many people still can't call me Ramona because they got called out.

Nielsen:

Yes, absolutely. Well, thank you for your time today.

Graves:

Thank you.

Nielsen:

This has really been a pleasure.

Graves:

It has been fun. Thanks.