Women of Mines: WISEM Oral History Project
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RAYGOZA-HEREDIA: Hi, everyone. I’m Mel Raygoza-Heredia. I am currently here with Dawn Culley, also known as Dawn Kerr. We are here for the Women of Mines Oral History Project on the day of April 6 of 2022. I am currently located in the White House in Golden, Colorado and Dawn is currently located in her office at Wheat Ridge, Colorado.

RAYGOZA-HEREDIA: Dawn Culley is president and sole owner of Rhyolite Engineering, a consulting firm that supports the documentation needs of heavy civil contractors. Rhyolite primarily participates in dam and water resource construction projects and most of the projects have some level of federal funding. Dawn's work relies heavily on her technical writing skills, as she prepares technical proposals, statements of qualifications, permit applications and work plans.

RAYGOZA-HEREDIA: She earned her bachelor's in science degrees in chemistry in 2000 and in chemical and petroleum refining engineering, also in 2000, and then worked in the asphalt industry and environmental consulting before returning the Colorado School of Mines as a doctoral student. She completed her PhD in chemical engineering in January 2009 and became a registered professional engineer in Colorado later that year.

RAYGOZA-HEREDIA: Dawn resides in Wheat Ridge, Colorado with her husband of 20 years and their three children. She enjoys walks along the many greenbelt trails throughout Jefferson County, hiking in the Foothills and traveling with her family to explore our national and state parks. Dawn has a passion for helping children, young women and mom entrepreneurs in her community overcome obstacles and chase their dreams. So, Dawn, could you tell a bit about your background, as you entered Colorado School of Mines?

CULLEY: I graduated from Fountain Fort Carson High School in 1995 as valedictorian of my class. I've been accepted to all seven schools I applied to, including MIT. Had no idea where I wanted to go to school, so I just started sending off all these applications. Three of those schools, including Mines, offered me full tuition scholarships, which was something I needed to be able to go to school. Financially, there was no other support.

CULLEY: So, you know, everyone in my life had full confidence in me and as silly as it sounds, though, I had the doubts, you know. It was more about my ability to excel at a level that would allow me to
maintain my scholarships than my ability to just get by and graduate so I just had this huge expectation on myself to excel there.

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CULLEY: When I set off on that freshman ‘M’ Climb up Mount Zion carrying that 10 pound rock, I wasn't convinced that I was going to graduate. My parents had both earned associate's degrees from community colleges, but I was considered a first generation college student, because I was the first at the university level, and I was the only one from my high school that was entering Mines. I knew two people who had attended Mines back in the late 1980s and neither of them had finished so, you know, it wasn't one of those things where you just assume that, like high school, “Oh, you know you start and it's just a given you're going to graduate, it's just where in your class.” I knew that that wasn't how it worked out for everyone.

CULLEY: But you know, huffing and puffing up there to the ‘M’ carrying that rock that just got heavier with every step, I just set my mind that, no matter how many days I got at Mines, I was going to make every one count. I was going to learn as much as I could, take as much from the experiences I could as possible, and hang on to that scholarship as long as I could.

CULLEY: Twenty-seven years later I look back and I've got huge pride in the three degrees I did obtain because Mines is not an easy school and obtaining that degree is not an easy feat for anyone. There were many highs and lows on the journey, so....

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RAYGOZA-HEREDIA: Awesome, Dawn. What was your most significant struggle going through Colorado School of Mines?

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CULLEY: The level of technology in American homes has drastically changed, and if there was huge explosion of change that happened in the 90s, with our smartphones and Internet everywhere we go, email at our fingertips, WiFi connections free in every Starbucks--It's sometimes hard to remember what it was like before Google and the current level of technology, but the first website was launched publicly in August of 1991 as I entered high school.

CULLEY: In 1993 only 23% of households had a computer in their home. By the time I was entering CSM in 1995 that same month the first web-based email services were implemented--think AOL and Netscape.

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CULLEY: So, my household did not have a computer. The high schools I attended had a handful of computers that were limited to a few classes; you might get a chance to work on them. The thing was that I didn't fully understand how new the technology was. I had grown up in areas where, you know, there might be families at church who had a VHS player or CD player, but our family didn't have that. And so I think I began to develop this perception that, I didn't realize it was new. I just thought more
affluent communities had them and I didn’t. So, just wanted to give you a little background there, so you understand where some of my nervousness that I developed about technology came from.

CULLEY: I didn't realize, you know now, as I look back, that I was pretty fortunate because I had enrolled in a word processing class where I got to work on one of those few computers and I learned how to write letters and correspondence and type on a computer and learn how to save documents, that not everyone did.

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CULLEY: But when I was coming in [to Mines], I don't know what the true statistics were for my freshman class or what their exposure to computers were on entering CSM. I just, my perception was that most Mines students either had a computer or their parents knew how to work them, or they lived on campus with 24-access to computer labs. What I saw for myself was, I don't have a computer and I live off campus and so access to a computer felt like this big obstacle. My perception was that most other freshmen came from these wealthier neighborhoods or they had parents who are engineers and I just felt like I was behind and needed to catch up.

CULLEY: The first time I seriously doubted that I would succeed at Mines came almost immediately when I stepped into the bookstore to buy my books for the very first semester and the calculus textbook was wrapped in plastic with a three and a half inch floppy disk for Mathematica software. I thought, what am I going to do? So I kind of panicked a bit and I drove straight from the bookstore over to the office of the excavating contractor that my dad worked for. I'd worked for two summers there so I was kind of friends with the office staff.

CULLEY: I’m explaining to my dad how it went and my former boss is listening in a little bit. He had younger kids and he was curious. And I know he heard that fear and that kind of sense of defeat already that I was, that my voice betrayed--I wear my emotions on my sleeves. And so Dave came in and he interrupted our conversation. He made me a deal. He said if I would come in and work every Friday and Saturday night for the whole semester inputting invoices into their accounts payable software, he would give me this computer that was several years old, that was starting to be outdated but he thought it would run the software, so I accepted the offer.

CULLEY: Kind of tough to have your first semester at college when people are talking about their, you know, fun in the dorms and all the partying and being away from parents, having your Friday and Saturday nights committed. But I accepted it, knowing that it would give me access to a computer and it would also give me some more familiarity with working on a computer with something that was important.

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CULLEY: So the semester went really well. At this point, I don't even remember whether I used that computer for a project or how many times I had to use that software. I probably ended up doing a fair bit of work in the computer lab with the new friends I’d made, but it wasn't the first time that some of those fears with technology and my ability to keep up with it made an impact on my education.
RAYGOZA-HEREDIA: Dawn, it sounds like you kind of had to struggle with belonging. So, when did you first begin to feel like you started belonging at CSM and that you would succeed in the long run?

CULLEY: I don't want to give that false impression that I had no confidence in my abilities. Again, it was just more that concern of, could I excel at the level to keep my scholarship which I needed to be able to stay. You know, fortunately, those fears of technology and my struggles with software, those were balanced with a really strong academic foundation. I came in with advanced placement courses and again was top of my class so I entered Mines with Calc One and Chem One credit, and I was enrolled in the honors Calculus II class.

Sometimes students who come in with college credits already, I've seen them struggle to find their group, you know. A lot of times you find these, this core group of people to study with in that first semester of freshman year. If you're with upperclassmen, they've already got their groups formed, but I was lucky, because I was just one semester off and there was, I think like 30 of us, I don't know. The real history will show that, but it felt like there was about 30 of us that were ahead one semester. Many were ahead in both calculus and chemistry, so it worked out great. We ended up with similar schedules and we made friends and there was a real camaraderie and a tight knit group forming with us.

So, by the time we took our mid-term calculus exams, there was a lot more joking and bantering and people kind of knew each other in the class. Dr. Barbara Bath came in right after the exam and she pulled up her transparency and projected it onto the wall of the bar chart of grades, you know, by letter grade and then she had this caption with the high, low and medium scores. Almost immediately, Ron Avela blurts out, “108! 108, WHO got 108?” and I just blushed bright red; it was obvious to everyone in the class that I had achieved the highest score.

I can almost feel my stomach dropping, like, “Okay, here comes that teasing about being a nerd or messing up the curve and okay, now I've messed up the other way. At one point I think I'm going to fail at Mines and now I'm not gonna have any friends because they don't go on, you know.” But he looked straight at me and said, “108--Would you marry me?” And that just changed my whole perception of Mines, because I realized that even if you do well, academic excellence is something that's praised in the group. You know, people want to be around people to do well, or we want to succeed.

And so you know it wasn't always easy. But from that that point forward I knew that if I looked around, if I was struggling, I could find somebody else to study with, to work through the challenges; that we would find a way to learn this newer, harder, challenging material and we'd get through it and, frankly, we could all nerd out and have fun together learning stuff too. Plenty of times after class, you know, surface chemistry, we went out and made different shaped bubbles and just had fun with the material, as we learned it.
CULLEY: Some of those first study mates are still friends to this day. As I had those successes, as I built that foundation of friends and colleagues, it was easier to just keep counting my blessings and working hard and enjoying the Mines experience, and that anxiety about my scholarship really began to fade.

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RAYGOZA-HEREDIA: Dawn, as you've mentioned before, you currently have three degrees from CSM. Can I just ask, why did you choose to double-major for your undergraduate degrees?

CULLEY: I entered Mines as a chemistry major because I loved chemistry. I had no idea what engineers did, so you choose what you know. At that time there were two chemistry tracks: traditional and environmental, and that was really the only thing I was trying to decide between. The environmental chemistry track had so many more practical applications, and frankly I’m that person—I’m not the “why, and curious, and explore the universe just to explore the universe.” I’m that person that goes, “Okay, but who’s going to care, what is this used for, why does it matter?” So the environmental track started to feel like more of the right fit for me.

CULLEY: Then I also found out that Environmental had a one-week field session with a required internship, where all the other majors as far as I knew had a six week field session. So, if I chose the environmental track I got to work more in the summer between junior and senior year—and needed that money for living expenses and books. It also meant that, because the internship was required, the department was going to help me find that job.

CULLEY: And so you know, when you're making that choice in your freshman/early sophomore year, you don't know about how strong the Mines community is or the Career Center and all those other resources. Knowing the department was going to help me find this internship, that seemed like a leg up that I couldn't pass on.

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CULLEY: I also found that many classes were large and in the big lecture hall in Coolbaugh [Coolbaugh Hall] with so many students and you just sat there and watched them lecture. But in chemistry, your major courses, you got to, sometimes there were only a dozen of us in the class and six or seven in a lab which meant it’s just a little more...you had closer friendships but you also had more access to the professors and the TAs [Teaching Assistants] to ask your questions and to figure out what you wanted to do with this and how you could succeed. A lot more welcoming when you wanted to go in for office hours or something, where some of the departments just felt so huge and it was hard--you'd go try to go to office hours and either the door was closed because the Professor was busy with her research or their meetings or five other students had beat you to the punch for getting help. So, Chemistry just felt easier to succeed in and more at home.

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CULLEY: I was also selected for the McBride Honors Program. Again, another tight-knit group with intense discussions and getting to know people. Through those seminars, I learned about a lot of cultural differences and how our upbringing influences our decisions, which kind of get your mind going, right?
The longer I was at Mines, I began to really understand the differences between majors and career choices and career options.

CULLEY: So, as much as I felt at home with that environmental chemistry pass, I started to realize that most chemistry careers are fairly low-paying technician positions, or you’re committed to going to graduate school. And remember, this is the beginning of my bachelor’s, when I’m still pretty nervous about whether I’m going to keep my scholarship and even graduate with a bachelor’s, let alone having the sights on this doctoral degree, you know, especially straight through, like I think there's a part of me that always wanted to go to graduate school. But, I thought it might be some time much later in life when I'd saved up money and had worked a good paying job. That freshman and sophomore year I began to have more and more doubts about the long-term financial ramifications of my major decisions, and then I still had a little bit of that technology fear hanging out in the background, ready to jump in at any time.

CULLEY: I don’t remember which McBride seminar I was supposed to take that spring semester of ‘97; I think it was something about international political economies or something and frankly economics was one of those freshman classes that it was a struggle for me to stay awake in. I didn't come to like economics until my senior year, so like, “Oh great, international economics, this is going to be exciting.” I’m sitting there, while listening to the instructor read through the syllabus, and he starts talking about how important this course is to prepare for that famous McBride summer trip abroad. He's telling us that our class is slated to go to South Africa, and instantly my mind goes off down that negative path. I can't afford to go to South Africa; I don't want to, I don't know, my family doesn't travel abroad. How will I afford it? Okay, I hear something about there'll be scholarships, but even if you get a scholarship to cover the trip cost, that's a summer lost for work. How do you pay for books and school and, you know, the scholarship covers tuition but there's still an awful lot of expenses in a year.

CULLEY: I’m thinking, well I'm not going on that trip so that's one reason that this class isn't, it's not helping boost my interest in this course. And then, shaking off my doubts, saying it'll work out, just figure it out, pay attention and at least listen, this is a required course for McBride.

CULLEY: And then I hear him say all assignments must be typed on a computer and submitted as an attachment to email. And I panicked, because I knew how to log in to email but I almost never used it. That old computer I'd worked so hard for, it didn't even have a modem; there was no dialing into campus with that, no emails. And so it's like, okay, well I’m going to do this McBride work. I guess I’m going to have to stay on campus. Nope, can't afford dinner or anything else if you do that, and how many hours do you want to sit in the library? And then like, if you go home (because I was living in Arvada), how do I cover the cost and the gas to get back to campus to submit this assignment from the computer lab.

CULLEY: So all this: I’m not going on the trip, I don't really like economics, I don't even know how to submit my assignments, if I figure out how to get them done... and it just kind of became too much. So, that with my nervousness about only getting a chemistry degree, made my decision for me. The next
day I walked into the Registrar's office without talking to anyone in McBride or anything and I just decided to drop that course before I would have to go get something signed. If you're within that first few drop days you don't need an instructor to sign. Dropped the course automatically, was out of the Honors Program and I just decided, well, I'll give chemical engineering a try.

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CULLEY: My advisor happened to be the Department Head of Chemistry, and so I thought well, I'll go talk to him and see if he can pull some strings to get my scholarship extended for a fifth year, and if that doesn't work out I can always just graduate with chemistry, find a different minor or something. If I could get the scholarship worked out, I knew that chemical engineering would have much better paying career options, if I had to stop after the bachelor's degree. So. That's how I became a double major.

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RAYGOZA-HEREDIA: It's my understanding in college, you went through a lot of technological changes. Did the changing technology continue to impact your education and career moving forward?

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CULLEY: Once I went into chemical engineering after the introductory Mass and Energy Balance class, then you take Thermodynamics and Fluids the next semester. The major project for Thermo was to develop a program in Fortran that would produce a data set. Then you had to evaluate that data and write up a whole report about it. The program was only worth, I don't know, 10 or 20% of the project grade, but you had you know, as far as my classmates and I were concerned, you had to have this data set to be able to do anything else on the project.

CULLEY: Most of my classmates, myself included, went in and we struggled with the programming and struggled with the programming, and finally, I was just like, this is taking up all the time and it's only 10 or 20% of the grade. I decided, well it's not what they want, but I'm going to think outside the box here. I put my chemistry knowledge to work and I happened to know that I could find an experimental data set in a journal article or something that would meet what I was supposed to be generating so I took that data set, and documented where I found it, and I wrote up the rest of the project. I ended up getting one of the highest grades on that project, because I was able to do the report where others spent hours upon hours in the computer lab and had nothing to write up.

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CULLEY: You know, something inside me changed with that project because I realized I wasn't the only one struggling with technology. I started to see that it wasn't just me—the whole class, no one was finding that programming overly easy. I mean, I'm sure there were a few, but you know. The vast appearance and my perception changed about where I fit in the group. After that, technology wasn't so overwhelming. There were other projects that were hard or where I had to figure out how to run new software, but from then on my confidence and my ability to just take that challenge head on was much stronger. So for the remainder of my Mines career, I successfully learned many new computer programs and worked with my team to get the data we needed.
CULLEY: Then, as a consulting engineer I worked from my home office for a very small company. I'd get just a few minutes at a time with my boss and otherwise he would just show me generally what some software was supposed to do and send me home to figure it out. But I taught myself a variety of programs; I ended up developing a custom database for a client, having taught myself access and then designing the whole thing and with all the coding. I was in the field working at a compressor station and they bought some very expensive equipment that would not speak to their older computer. In a couple hours after lunch, I was able to write some code that would at least take the output from the instrument and get it into the data format that the computer was expecting to read.

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CULLEY: When I decided to return Mines for my graduate work, I just decided I’m firmly putting these technology fears behind me, I am going to do a huge computational-based project and get this all put aside. My thesis project required Fortran with parallel computing—I had a whole room full of parallel processors doing complex thermo-physical properties math and simulations. I got through it and I graduated and I’ve never used those skill sets, but at least I can say that I did it and I can learn any software anyone throws at me, and I can figure out smartphones, and all this stuff my kids bring home that I have no idea how to use and we'll figure it out.

00:29:24
CULLEY: So you know, I was watching the movie, “The Martian” [2015; Ridley Scott, director], that Matt Damon plays in and where, you know, this botanist gets left on Mars. At the end of the movie he’s talking to the future astronauts about going into space and he says, “At some point everything's going to go south on you and you’re going to say, this is it, this is how I end. Now you can either accept that or get to work.” You know, he’s talking about all the crazy things that can happen as an astronaut in space, but frankly it's been a good motto for life as an engineer. Mines teaches us to problem solve and to get to work.

CULLEY: You know, I've no doubt that most of us at some point in our careers, our entrepreneurial journey or even parenthood—you start to feel really overwhelmed and you wonder, is this the end of my business? Is this the end of my career? Is this the end of this, maybe it's something smaller, of just this job or this assignment? But you wonder if you can make it, and I hope that every Mines graduate, myself included, just, we take strength in those moments, and we put our problem solving skills to work and use our network when we need it and call those old friends from 20 years ago. We get to work, solving those problems, one puzzle at a time. We aren't afraid to admit to somebody that we don't know how to do something, and get that help instead of just dropping out of a program [laughs]. Then you just keep solving one problem after another until hope returns.

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RAYGOZA-HEREDIA: Well, thank you so much for coming out, Dawn Culley. Is there anything you'd like to add before we end?

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CULLEY: I just want to say thank you, Mel, for taking your time to collect these histories. And good luck with the rest of your Mines journey, to you and anyone else who happens to watch this oral history. I'll
just say that, you know, keep moving forward. When you don't know where to go, just take the next right step and never be afraid to get out there and try.

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RAYGOZA-HEREDIA: Alright. Well, this concludes the session with Dawn Culley for the Women at Mines Oral History Project.

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