



AMERICAN INSTITUTE OF MINING,
METALLURGICAL, AND PETROLEUM ENGINEERS

ORAL HISTORY PROGRAM

Tom O'Neil: Surmounting the Troughs of Mining in Academia and Industry

PREFACE

The following oral history is the result of a recorded interview with Tom O'Neil conducted by Michael Karmis on March 2nd, 2022. This interview is part of the AIME and Its Member Societies, AIST, SME, SPE, and TMS, Oral History Program.

ABSTRACT

Tom O'Neil's dreams of seeing the world sparked his interest in oil exploration and led him to study mining at Lehigh University. After a summer out West at the Climax underground mine, O'Neil fell in love with mining and has had a diverse career as a mining engineer in academia and industry. O'Neil's academic aspirations moved him and his family across the country, where he became the department head of mining at the University of Arizona right after graduating with his PhD. O'Neil's time at Arizona sparked his interest in the business side of mining, and he founded the university's minerals economics program. O'Neil also made an impact at Arizona by starting their first chapter of the American Indian Science and Engineering Society and developing the APCOM conference series, which is now an international meeting. After transitioning into industry, O'Neil faced many troughs of mining, but persevered as he developed gold mines across the south pacific and led the charge to combat health and safety practices in mining at Cleveland-Cliffs. O'Neil's career has been an array of creative opportunities, and he has had an impactful career reinvigorating the mining industry through his work with SME and mining company boards of directors. O'Neil has fostered the continuous growth of the mining industry today.

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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00:15 Introduction

Karmis:

Today is Wednesday March 2nd, 2022, and it is a great pleasure for me to interview this morning Tom O'Neil, who had a long and distinguished career as an engineer, industry executive, and academic, that has been recognized by many prestigious awards by the mining community and the National Academy of Engineering. My name is Michael Karmis, and I have recently retired as Stony Barker Professor of Mining and Minerals Engineering at Virginia Tech. This interview is being conducted as part of the American Institute of Mining, Metallurgical, and Petroleum Engineers' Oral History Capture Program, and we're sitting in a Hilton hotel in Salt Lake City, just next door, in a way, to the convention center, where the SME annual meeting and convention is currently underway. It is my pleasure to start in asking Tom some questions. Tom, welcome to this interview.

O'Neil:

Thank you, Mike. Thank you for the kind introduction.

01:13 Growing Up in Fredonia – The Extreme Western Tip of New York State

Karmis:

So, Tom, starting with the first question about your early life: tell me where you grew up and something about your family.

O'Neil:

I spent the first 18 years of my life, Mike, in a small town in western New York named Fredonia. It's about halfway between Buffalo and Erie in the extreme western tip of New York state. My wife is from the adjacent town of Dunkirk, which is only three miles away. And, we'll celebrate our 60th wedding anniversary this year.

My father was an Irish Catholic, and my mother was a German Lutheran. So, when they got married, it was somewhat of a crisis in the family. He came from a long line of poor Irishman. He was the first O'Neil to graduate from high school, and then he worked for about four years and, finally, went to college. He graduated in 1931 from the University of Michigan. My mother taught primary school.

I have one sibling, my older sister, and she has had quite a successful career as well. She graduated from Michigan and retired as a Dean of Nursing from Columbia University, just a year or two ago. She's in the National Academy of Medicine, and so she's had a very distinguished career. I spent the first 18 years of my life in Fredonia, graduating from Fredonia High School in 1958.

03:01 How My Love for Maps Led Me to Engineering – Studying Mining at Lehigh University

Karmis:

And, how did you decide on an engineering career?

O'Neil:

Well, that's interesting. I talked a little bit about my father. What I didn't tell you was he died very suddenly at a young age, 51. I was 15 at the time, so I didn't have much male guidance on career options when I was younger. So, when I was in high school, I did what most young men did when I was there. I played sports and chased girls, but I was a pretty good student. My high school student teachers tried to steer me towards a math and science program. And, another thing I was very interested in as a child, I still am, are maps. I'm a map nut. I have a lot of maps, and, as a kid, I used to study them.

So, one thing I wanted to do in my career was to see the world. My guidance counselor in high school had a bunch of brochures, which I read, and I lit on one called geophysics, because it had to do with oil exploration. I had visions of myself traveling the world and doing oil exploration. So, I decided I was going to major in geophysics. I only applied to two colleges, Lehigh and Penn State, and I ended up going to Lehigh, and I was going to study exploration geophysics.

But, it was a very small department at Lehigh, and it included mining engineering, mining geology, and mineral processing. There was only about eight or ten of us in all those disciplines. As a consequence, we all took field trips together, and, on those field trips, we would go to underground mines, and I decided that was really exciting. I loved being in mines. So, I transferred into mining after my freshman year at Lehigh.

05:12 A Summer in the Climax Underground Mine – The West's Influence on My Career

Karmis:

Well, that's wonderful. Yeah. Lehigh is a very historic school. Did you have any summer work in industry while you were a student at Lehigh?

O'Neil:

I did, and it kind of affected what I decided to do in life. The only experience I really had in mining as an undergraduate was between my junior and senior year, when I worked underground at Climax in Colorado. It was a glorious summer. I just loved what I did, and it convinced me of two things in my life. One, I'd made the right choice going into mining, and, secondly, I wanted to live in the West.

Karmis:

And, you have done both, right? Yeah, that's excellent. So, you now have graduated in mining engineering, when did you get your first job after graduation?

O'Neil:

Well, one thing about graduating, during my junior year in Lehigh, they announced that they were going to close the mining program. So, there were two of us who graduated together in my senior year at Lehigh. And, I used to tell my students when I was teaching in Arizona, that there's really hope for you because I graduated last in my class.

Karmis:

Oh, okay.

O'Neil:

Because the other fellow had a higher GPA than I did. But, there was another well-known Lehigh mining engineer by the name of Stan Michaelson, who worked for Kennecott Copper. And, the head of the department at Lehigh got an interview for me with Stan, and it led to my first job, which was with Kennecott in Salt Lake City. My wife and I were married just about the time I graduated from college, and we took off for our first home which was in Salt Lake City for two years.

Karmis:

This is coming home then, back to your relief meeting at this conference.

O'Neil:

In a way.

Karmis:

What were your duties during that first job?

O'Neil:

Well, Kennecott had a very good management training program. They hired about 20 engineers; I was one of them, and they put us through this training program. And, we spent time in each one of their plants: the mine, concentrator, smelter, and refinery. After that first portion of the training program, they sent you back to one of these properties for a longer stay. I selected the smelter, oddly enough. So, I went back to the smelter and worked for about six months. I was really fascinated with the smelting process; and I thought maybe I wanted to go to graduate school in metallurgy at that time. I talked to a couple of schools on graduate study in metallurgy and found out I was going to have to take a lot of remedial stuff to get a Master's degree. So, I didn't do that. And then, I transferred to the Bingham Canyon Mine for a year, which I really enjoyed, too.

Karmis:

Did you develop professional relationships with other mining people, mining associations, or anything like that?

O'Neil:

Really not yet. That was one downside of my work. I was really a small cog in a big organization. As I mentioned, there were about 20 of us that went through this management program. So, I took a couple of courses at the University of Utah in management, thinking, well, maybe I'm going to go into management. But, I didn't get really involved in too many professional activities until somewhat later in my career.

09:10 Master's Degree at Penn State – Learning from Howard Hartman

Karmis:

And then, you decided to go back to school?

O'Neil:

Yes, and, well, it was kind of interesting. I think Lehigh is a very fine university, and my basic engineering background was quite good> But, as I mentioned it, mining was a pretty tiny part of that organization. And, I discovered working for Kennecott that I didn't really know as much about mining as I'd like to. So, I had a letter from Howard Hartman, who, you know, is was a famous mining professor at Penn State at that time, and he was looking for graduate students. And, he'd gotten my name from Bob Gallagher, who was the head of the department at Lehigh. And, my wife and I talked it over. I thought maybe a master's degree in mining would help me to better understand my chosen field; so, off we went to Penn State.

Karmis:

Now, who was your advisor at Penn State? It was Hartman or somebody else?

O'Neil:

Well, I was actually at Penn State for 18 months to get my master's degree, and I was his teaching assistant. But, my thesis advisor was Chuck Manula, who was a brilliant guy, no PhD, but he knew his field with operations research, statistics and computer applications. Bob Stefanko was also there at that time. He was head of the department and was very helpful to me, too. But, I actually studied for my master's and my master's thesis under Chuck.

But, I want to say that my association with Howard Hartman was one of the more important things in my career. I was his teaching assistant, and, if you know Howard, he was very organized, [very professional. At that time, he was also the Assistant Dean of Engineering, a very busy guy. There was no nonsense with Howard; he knew what he needed and gave you his marching orders. I really admired his work ethic, and it helped me to grow professionally.]

Karmis:

[Crosstalk] So, you took ventilation, I take it, among other things?

O'Neil:

Oh yes, I did, yes, I did. But, he was very kind to me, I learned a lot just by being his teaching assistant, by watching him conduct himself. And, my subsequent years, when I began teaching, I used a lot of the same approach and materials that he had. We're jumping ahead a little bit, but he was a visiting professor at Arizona for a year, when I was chairman of the department there. So, we renewed our acquaintance at that time.

12:04 Moving on to New Product Development with Ingersoll Rand

Karmis:

We will come back to Arizona a little bit in the questions. Now, you have a master's degree; what did you do?

O'Neil:

While I was earning the master's degree, we had our second child. Our first one was born in Salt Lake City. Second one was born while we were at Penn State, and we were broke, as grad students often are. Ingersoll Rand did a good job of recruiting. I thought I wanted to go back West, and we ultimately did

return to the West. But, I-R did a very good job recruiting me, offered me a nice job in the drill division. They were, at that time one of the biggest drill manufacturers in the country. I was working in new product development, which was pretty exciting. So, I took the job with Ingersoll Rand, and they treated me very well.

Karmis:

Where were you located with Ingersoll Rand?

O'Neil:

We lived in Easton, Pennsylvania. The plant was in Phillipsburg, right across the river in New Jersey. I traveled quite a bit. They gave me some very interesting jobs. We had new products that were out for testing in the field; and, I was kind of a field engineer, sat on those projects. We had one project we were busting up the runway at Boeing field in Seattle with a new breaker, and I sat on that project for about three weeks. So, I had some really interesting work with them. And, because it was in new product development, I got to meet the executives of the company. My boss was John Adams, a fine man. But, the CEO of the company was a man by the name of Tom Holmes, and I met him on several occasions. He was very good to me. In my later years, he provided me with very nice letters of reference for new jobs, and he was a very kind man.

14:11 “My Wife is a Saint” – Balancing a Family with My Academic Aspirations

Karmis:

Okay, thanks. So, Tom, you have some time spent with Ingersoll Rand, and you enjoyed, obviously, that job and traveling around and talking to people and operations. But, you start thinking also about going back to graduate school. When you were at Penn State, did you have ideas of further education, and was there anything at Penn State to help you start looking at other things as well in education?

O'Neil:

Well, you're actually right on the money there, Mike. As much as I enjoyed my work with Ingersoll Rand, as well as they treated me, I did have this experience working for Howard at Penn State, which I greatly admired him. My master's thesis at Penn State ended up being the basis for the Peele Award that I was awarded from AIME. So, these academic aspirations were fueled by Penn State. After two years in Ingersoll Rand, I had to try to decide what direction I wanted to pursue. I kind of moved around a bit. Ingersoll Rand, as much as it was a fine company, they were really more construction oriented than mining oriented. It took me away from mining a bit, and I still wanted to live in the West. And, I did have this idea from my time at Penn State that I wanted to be a professor.

So, again, we talked it over, and I decided I wanted to move on and get a PhD. Howard Hartman helped me by recommending a couple schools. But, I needed more than an assistantship, because now we had three children. Fortunately, I had a chance for an Instructorship at two schools: the University of Minnesota and the University of Arizona. In line with our desire to live in the West again, we decided to go to Arizona. So, we packed up the U-Haul truck, which I drove 2,500 miles to Tucson with my 5-year-old son, my wife following in the car with our three-year-old and one year old.

Karmis:

So, obviously, you now have children and family and you changed places. How did the family adapt, your wife and children, in all these moves?

O'Neil:

Well, remarkably well. I mean, my wife is a saint, there's no doubt about it. If I decided I wanted to do something, she said, "If that's what you want to do? We'll do it." And, she was wonderful at that throughout our many years. Fortunately, I was in Tucson for 13 years once we moved there. So, our children were really raised in Tucson. They didn't really have to move until they were in their high school years, which is pretty hard. But, I didn't travel much at that time, so I never missed a parent's night or a little league game or a swim meet. I was there pretty much all the time.

17:50 PhD at the University of Arizona – Diving into the Business Side of Mining

Karmis:

So, you are pursuing a PhD at the University of Arizona. But, from what I understand, you also minored in finance, which is quite unusual.

O'Neil:

Yes, I think Don Gentry, our mutual friend, also did that. We both got interested in the business part of mining. We felt pretty comfortable in our technical knowledge in mining, but we were less comfortable in knowing about the mining business and how the unique features you have in mining with depletable assets and finite mine lives are handled. So, we took a couple courses in finance and decided maybe we could construct a minor around mineral economics with an emphasis in finance. And, there was a very receptive Professor of Finance at Arizona, Clark Hawkins, who helped us figure this out.

Karmis:

That's wonderful. Your doctoral advisor, Bill Lacy, tell us a little bit about him. And, of course, he, at some point, moved to James Cook University in Australia, before you had finished your PhD. How did that work out?

O'Neil:

Well, it actually occurred just about the time I was finishing my Ph.D. Bill Lacy was the next man in my life who was a real mentor and just a fine man. He passed away a couple years ago; I think he was 95. But, he was chairman of the department and very kind to us and our family when we arrived in Tucson. He took us in, all five of us, and we lived with him for a few weeks until we found a place to live. But, when he left, it left a big hole in Arizona. And, I was just finishing my PhD, and the remaining faculty all decided they didn't want to be department head. So, they came to me and asked me to do it, and I just graduated with my PhD. I agreed, and they were able to talk the Dean of the College of Mines at that time, Bill Drescher, into me being department head.

20:14 From PhD to Department Head – Founding Arizona's Minerals Economics Program

Karmis:

So, you are now 34 years of age, according to my notes, you are an associate professor and department

head at the University of Arizona?

O'Neil:

Kind of strange. Huh?

Karmis:

It is quite unusual, spectacular.

O'Neil:

Well, no one else wanted the job, as it turned out.

Karmis:

I'm sure they recognized the talent.

O'Neil:

But, when they decided they had to give me the job, they said, "Well, we can't have an assistant professor be head of the department." So, they jumped me over the assistant level and made me an untenured associate.

Karmis:

Associate professor.

O'Neil:

It was untenured.

Karmis:

And, of course, at that time you were able to establish a more formal mineral economics program. Tell us about that.

O'Neil:

Yes, that was one of the significant contributions I made. As you recognize, I had interest in mineral economics through my finance minor and so forth. And, I decided that a graduate only program in mineral economics would be successful. There weren't very many programs like that in the country, Penn State and Colorado School of Mines had mineral economics programs, and I still believe that's a program that would be well received.

We were able to recruit DeVerle Harris from Penn State, who was one of the best-known people in the field, to start that program. And, we got a couple of other faculty positions, ended up with about three people in mineral economics for master's and PhD only program, and that program grew over the four years I was department chairman. When I left, I think we had something like 20 to 25 grad students in that program, including a number of foreign students who were quite distinguished. People who had led great

careers. Unfortunately, after I left, my successors were more traditionally minded and the program kind of slid downhill until it was discontinued. It's interesting, now the school is rethinking that decision and considering starting a program in that area again.

22:32 San Xavier Mine – A Student-built Mine and Classroom

Karmis:

That's true. When you were there also, tell us a little bit what happened with San Xavier Mine. Is that, was that the mine that was always at the department and the university or...?

O'Neil:

Yes, we gave it a big boost when I was chairman. We owned the San Xavier Mine; it's located about 25 miles southwest of the university. It had been a gift to the university by some former graduate. And, it was just a hole in the ground that we used for geological mapping and mine surveying. But, we decided to convert it into a practice mine for teaching and research. We had a head frame donated to us by Phelps Dodge. And, students and one of our faculty members, Ed Jucevic, went down to Bisbee, disassembled this 30-foot-high head frame and re-erected it on the mine. We got some donations of equipment, a drill jumbo, compressors, a mine hoist, and the students took charge and developed this mine; it's actually a well-functioning student mine today.

O'Neil:

We subsequently received enough gifts and research contracts, so we built a couple of buildings out there, a classroom building and a shop. It's been really successful, and the students are all volunteers, and they spend their weekends out there.

Karmis:

This is a unique facility, and, you're correct, the students do enjoy getting out.

O'Neil:

Oh, they do. Yeah.

24:05 The American Indian Science and Engineering Society and APCOM Series

Karmis:

Any other accomplishments you would like to add at that time?

O'Neil:

I worked on a lot of things at that time. One thing I got involved in is with the Indian community in Arizona, first as a consultant. They were looking for help with negotiating mining contracts, mineral development contracts with companies, and I helped them with royalty agreements. I helped them negotiate the sale of the Lake Shore Mine to Hecla Mining Company, and, in doing that, I got acquainted with a number of other tribes. I worked for several other Indian tribes in the same capacity. We had a Navajo student in mining engineering, a very nice young man, but he had trouble getting through the program. He finally made it,

but it really got me interested in the hard time that American Indian students have in science and engineering.

So, I helped start a chapter of AISES, American Indian Science and Engineering Society. . And, I was the first campus advisor for students there to try to help them get through the culture shock, which they have coming to a big university. That's been quite successful. Today there are many, many more Indian students in science and engineering programs. Also, at about this time, I got a pilot's license which helped me recruit engineering students on some of the remote reservations around the state.

Let me see, what else? I led the formalization of the APCOM conference series, when I was a chairman of Arizona. APCOM stands for applications of computers and mining [Applications for Computers and Operations Research in the Minerals Industries], which sounds kind of naive today because there's applications of computers in everything. But, it wasn't at that time. So, it was a chance for people from around the world to meet and present their papers on different kinds of computer applications in mining. And, I think that organization still exists today; we started it with four universities, and I was chairman for the first several years.

Karmis:

That has proven to be a very international meeting as well.

O'Neil:

It has. Yes, I can remember one conference we held when the Russians participated, and I got debriefed by the FBI afterwards. [Several of the conferences were held overseas – Australia, South Africa, Germany, for example.]

26:48 Two Weeks as a Dean, Not for Me – Moving on From Academia to Industry

Karmis:

That's wonderful. So, you are now, have a few years in Arizona. You're approaching about 40, I think, if my notes are right, and you start thinking yet for another career. Tell us about that.

O'Neil:

You're right, Mike. I enjoyed my years at Arizona. And, if you're a department chairman, and you conceive of a career in academic administration, the next job is to deanship somewhere. In the late seventies there, I had a couple of overtures, I looked into, and I took a job as a dean at a major university, which you know, but we aren't going to talk about that in detail. After a couple of weeks on the job, we had a major disagreement. And, I thought, if two years on the job, if I'm having a major disagreement, this is not a good thing. So, I resigned, went back to Arizona - they took me back – and I stayed for a year.

Karmis:

You said two years, I think you mean two weeks.

O'Neil:

Two weeks was all I was at this Dean's job. Did I say two years? It was two weeks, two weeks. Yes. So, I sat

down and said, "Well Tom, what are you going to do now? You know, you can't do this department chairman job forever." I didn't want that. This deanship didn't look very good, and so I said, maybe I should look at industry again. Maybe that's a better match of my ambitions and my abilities. Along came a gentleman who I worked for a long time ago at Kennecott; he was now Executive Vice President of Amoco Minerals -- and I had his son as a student, which was part of how I got to know him again -- who offered me a job.

Karmis:

And, before we get to this, as we're finishing the academic sort of part of your life, young engineers often ask, if graduate school is a good idea for them. Any advice you would like to offer?

O'Neil:

Well, it's really hard to advise anybody because it's highly specific, goes with an individual's desires and what he views for his career. If you view your career going into a management of a mining company, a second degree, an MBA or mineral economics, is probably a good idea. If you view your career more in technical, you're going to be going to deal with technology, ultimately into maybe consulting or an engineering company, a second degree in your chosen professional field is probably worthwhile. I think, on balance, graduate education is great. I think it helps you mature; you get to know your field better. You're no longer dealing with undergraduate issues. You're focusing on a research project. I think graduate education is really good, and I don't know anybody who's ever regretted it.

30:17 Amoco Minerals – The Most Talented People I've Ever Worked With

Karmis:

Let's go back to industry, Amoco Minerals and Cyprus Minerals. Tell us a little bit about that.

O'Neil:

Well, it was interesting. Amoco, like all the big oil companies, got into mining when they made so much money in the 70s, they didn't know what to do with it. They figured, if it just came out of the ground, how hard could it be? Right. So, they got into mining, and like other oil companies, got in in a big way. Amoco Minerals was located in Denver, and it was a collection of the most talented people I've ever worked with. They paid well, and they had some of the best, smartest people I've ever worked with in the industry. But, they also brought along all of their red tape. It was, you know, big oil company way of doing things.

Amoco had three divisions: a coal company, a metals company, and an industrial minerals company. And then, they also had Rio Blanco oil shale. I was manager of business development for the metals part of the company. Well, about a year after I've been with Amoco, the mining business was slowly sliding down the tubes. In fact, the rest of my career has been with mining companies at the trough in the cycle, not in the peaks like we've been in the last few years. So, after pouring hundreds of millions of dollars in Rio Blanco oil shale, they threw in the towel. And, rather than getting out of mining immediately, they just turned the screws down. As a consequence, there wasn't much business development to do. So, I spent more of my time selling properties when I was with Amoco than I did developing them.

Karmis:

Now, Tom, while you were with Amoco, you were able also to finish a textbook. And, during that period,

you know, working and doing a textbook is not always easy. Tell us about it.

O'Neil:

Thanks, Mike. I'm really proud of the textbook that Don Gentry, my co-author, and I wrote, titled Mine Investment Analysis. And, it served as the standard text for mining economics courses for probably 20 years. SME published it. I know that they finally ran out of copies. And, we talked about a second edition, but never did it. But, it was a good standard textbook for a number of years. I'm quite proud of it.

Karmis:

And, if I made a comment that it was a textbook all over the world, it was not just in the US.

O'Neil:

Oh, thank you.

33:22 Cyprus Minerals – Project Manager of the Copperstone Gold Mine

Karmis:

Getting back to Cyprus, the spinoff of Cyprus Minerals, that was a difficult time. I'm sure the mining business was depressed at that time. Tell us a little bit about that period.

O'Neil:

Yes, it was a time of real uncertainty. The people who came from Amoco corporate had an opportunity to go back with the oil company side; they all left, went back to Chicago. So, it was a big change in management of the spun off company. And, as you pointed out, it was a weak time in industry. We didn't have a whole lot of financial strength. I can remember one of my last jobs as business development manager. Getty Oil was getting out of mining at the same time, and they had a beautiful portfolio of mining properties. And, I led a team to go and look at these properties. One of them was the Escondida property in Chile, which they had a major interest in. And, as you know, Escondida is the biggest and best copper mine in the world.

We had a chance to bid on that, but we were financially unable to do so. It was a time when the only part of the industry that was healthy was gold. Amoco, now Cyprus, had a number of gold properties undeveloped, and I was given one called Copperstone, which was in Western Arizona. And, I was given the job as project manager for that. I had full authority for designing and building this mine, and it was another great step in my career. It was one of the most enjoyable times I had. It wasn't a big mine, I think we only spent 20 million on it or something, but I had full authority to go through the initial testing and metallurgical testing, designing the flow sheet, hiring engineering companies, hiring contract managers, and construction companies for Copperstone. And, that was an exciting time for me.

Karmis:

And, this was your first gold project as well, I believe?

O'Neil:

It was, right.

35:56 Moving to Australia – Developing Gold Mines Across the South Pacific

Karmis:

So, what happens after that?

O'Neil:

Well, we got to, within about two months of commissioning that mine, when Cyprus asked me to move to Australia and take responsibility for a whole series of gold projects we had in the South Pacific

Karmis:

So, family is moving again, to where, in Australia?

O'Neil:

Well, we moved to Sydney. Our children were either out of college or just in college, except for my younger son; and, halfway through his senior year in high school, we took him to Australia with us. And, he doesn't regret it at all. He had a great time in Australia. We lived in Sydney, and Cyprus' interests were all joint ventures, and we were developing about five different small mines in Australia and New Zealand. So, my job was all over the South Pacific and dealing with joint venture partners in constructing these small mines. We had an exciting gold project, which I visited on couple occasions on Guadalcanal, for example. So, that was pretty exciting. And, we were developing an underground mine in New Zealand, which was exciting.

So, it was a good two years. I'll tell you one story about it. These are the kind of things you have to deal with. We were developing a mine called Selwyn in Western Queensland, and we were within a month of commissioning the mine. We just got the ball mill installed. It was 24 feet long and 12 feet in diameter, not an insignificant ball mill. It was constructed in two pieces, bolted together at a flange in the middle. On wet commissioning, the bolts failed, and the mill just broke in half and dropped on the ground. So, these are the kind of things you kind of encounter in your career. That was really an intense time, got Cyprus and me in lawsuits in Australia.

Karmis:

So, you spent, all together, what, about two years in Australia?

O'Neil:

Two years in Australia. Yeah.

Karmis:

And then, what happens?

O'Neil:

Well, then Cyprus asked me to move back to the States and be general manager of their biggest copper mine they had called Sierrita, which is south of Tucson. So, we're moved back to Tucson again, and I was

general manager there for a couple years. My wife, my dear wife, who never had a chance to go to college when she was younger. When we first lived in Tucson, she earned a bachelor's degree in Nursing at the University of Arizona, and then she went on and got a master's degree in Nursing at the University of Colorado, when we lived in Denver. Now she had an opportunity to teach at the U of A for those two years when we returned, so it was kind of a big step for her, too.

39:20 Cleveland-Cliffs – Persevering Through the Troughs of the Mining Business

Karmis:

Yeah. That's wonderful. And then, after that, you are thinking of another change.

O'Neil:

Well, yeah. After another two years, I was contacted by a recruiter, and Cleveland-Cliffs approached me. They were having one of their senior executives retiring and were looking for someone to take over all technical functions for the company. So, we are two of the few people that ever moved from Tucson to Cleveland. It's usually the other way around. But, this was the start of my 12 years with Cleveland-Cliffs.

Karmis:

So, Tom, you are now joining another company, you know, another commodity, actually, and you are part of Cleveland-Cliffs. Tell us a little bit about that.

O'Neil:

Well, it was quite a change for me as you probably suspect. Cleveland-Cliffs today has been around for about 175 years. For about 170 of those years, it was an iron ore mining company basically, although they had a couple of excursions in some other things which didn't work out. But, they were an iron ore mining company. In the last few years, of course, they've become one of the biggest steel companies in the United States. But, my time with them was when they were an iron ore mining company. And, as you might suspect, for a company that's 150 years old, when I joined them, it was a pretty strong culture. To my knowledge, I was the only person hired at a senior executive level from the outside in Cleveland-Cliffs. Ever. Everybody else who was there were lifers.

So, it was a very strong culture. And, it was an interesting company, in that we had management responsibility for large iron ore mines, but we didn't have very large ownership interests. If you look at a Cleveland-Cliffs' annual report, you would see that our sales revenues weren't very high, but I had ultimate management responsibility for six mines and about 5,000 employees. It was an unusual company. Most of our mines were joint ventures. We only owned one mine outright, and all of the joint venture partners were major steel companies. My first job there was technical. And then, I advanced to another level where I had one mine reporting to me, our one non-union mine, which we owned outright. And, ultimately, I had all the other mines which were union mines report to me. And then, finally, when I retired, I was President and Chief Operating Officer, but I can go through some of that in more detail if you wish.

Karmis:

Well, one thing of interest would be the steel industry was in depression at that point. How a company like Cliffs manages that?

O'Neil:

Well, you're absolutely right. This is another part of my career that I'm in the trough of the mining business, not in the peaks. And, through the late 90s and until I retired, it was a very tough time for steel. I used to say, when I worked for Cleveland-Cliffs, we were a simple company. We had one product, iron ore pellets. One customer, the blast furnace. And, through the 90s, it was a very tough time for the integrated steel companies to compete with the Chinese, with the Koreans, Japanese steel companies. So, there was a lot of pending financial problems resulting in a number of bankruptcies among our steel company partners. We watched with dread as some of these blast furnaces were shut down, as some of these companies slid into bankruptcies. We had to really turn down the costs in our operations.

We couldn't take a strike in any of our properties because our steel company partners couldn't afford it. And so, it was a tough time. But, I learned a lot there, you know? You learn a lot when things are tough. To learn how to survive, and I found myself spending less time on technical as my job progressed, more time on pensions, healthcare systems, working with actuaries, working with lawyers, working environmental problems, not too much in mining problems, but it was very educational. I learned a lot.

44:23 Surviving the Depression of the Steel Industry

Karmis:

Tom, did you do, or Cliffs do, anything different to survive this depression of the steel industry?

O'Neil:

Well, we tried. We saw the shrinkage in the one customer, blast furnaces, and the growth of the mini mill business of electric furnace produced steel in the country, and the one growth product for iron in that business was direct reduced iron, DRI, and HBI, hot briquetted iron. And so, we, with our limited financial resource, we built a plant in Trinidad to produce hot briquetted iron, and it was a hydrogen reduction process. It was a new process we developed with Lurgi. It was their process really. The pilot plant was ours, and we built that plant in Trinidad. And, it was not successful.

We built, we produced some iron, but we couldn't do it commercially. So, that was our one stab in that. Now, if you've followed Cliffs in recent years, they just built a plant in Toledo, Ohio to build, to make that direct reduced iron with a more conventional method. And now, I understand that's going much better. As you well know, most of the steel in this country is produced now through electric furnaces, and they consume a lot of reduced iron. In fact, even blast furnaces are consuming direct reduced iron now to increase their productivity. When I was with Cliffs, our one endeavor in that didn't work out very well.

Karmis:

So, altogether, you are how many years with Cleveland-Cliffs?

O'Neil:

1991 to 2003, when I retired. Yeah, and my timing was very poor. About 2004, the iron ore price started to go up. Steel prices went up 2005-2008. I mean it was boom time, and I was retired.

Karmis:

Oh, you missed the boom time!

O'Neil:

I missed the boom time.

Karmis:

You got the downtime, but you missed the ups again.

O'Neil:

But, it was a great experience. As I mentioned, it was a company that had very strong culture, had very strong silos. It was tough to bust down silos. You've been in education; you know about silos. Education's tough to tear down silos. Lot of talk about interdisciplinary stuff on campus, but hard to make it work. Because you got those silos, people won't talk to another branch.

47:20 A Proponent of Health and Safety – Combating Unsafe Practices in Mining

Karmis:

In your time at Cliffs, I'm sure you spent a lot of time on health and safety issues, and I know you're a big proponent of all that.

O'Neil:

Yes, that was the one area where we could do better. When I came to Cliffs, I recognized we had very limited growth opportunities, because we were tied to the blast furnace and domestic steel companies. We couldn't compete internationally with the direct-shipping ores from Australia and Brazil. But, we were very good miners, very good producers of iron ore pellets. So, I identified a couple of projects, foreign projects, which looked very promising, one in Peru, one in Venezuela. We worked on those projects with some success, but, in the end, we didn't have sufficient financial strength to consummate those deals. So, the one area that we weren't as good as I'd hope we would be was in safety.

Our safety record was pretty average. So, we spent a lot of time in the last few years of my, when I was president, of beefing up our safety program, adopting a more behavioral based program, where you are working with people to make sure that they don't pursue unsafe practices. Unsafe conditions are often not the biggest problem in modern industrial safety, it's unsafe practices. We spent a lot of time in that area, and it continues to improve, even today. They're much better at safety. I take pride in what we accomplished there.

49:16 Honors and Leadership – Serving on the Board of Directors for Six Mining Companies

Karmis:

That is well recognized, as you know. Tell us a little bit, you received a lot of our awards and honors and recognitions during that time. Anything that's noteworthy?

O'Neil:

Oh, well, I was very fortunate and humbled by some of the recognition I have received. I won the AIME, the Rand award and the Saunders gold medal. The Mining and Metallurgical Society awarded me their gold medal. I was elected to the American Mining Hall of Fame in Tucson. I was elected to the National Academy of Engineering in 1999, distinguished alumni at Penn State and Arizona. So, I'm very humbled by all those - probably not deserved but grateful nonetheless.

Karmis:

Well, you are modest. They're very well deserved. You served on a number of board of directors, both before and after retiring from Cliffs. Anything about serving on board of companies?

O'Neil:

Well, it was a great experience for me. I served on the board of six different mining companies, two big ones, two small ones, and two little ones. Four of them were ultimately acquired. So, it was a very interesting experience. Three of them were American companies, three of them were Canadian companies. And, I got to meet very interesting people, and it was really out of the box stuff that I was doing on those boards. I chaired the environmental safety and health committees, where I had more experience. It was a fine experience, and it was a great way to me, to kind of culminate my career. And, I think I left the last board maybe four years ago, something like that.

51:17 My Diverse Portfolio of Jobs – Opportunities for Creativity

Karmis:

Okay. That's wonderful. So, Tom, just summarizing a little bit, it would be interesting, I think for somebody like you to provide an opinion or some thoughts. You've been a faculty member in a university, you've been an administrator in the university. You've been an engineer; you've run technology and you've been a corporate person. That's a very diverse portfolio of jobs. Similarities, differences between all these?

O'Neil:

Well, of course, the similarities, the obvious similarities, is you're just dealing with people. You're dealing with people all the time. Both academia and my experience in industry offered me a couple of things you want out of a career. One is your intellectual engagement. In academia, you're doing your research, and in my case, I was building programs, and those took a lot of intellectual rigor to figure out how to get over all of the hurdles that academia puts in front of you. [Getting the mineral economics program approved was very satisfying.]

And, the second thing they both offer you is opportunity for creativity, which you really want in your career. In my case, when I was in academia, we discussed some of the things we did. The mineral economic program gave me some creative satisfaction. And, in industry, it was building mines, and there was nothing more fun than when I had that project manager job and built the mine. In industry you're able to see the results of your decisions more quickly, which is a big advantage, and you do have a better opportunity for eliminating some of those silos. So, that was something that I really enjoyed.

One final thing is that I told my sons, when they'd ask me about my career ---and they have quite successful careers -- I said, "The one thing you've got to learn in management is dealing with ambiguity and being able to deal with that effectively is going to largely determine your success as a manager. You have certain goals in management. You want to get from point A to point B, but it's never a straight line. It has a lot of twists

and turns in it. And, you find yourself making decisions that you'd rather not make, because it takes you off the straight line to that goal., Sometimes those decisions are setbacks but you must keep that goal in mind. And, you have to deal with that ambiguity." So, I think that's something that will serve you well, no matter where you sit in your career.

54:35 President of SME – Reinvigorating the Foundation

Karmis:

Let me turn over to professional societies. You've been the President of SME in 2003. Any comments and memories during your involvement with professional societies like SME?

O'Neil:

Well, there's a couple of memories because again, it was a trough in the mining business, and, when it's a trough in mining, it's a trough in SME, too. I think we had a little discussion about that this morning.

Karmis:

Yes. May I say, I presented you with the trough because I was the President of 2002. So, I'm to blame, too.

O'Neil:

Business was pretty weak at that point in time, and the society, it was losing members, and there were questionable, problematic finances. But, we made a change in the executive director. Our current executive director is outstanding in my view. But, I had to let the previous one go, and we had to reinvigorate the foundation. The foundation was floundering a bit, and I got on their case a little bit. Told them that we needed to do things a little bit differently. And, at least two of the people on the foundation at that time have come back to me in later years and thanked me for that. The foundation's doing much better now, but it was an interesting time. You were a president, so you enjoyed the experience. I did too, in spite of the fact that the industry was not doing well at that time.

56:24 Future of Mining – A Continuous and Growing Demand for Minerals

Karmis:

Any comments on the future of mining and the prospects for young minerals and mining engineers?

O'Neil:

Well, I think it was Mark Twain that said, it's very difficult making forecasts, particularly about the future. So, I'm not big on forecasts, but I think one thing is pretty certain. There will be a continuing demand for minerals, and it'll be a growing demand. It won't grow without some bumps and twists and ups and downs. And, it may not grow as rapidly as the other parts of the economy do, but it will grow. So, there will be opportunities for miners.

I think there'll be more opportunities internationally than maybe domestically. It's become so hard to get permits, to build a mine in this country. And, that difficulty in building new mines, particularly the long lead time contributes to the boom-and-bust cycle in mining. Often you must make a commitment to spend hundreds of millions of dollars 10 or 12 years before you're going to see any return on that investment. So,

that's going to contribute to risk in new mining ventures. But, to answer your question, there's no doubt in my mind that there will be a growing demand for minerals and for well educated, enthusiastic young people. It'll make a wonderful career.

Karmis:

Tom, any final comments you wish to make? We're at the end.

O'Neil:

Well, you know, I've loved my career. I have a hard time remembering ever waking up in the morning and not being eager to get to work. I'd probably do it over again. I hope I wouldn't make the same mistakes, just make different ones next time. But, I truly loved it. I can't imagine sitting in a cubical for your career or behind a desk for your entire career. My good friend, Dave Lowell, who just passed away recently, when he was 90, he was still climbing around the Andes, his beloved Andes in Peru, looking for ore. All I can say is, we should all be so lucky.

Karmis:

Well, Tom, you have a fascinating life story to go with a distinguished and diverse career. It was truly a great pleasure to spend time with you today. And, thank you very much again, for willingness to share your story with AIME.

O'Neil:

It was a pleasure.