AMERICAN INSTITUTE OF MINING,
METALLURGICAL, AND PETROLEUM ENGINEERS

ORAL HISTORY PROGRAM

David Matlock:
Secrets to Success: Be Ahead of the Game and Be Flexible

2018

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00:15 Introduction

Judge:

Today is November 19th, 2018 this is an interview with Dr. David Matlock, who is an emeritus professor at the Colorado School of Mines, as well as a co-founder of the Advanced Steel Processing and Products Research Center. This interview is being conducted as a part of the American Institute of Mining, Metallurgical, and Petroleum Engineers oral history project. My name is Ginny Judge, and I am sitting with Dr. Matlock at the Colorado School of Mines in Golden. Today we will be discussing his experiences working in academia as well as his contributions in the mechanical metallurgy field.

00:49 The Early Years in Austin - Learning Engineering from a Very Early Age

Judge:

Let's start at the very beginning. Tell me about where you grew up.

Matlock:

Well, first, thank you for taking on this assignment. I grew up in Austin, Texas. I was born and raised in Austin, Texas.

Judge:

Can you tell me what your parents did for a living?

Matlock:

My dad was a professor of civil engineering at the University of Texas, and my mom was a homemaker as well as working with him on all of his consulting and other projects.

Judge:

So did you know that you were interested in engineering from an early age? Did your dad's profession have any effect on that?

Matlock:

Yeah, I grew up with a father that did projects in the backyard; in the field in the summer. And, from the time I was about 10 or 11, I sort of was around engineering projects and had the opportunity to learn engineering from a very early age. Dad had an awful lot of influence on my life because of that. So, I think that really is where I gained my real interest in the kind of things that I'm doing today [that] I have done.

Judge:

And did you ever help him with any specific projects?

Matlock:

Yes, throughout my junior high and high school, I worked for him for a variety of projects. Through high school, I was the draftsman for all of his technical papers. Prior to that, I was helping him in the field with things like reading gauges. I learned early on to do things like install strain gauges to make transducers for some of the equipment that he was putting into the field. His field was soil mechanics, which is sort of related to mechanical properties of materials. It's just a little bit different from what I've been doing in my career. And he was involved with putting instrumented piling in the ground and then causing displacements to this to see how the pile interacted with the soil and from that developed models that then led to the design basis for many of the offshore oil rigs at the time, particularly those that went into the Gulf.

Judge:

So we spoke about you helping your father with some of his projects, applying string gauges and things like that, and maybe that had some influence and you getting into engineering? But, can you think of any hobbies that you participated in as a young man that may have also influenced you?

Matlock:

Well, yes, I, I did like to make things, and, so, I built model airplanes as a kid, young kid. I still build woodworking today. One thing, when I was about 16, I decided that I really wanted to buy a Sunfish sailboat. And, I couldn't afford the fiberglass version, so I decided I'd build one. I found a set of instructions, one-page instructions in a Popular Boating magazine and set off and built a sailboat. It was a great performing boat, and it worked just fine. And, it also offered me some opportunities to learn about some engineering aspects because the second time I took it out, I got into a very high wind storm on Lake Austin, and the mass buckled. So, I learned some things about engineering, like stress concentration, and moment of inertia, and material strength, and engineering economics because the single most expensive piece I had to buy was the aluminum tubing that was used for the mast. So, I had to buy another one. But, those are the kind of things that I like to do, in fact, I'm still woodworking today, and I have a complete woodworking shop in my home today.

Judge:

What kinds of things do you make?

Matlock:

I make mainly furniture. So we've built several of the pieces of furniture in our house, and I'm right now in a process, we lost a tree in our backyard two years ago. And so, I took the tree, and I had it milled. I then stored it in my attic for a year so it would air dry. In fact, over the last couple of weeks, I've been milling it down to make lumber out of it. And, my goal is to make a piece of furniture for our house that is entirely made out of wood, that grew in the backyard; and, that's what I'm working on today.

Judge:

That's cool.

05:05 University of Texas – Ingrained in My Blood

Judge:

So you grew up in Austin, Texas, and you ended up going to the University of Texas in Austin for your undergraduate degree. Can you tell me a little bit about what led you to go to that school?

Matlock:

Well, I sort of grew up in Austin on campus. At a very early age, Mom would send me and my brother to school with Dad on Saturday so that we would get out of the house. And, we would play on the sand piles while he was teaching civil engineering laboratory. Early in my elementary school, I went to U of T football games, to sit in the knothole section, which was the end of the horseshoe where you could get in for 50 cents. And, I just grew up in the area. I really never thought about going any place else other than the University of Texas at the time. It was sort of ingrained in my blood.

Judge:

All right, so you've talked about your father being a civil engineer and kind of growing up in that environment. But, when you went into your undergraduate degree were you immediately, did you know that you're interested in engineering or did you start off thinking you wanted to do something else?

Matlock:

I actually thought, started off thinking, that I wanted to go to med school, and I wanted to be a surgeon. And, that lasted about half a semester, and I quickly realized that my life was better focused on science and engineering. So, I quickly changed and went that route. So yes, there was a change.

06:39 Stanford University - A Big Change - A Culturally Different Environment

Judge:

[Laughs.] Okay. So, after your undergraduate degree, you went straight into graduate school at Stanford University, and there you got your masters and Ph D. in Materials Science and Engineering. How would you describe your transition from UT to Stanford, both culturally as well as academically?

Matlock:

Well, it was a big change. My undergraduate degree was in engineering science, which was a very general engineering degree at Texas. And, as such, I felt like there were a lot of holes in what I was doing. I did get interested in materials. That could be also related to some of my father's influence about his materials being soil and concrete. I got interested in mechanical properties and testing and breaking things. And so, I went to Stanford to study materials engineering at that point. Culturally, at that time, it was a very big change in our lives. It was the summer of 1968. I got married in June of that year. Earlier that year, Martin Luther King had been killed. A week before we got married, Bobby Kennedy was killed. August of that year was the riot outside of the Democratic convention in Chicago. It was a big change in the history of the United States at that time. And so, we went from a very conservative central Texas

and got dropped into the middle of the very liberal northern California area around the Stanford community for my wife and I both. This was a very, very culturally different environment, no question about it.

Judge:

And, did the political environment affect your studies at all?

Matlock:

It didn't really affect the studies, I mean it was ever-present in the environment around you. And, it was also very clear that there was, you know, good engineering and good teaching and things going on at the university, and there was also a political climate that we were involved with. One example is, during some of the riots on the campuses in ‘69 and ‘70 related to the Vietnam War, the building that I was doing all my research in was blockaded by students. So, for about six months, I had to carry my bicycle over students sitting outside the door in order to get into my room where I was doing research. So, you had to be a little bit careful. At that time, we didn't have USB and electronic ways to record what we were doing. So, every day at the end of the day, I would make a Xerox of whatever I did at the university and take that home, put it in a box in my apartment. And, that was my backup.

Judge:

What made you want to pursue a graduate degree?

Matlock:

Well, as I said, with the Engineering Science degree, I had gone through a couple of three different degree programs trying to find my way as an undergraduate. At one point, I thought I was going to be an aerospace engineer. That was at a time when aerospace, was booming. And, I determined that really wasn't for me. I got to be a senior, and I developed an engineering science curriculum, which at Texas allowed you to have a lot of flexibility in your course path. But, it wasn't very focused. And so, I needed to do more in order to become technically competent to go do something. So, that's the main reason I went to graduate school.

Judge:

I mentioned earlier, you got your masters and Ph D. in Materials Science and Engineering. Did your thesis focus on a metallic system and what drew you to metallurgy as opposed to other materials systems?

Matlock:

Well, my goal in going to graduate school and thesis topic was to do one on mechanical metallurgy because I was really interested in the mechanical properties of materials. Testing, those kinds of things. My thesis was on high-temperature creep of a nickel-based alloy as a surrogate for alloys being used in nuclear reactors. So, yes, it was on metal systems, and that's what I was interested in. But, more importantly, it was on mechanical properties, which is what I really wanted to do. I wanted to do that kind of part of our engineering curriculum.

10:57 Mentors - Oleg Sherby - William D. Nix - Lucky Number 13

Judge:

Did any of your professors' mentor you in any memorable way?

Matlock:

Yes, I had several very good professors. I was very honored and very blessed with the faculty that I got to work with at Stanford. Two particularly. One was Oleg Sherby, who passed away a couple, three years ago. And the other was my thesis advisor Bill Nix, William D. Nix, and he's still my close friend today. And, he really was a great inspiration to me as well as a lot of other graduate students that he's mentored along the way. We sort of laugh about it. I'm number 13 of his 79 Ph.D. students that he has graduated over his career. And so, we really, we meaning his group of students, not just me, but everybody admired what he did, and his career certainly speaks for that. In fact, as an aside, this last summer, his students got together and had funded a new institutional wide award in AIME and TMS, in his honor. And this will be the W. D. Nix award, which will be first to go out to be given in 2020. We're sending out announcements now. And so, funds were raised to support the endowment. This gives you one good example of how people thought of what he did for us.

Judge:

So, before I move on to your early years at Mines, do you want to comment on anything else about your graduate school experience?

Matlock:

It was a great experience at Stanford. Stanford was, when I was looking around to go to graduate school, I sort of applied to Stanford out of a whim, and they somehow accepted me. It was a great environment to go to school. I really appreciated that environment. So, yeah, it was good. And, I have maintained a lot of friends here. I met a lot of folks, and I still have friends that I communicate with today out of that graduate community. Unlike Mines, Stanford's a little bit different in that they had very large entering Ph.D. classes every year. It's a much bigger graduate program than what we have. And so, you had a lot more students that you entered with than what we have. It's a little bit different in that sense. Yeah, so it was a good place to be, notwithstanding the fact it was a beautiful campus.

13:34 Decision to Go into Academia - Early Years at Mines - 46th Year in a Temporary Position

Judge:

So, moving on to after graduate school. You graduated with your Ph.D. in 1972, and then immediately took a job as an assistant professor here at the Colorado School of Mines. Can you tell me a little bit about your decision to go into academia? Did you ever consider going into industry or national labs?

Matlock:

That's an interesting question, mainly because I absolutely did not want to be a professor. I wanted to

go to a company and make widgets. I wanted to make things. And, in 1972 when I'd finished, there were no jobs. The engineering market was absolutely on its bottom. And, as a result, I needed to find something. So, at the time that the position announcement for this one came along, I said, well, I'll apply for that and stay there for a couple of years until something opens up. So, I like to tell students today I'm in my 46th year of a temporary position waiting for something to open up. But, the decision was very simple. My wife was pregnant, we had no money, and we needed to find a place to do something. So, that's how I ended up at Mines..

Judge:

And what do you think led you to stay at Mines instead of it actually being temporary?

Matlock:

What led me to stay at Mines is the environment. I love the student population here. I love the approach our students here take over those I'd seen at other universities that are very focused on what they want in life. Then when I came, my responsibility was to not only teach but develop all the mechanical testing facilities in the department. So, I had the opportunity to sort of build a program at that time. Luckily, I joined the university in August of ‘72, one week after Dave Olson joined the university. And, together, these two young faculty spent a lot of time building the facilities in this department, many of which are still operating today. So, it just evolved. Then, a couple of years later, George Krauss joined us, and we formed a partnership that, then, ultimately it led on to our research in steel and then the steel research center, which I think we'll talk about here in a few minutes. So, it was just an evolution of things that led to this being the right place to be.

16:04 Armco Foundation Professorship

Judge:

So nine years after joining CSM as an assistant professor, you were awarded the Armco Foundation Professorship. Can you elaborate on this endowed position and what it meant for your academic and professional career?

Matlock:

Well, that was very significant. It's interesting that you bring that up, it's a very significant point in my career. I was a young faculty member, and, to be given an endowed professorship at that time did really mean that the university had some confidence that I could stay and function in this environment for a longer period. I worked one summer at Armco in 1975 for six weeks, one summer. So, I had gotten to know the people at Armco, and I was really honored that when the professorship was established that they chose to select me to receive that professorship. There's no question about it. What is it? It really gave some exposure and position. At that time, George Krauss had a professorship funded by the Climax Foundation. I now had one funded by Armco, and these were certainly significant titles to take along as we then developed our steel center through the ‘80s. So, it really was a great contribution to what I've done around here.

17:34 Most Rewarding Aspect of Teaching

Judge:

All right. We're going to switch gears a little bit and go more into teaching, and then we'll cover your involvement with the research center that you helped found. So, you've received numerous awards for teaching over the years. What would you say has been the most rewarding aspect of teaching?

Matlock:

Well, the most rewarding, clearly, is the opportunity to work with the kind of students that we have here at Mines. To see students develop and grow and then be able over the years to actually keep up with them and their careers. I still have students today that I had in the ‘70s come back and see me. I mean, that was just a real boon to what we've done. I enjoy the type of environment. We had a program which was very laboratory-based education. I'm not a theorist, theoretical person. I'm very much more of a lab-based type teacher, and I really appreciate the opportunities to do that. It's that environment of the students, and then to be able to work with them in the laboratories together, which really made it rewarding.

18:42 Course Changes Throughout the Years

Judge:

Some of the courses you've taught throughout the years, specifically mechanical properties and materials analysis of metallurgical failures and strengthening mechanisms, you've taught for over 30 years. Can you describe how these courses changed throughout the years that you have taught them?

Matlock:

Sure. Let's look at the mechanical properties course first, because that's the one that's an undergrad required senior undergraduate course. That's a very laboratory-based course. In order to teach a laboratory-based course, you need equipment. Over the years as our research developed in this department -- I should point out, when I came, there was almost no research in this department and very limited equipment -- with the equipment that we put in, that allowed us to add more things to the undergraduate program. We established laboratories based on facilities, mechanical testing, physical metallurgy, microscopy, not individual people. All of these labs became multi-use laboratories for both teaching and research, and that new equipment allowed us to expand our capabilities. There was one screw-driven tensile machine when I arrived. There are several more than that today, and, so, we can do many more experiments. It also allowed us to then get more equipment, so students had hands-on experience. That's the other thing that is part of my teaching, is I thought students ought to run the equipment, not TAs. So, we wanted to make sure that students turn the knob, knew what they were doing, and ran the equipment. But, you have to have the equipment for them to do that.

Matlock:

So, that's where a lot of the changes, and that, as we got further on into computer acquisitions and data acquisition systems in the late’80s, early ‘90s, we transitioned from taking data on strip charts to computers. And, that really started the whole computerization of data analysis and report preparation. Another thing that came along at that time is there was some point I no longer accepted handwritten reports and they had to be typed because students had computers on which they could type.

Judge:

I can't imagine handwriting a report.

Matlock:

It made grading reports much easier.

Judge:

You mentioned some of the changes that occurred throughout teaching Mechanical Properties and Materials, but can you comment on some of the other courses that you taught over this 30-year period, which are Analysis of Metallurgical Failures and Strengthening Mechanisms?

Matlock:

Sure, I'd be happy to. Certainly, Strengthening Mechanisms evolved as the literature changed because that was a course that I based on the available current literature. So, students were reading, there was no textbook, so the textbook was a compilation of papers. So, as papers evolved the content evolved for that one. Even more notably, the other one was an analysis of metallurgical failures. That's one that continues today. Professor Kip Findley is teaching that today, it's a course that evolved out of some of the consulting work that I had done on various failures. The summer I spent at Armco in 1975, I had the opportunity to look at some failures with them on gear assemblies in their rolling mill as well as some wire failures out at their wire plant. Following up on that, I got involved in the late seventies in Colorado in being an expert on looking at failures of ski components. Through those, I ended up doing quite a lot, for several years on failure analysis, one particular, is the ski area systems. But really important is, out of all of those failure analysis consulting projects, projects came to the classroom. And, I have many examples where those ended up being examples that we used for teaching as well as projects that students may have done as part of their failure analysis course. So, through some of that work, I was able to then incorporate into the class projects that students would have to do and then stand up in front of class and independently defend their work in front of their classmates. Then the classmates had to ask questions on what the student did. And so, it's sort of bringing together some of that practical part of applying metallurgical fundamentals to solving engineering problems in what we call failure analysis, I think was kind of fun. So, over those years, today you hear very few incidents of ski area failures. Significant changes have come about. Applications of nondestructive testing to ensure safety of the equipment. Updating equipment, incorporation of design methodologies that are used at other transportation systems. And so today you just don't hear about them anymore, and I think that's a good thing.

Judge:

Yes, I would agree.

Judge:

And what advice would you give yourself as a new professor, specifically related to your teaching responsibilities?

Matlock:

Well, the two things I've tried to always do, is one, be prepared, and be on time. And then the other part is to treat your students as peers, not as somebody that's less than you. That's what I tried to do for my career, and that way you're all in this together. We each have a different job, and so, we have to do that. So, that's what I would tell new faculty to do.

24:33 Co-Founding and Directing the Advanced Steel Processing and Products Research Center

Judge:

So, we're going to transition into talking about co-founding and directing the Advanced Steel Processing and Products Research Center, which has been operating for the last 25 years. Tell me a little bit about what led to the founding of this research center.

Matlock:

Several things: George Krauss joined us in the early ‘70s, and together he and I developed several programs on steel, particularly the early days of dual-phase steel. We had some funding from the American Iron and Steel Institute. We had some funding from the National Science Foundation. He came to Mines with an internationally known career in ferrous metallurgy and, together, we developed several programs. So, we had the nucleus of steel research and ideas came along in the early ‘80s to really go further. At the same time, the National Science Foundation set up an office called the Industry-University Cooperative Research Centers Program Office to which you could provide a proposal to get some matching funds from the federal government to establish an industry-university cooperative center. So, it was that growth, together as a partnership, the opportunity within NSF to create some funds. And, we wrote a proposal in ‘83 to establish a center that subsequently was started in ‘84 with six initial companies and five years of seed money from the National Science Foundation. In 1989, the seed money, the National Science Foundation money, ended and we remained then as an independent industry supported program since. And, it's going strong today.

Judge:

Can you describe a little bit more in-depth the structure of the center and how it might differ from other university research centers?

Matlock:

The main difference in structure is the fact that it's a cooperative program in which all research is shared between all corporate participants. We do not have projects for individual companies. We have projects for the center. Each company has the opportunity to put their information or their input into those projects to help operate them. But, in reality, all the results are shared between everybody. So, we're a consortium and that's one of the big differences. And, that's an opportunity and a challenge. It's a challenge in that you have competing companies working at same table together. It's an opportunity in that you can bring people together to find common ground primarily in pre-competitive research that we can do within the center. And so, that's really the main difference in the structure. When we started the center, it was focused entirely on North American activities and only North American companies.

And then, as the world changed in the early nineties, the Soviet Union dissolved. The Berlin Wall came down, and overnight we became a globalized program. And so, we, without anything of our own doing, became a global center at that time. General Motors bought Saab. Ford bought Volvo. Chrysler was in joint ventures with Mitsubishi. ArcelorMittal started the basis of being developed as a worldwide steel company. And then, today, it's certainly very different with the international presence throughout our industry.

28:16 Benefits of The Industry-University Partnership - The Students Perspective

Judge:

Can you tell me what you think is particularly beneficial about the industry-university partnership? You commented a little bit on that earlier, but maybe specifically from the student perspective.

Matlock:

One of the base things from the student perspective is we offer students the opportunity, we fund them for their graduate programs. We allow students to come and find areas in our research programs that really fit their interests. We have a broad enough program that we have been very successful in making sure that the student interests are met. This is very different than if you had come to me, and I had a specific NSF funded project to work on a specific topic, and I invited you to work with me, and I said you could work and do anything you want with me as long as it's this specific topic, until we have some flexibility. The other thing is the funding has provided us a continuous funding base. We have never had a situation where we weren't able to financially support a student that we had join our program. And, I'm very proud of that because some cases I know faculty whose contracts ended, and they have students who no longer have funding. And so, we've sold that from a benefit point of view now, technically, is students can come in and, immediately, they're talking to 30 companies today, and, whether they go to work for them or not, that's their own business.

But, they're getting a good perspective on a variety of different opportunities that they maybe find for them when they leave. That's unlike other students who may be working on a government contract and know no companies. And, then, when it comes to look for a job, they have to go see what opportunities are available. So, there are some really good opportunities. Then, the third is that you get to work, we have the whole resource base of our companies that students can access if they need specific things, test equipment, special alloys. We send students to various facilities to do testing. This is really an opportunity for, I think it's a great thing for students. And, this is not without a restriction. We still allow publication for students. We expect people to publish their work, and they do. Many of our students have received paper awards based on their publications for which we are very proud. So, I think there are a lot of opportunities. I'm very biased toward this type of graduate funding. I don't make any dispute about that.

31:07 Passing on The Directorship of The Center - A Seamless Transition

Judge:

You were the Director of the Advanced Steel Processing and Products Research Center for 20 years, up until 2013, when you retired. What was it like to pass on the directorship of a center that you helped

found?

Matlock:

Well, George Krauss was the original Director, but I was his right-hand man. His office was next door to mine, so we operated directly. So when he transitioned this directorship to me, after he did it for nine years, it was a seamless transition. John Speer joined us as a faculty member in 1997 and, effectively, from '97 until 2013, we ran the center together, although we never had any title called assistant or associate director. So, when it came time to transition, it was a relatively seamless transition because all of the people involved were fully aware of the operations of the center, and all of the people involved had a professional commitment to see the center flourish. And, that's not just John, that goes on with the Kip Findley, Emmanuel De Moor and the other people that had been involved with our program. They individually had a commitment and certainly John did, and so John Speer is Director today.

Judge:

And do you think that seamless transition has helped keep the center successful?

Matlock:

That transition has definitely helped to keep it successful. We know of centers around the United States, established like ours, that were more of a single faculty, single center, and when that person retires or go someplace else, that tends to cause a disruption to the function of the center. In our case, you really cannot see a transition in the function of the center. That really is dramatic when we change from Director one to Director two to Director three.

33:12 Most Technically Intriguing Projects - The Evolution of Advanced High Strength Steels

Judge:

So you focused your career on physical metallurgy. What has been one of the most technically intriguing projects you've been a part of?

Matlock:

Technically intriguing. Well, certainly there have been several, and most recently, starting since the early 2000s, is the evolution of advanced high strength steels for automotive applications. I think we've made some very significant contributions to design criteria that have gone into those materials. And then, also, John Speer's recognition over the quenching and partitioning process is one of those paths to create products. We've done in the center, I think, many things that are really involved in this very exciting part of research. That's only one. Certainly, prior to that, we've done a lot of other good things that I think are also very interesting.

34:15 Greatest Contribution to The Field of Metallurgy

Judge:

In your mind, what has been your greatest contribution to the field of metallurgy?

Matlock:

My greatest contribution I think is probably contributions to the students that have left Mines. I, at least, think that what they have done on their own, having left our program, is really remarkable. And, we have students who have just taken and done all kinds of things whether they're in engineering or have gone on other paths. That to me is the most remarkable one. And, the part of Mines that helps support that is the fact that we have this center that's self-functioning that helps attract students that, hopefully, will go on and continue to do that.

34:57 Lectures – A Wide Range of Topics

Judge:

If you were invited to give a lecture about any topic, technical or nontechnical, what would be your topic of choice?

Matlock:

Well, that's a hard one to answer, only because I've been asked recently to do several of those lectures, and I have done that, and those range from mechanical properties of materials. When asked to the Martins lecture at the Salt Lake City MS&T conference, I chose a title about something to the effect of "Enhancing the Fatigue Performance of Steel, Have we Learned Anything from the Past?" I always think that once you go back and look at the history, think a little bit about what you know before you launch off into something in the future. I was asked in August this year to give a lecture on the effect of electrification on materials for the automobile industry for a conference in Cancun. That would require a lot of reading and planning because it was a very different subject. So, what subject would it be? I don't know what the next one will be.

36:12 Society Affiliations - Advice for the Next Generation

Judge:

Fair enough. All right. So to move on and talk about your society affiliations and some advice for the next generation, I understand that you're a member of AIME's member society, AIST, and TMS, as well as ASM. When did you first hear about these member societies, and how did your involvement progress over the years?

Matlock:

Well, I learned of society membership while I was a senior at Texas and, at that time I joined, could join jointly TMS and ASM, and did so. That was before we had what we have today for students where you can join, as a student, multiple societies including ceramics and steel. I subsequently joined the Society for Automotive Engineers. I joined the American Welding Society because we had many welding programs in the '70s and '80s. In addition to the ones you listed, I'm also a member of SAE at AWS. Society membership has been extremely important. It provides opportunity to meet people. It provides

opportunity for technical exchange, and we're continuing to participate in those even as now I'm a retired person; I still am involved with society participation. One of the challenges I see is, you know, 40 years ago companies used to be more encouraging of engineers to join societies and, in fact, provide some support for them to do that. I see less of that today, and I think that's not good. I think it's important that companies as well as individual engineers need to recognize society importance. One of the issues, a challenge in materials, is there's been an expansion of number of societies. As a materials engineer you could be in materials research society - MRS. You could be in the ceramic's society. You could be TMS/AIME. You could be AWS, you could be ASME, you could be ASM. There's a whole bunch of them, and some of them have cross cutting areas of interest. So it's a challenge sometimes for you to focus. But as long as you focus on a couple, notwithstanding AIST, which has evolved over the last 10 or 15 years, there's a lot of opportunities. But, students need to do that when they get in to be professionals. And then, as a professional, most people won't stay in their career their whole life, so they'll change. The society membership offers them opportunity to keep some of those connections as they go from position to position.

38:58 Society Membership Career Benefits

Judge:

Can you comment a little bit more specifically on how membership has benefited you in your career?

Matlock:

Well, very specifically, I've been able to receive a couple or a few awards from various societies. Each of those, obviously, are things that help maintain and grow a career. I participated in conferences over the years. TMS in the late ‘70s, early ‘80, had three conferences on dual phase steels in the early days. We were participants in all of those. Those books still sit on my desk today, and I use those. Also, for multiple years our steel center has been involved with sponsoring conferences jointly with AIST. These would become known to be very, very prominent international conferences in a variety of subjects. Those are all very important things as you go along. Notwithstanding the opportunity to speak in front of the public and be criticized and answer questions openly in a public forum. I think that's an important part of it, and so this whole, all participation is important.

40:21 Attracting Young Professionals and More

Judge:

We talked about how industry isn't necessarily supporting as many young people in these professional societies. So, what do you think that AIME and other member societies can do to attract young people?

Matlock:

Well, I think that they just need to continue doing what they want and working through being able to make sure that the young people see opportunities and see benefits for participation. And, they need to understand that professional development, their own professional development is important. The various societies have to be able to make sure that they can offer those opportunities for them.

Judge:

And, along the same vein, how can these member societies attract even younger students, maybe in high school, to the metallurgy industry?

Matlock:

Well, I know that ASM has been very successful through their materials camp, where they have opportunities for showing materials both to materials camps for high school teachers where they learn about materials and take that back to their students in high school as well as materials camps for high school students to come and learn about materials. That's probably been one of the most effective ones that I know that you can put your finger on because that has led to opportunities for students who might not know otherwise. It is a challenge to get out into the communities because you need to do it in a way that can integrate with the high school educational program.

Judge:

So, we're going to wrap it up with a few more questions. So, please tell us what has made working in academia meaningful to you and what in your career you're most proud of?

Matlock:

Well, working in academia, as I said earlier, working with students and people is probably the most rewarding part of what I've done. Being able to see that things that I was assigned the responsibility to do, actually had some impact. Developing facilities, seeing students utilize those facilities, seeing students benefit from what they've learned here for developing their own careers, I think, is important. You asked what's one of the things that I was most proud of. I think probably the thing I'm most proud of is having been elected to the National Academy of Engineering in 2003. There's no question about it. That was a real surprise to me and, at that time, it was even more of a surprise because my father was also a member of the Academy, and, so, we were one of the two few father/son, or father/child pairs, or mother/child pairs that were in the academy at the time. And, that was truly a real gratification of a career to having had that happen. No question about it.

Judge:

What advice would you have for today's young leaders in the materials profession?

Matlock:

You just have to be flexible. You have to be prepared as you [can]. Let me take one good example of one of the young new leaders that's sitting here with me today, as you came prepared to this. It's simply, that's a good example, be prepared for what you need to do. Be ahead of the game and be flexible because you don't know what's coming out there. When I graduated from Stanford, the year I graduated was the first handheld scientific calculator. Today, you do everything I could do on that calculator on your telephone. You just don't know what's coming, so you've got to be flexible.

Judge:

Alright. So that concludes what I have. Do you have any other comments before we wrap up?

Matlock:

No, I just thank you again for taking the time to do this. I appreciate this opportunity for AIME to reflect a little bit on a career. It's been a great career, and I guess that I was afforded a really distinct opportunity to come to Colorado School of Mines. I think that we are what we are, and I really think it's different from a lot of places, and I have enjoyed being here. So, in that sense, I appreciate that. Thank you, again.

Judge:

Well, thanks for taking time to sit down with us and answer some questions. Your life, hearing about your life has been really interesting.