



AMERICAN INSTITUTE OF MINING,
METALLURGICAL, AND PETROLEUM ENGINEERS

ORAL HISTORY PROGRAM

Ihor Kunasz:

Mr. Lithium and His Many Contributions to the Lithium Industry

PREFACE

The following oral history is the result of a recorded interview with Dr. Ihor Kunasz conducted by William H. Wilkinson on February 27th, 2019. This interview is part of the AIME Oral History Series.

ABSTRACT

Ihor Kunasz, a world-renowned expert in lithium, has had a unique life and career that has led him all over the world. In his childhood, Dr. Kunasz lived in France before he moved to Cleveland, Ohio for college. In college, he was an All-American soccer player for Western Reserve University while studying geology. There, he met Dr. Francis Staley who was a major influence in his studies. After graduating with a bachelor's degree from Western Reserve, Dr. Kunasz attended Penn State for graduate and doctoral school. While there, he focused his research on the lamination in salt and the geochemistry of it. During this time, Foote Mineral Company had a fellowship opportunity available that dealt with studying salt drilling. Dr. Kunasz took this fellowship opportunity and eventually became a chief geologist for Foote Mineral. In this time, they expanded their company reach from North Carolina, Nevada, and California to locations internationally. Dr. Kunasz traveled throughout the world for business, though his main focus was in Chile. There, he helped define the Salar de Atacama salt flat which has since become the largest producer of lithium brine in the world. Challenges that Dr. Kunasz had to solve were working around the sand and mud to successfully drill the salt flat.

A major accomplishment of Dr. Kunasz' was his defining of brine deposits and developing models to aid lithium extraction. Although many of the deposits appear similar, there are multiple chemical make-ups of the deposits, requiring each to be approached in a different way. Dr. Kunasz helped develop approaches to each of the make-ups, and these models are still used to this day. To be successful, though, Dr. Kunasz had to enter the areas he worked with an open mind. He had to curb expectations and do his best to learn the language and culture upon arriving. Some of the places he had to do this were Russia, Chile, and Kazakhstan with associates such as CORFO in Chile. As a result of his many contributions to the industry, Dr. Kunasz received many prestigious awards throughout his career, among them the Hardinge, Dreyer, and SME President awards. Dr. Kunasz reached the role of presidency with SME over the course of many years with the organization, developing a fraternity like relationship with many of the members. He continues to be an active member of SME 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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Part 1

00:13 Introduction

Wilkinson:

Hello, I am Will Wilkinson, the 2009 president of SME. I'm here today with Dr. Ihor Kunasz, the 1998 SME president. He is a well-known expert on industrial minerals, particularly lithium and brines, and he's also recognized for his extensive knowledge of global gold, copper, and other mineral opportunities. We're attending the 2019 SME annual meeting in Denver, Colorado. And, we're doing an oral history capture, one of a series that AIME has been doing over the past several years recording prominent members of our member societies. Today is Wednesday, February 27th, 2019. So, let's get started. Ihor, can you tell me about where you grew up?

00:58 A Unique Experience – Growing up in France with Ukrainian Parents

Kunasz:

Well, thank you for this opportunity. First, I'd like to make a comment. When we were married 30 years with Zenia, she would say, "Yes, we were married 30 years, but I had you only for 15," because I was traveling all over the world, in pursuit of minerals, lithium in particular. So, my birth is just a little different from many of the interviewees. I was born and raised in France. My mother, at 17 years, had come from Western Ukraine to work on a French farm. The French had lost a lot of people during the First World War, so they contracted a lot of these people. So, 1937, she's there, marries my dad from the same village in Ukraine, I was born in 1938. And, I like to joke that, when they heard that Chamberlain had come back with a letter from Hitler about peace for all times, I must have been created, or something like that. I was born in the town of Montlucon, which is exactly the geographic center of France. And then, we moved to Northeastern France, near Germany, where I grew up. And, I graduated from high school, after which the whole family moved to the United States to Cleveland, Ohio.

Wilkinson:

You said your mother worked on a farm. Did your father as well?

Kunasz:

Yes, from the same village. He was 11 years her senior, and my mother tells me that, well, it was this nostalgia from the same village, you know. Her uncle was really opposed to the marriage. But, after that, we moved to the North side, into the German occupation zone; the Germans were hiring a lot of people to work on their factories. So, my dad went up further into Germany, and then, my mother and I stayed in the small town of Hagondange. My mother had a very good friend who was Ukrainian, who was the wife of a hotel owner where we lived, and helped us. But then, when I was 4, my dad died in a train accident in a factory. Thank God the French government, because they had lost so many people, offered what was called allocations familiales, which is a social security. The French Government paid you to have children. So, at least mom got money for me, and we were able to survive. Eventually, my mother re-married and my brother was born.

Wilkinson

You moved to Cleveland after high school?

Kunasz:

Yes.

Wilkinson:

And, your father had passed away before that?

Kunasz:

Oh, yes, yes. I was four years old when my dad passed, and I was 19 when I came to the United States.

04:33 A Geology Degree from Western Reserve

Wilkinson:

So, who or what influenced you to want to become an engineer?

Kunasz:

I thought about that question. I had a bunch of friends. One of them was a student in Strasbourg. In France, your high school degree allows you to enter any university, but then you had to compete to go to some very special schools. The petroleum school in Strasbourg was one of those, and he was accepted to that school. My best friend, went to study mineralogy and crystallography at the University of Nancy. There was nothing special in my life that said, "Oh my God, I'm going to study geology." You know, this happened in fact in Cleveland, Ohio, when I started the university there.

Wilkinson:

Then you are a geologist and not a geological engineer?

Kunasz:

I am a geologist, yes. My training is in geology, and what is interesting, you asked me why would I go to geology? Well, remember I'm a French kid arriving in Cleveland, not knowing anything about this country, about the system, and so on. So, I decided to go to what was then Western Reserve University, renamed Case Western University after the merger. It was not a good experience because geology was part of the geography department, and they had old people, uninteresting people. I wasn't sure I was going to continue in geology. But, what happened -- these are the serendipities, you know, in my life -- Dr. Francis Stehli had left Pan American Oil Company. And, he created the geology department at Western Reserve University, and that changed everything, because he was wonderful. He was very knowledgeable, he was supportive, and that's why I stayed and finished my four years at Western Reserve and graduated in geology.

06:44 A Polylinguist Learning American English Through Television

Wilkinson:

We might come back to this later, but we all know you speak at least five languages. Did you speak English when you came to the US?

Kunasz:

Oh, yes. I had the King's English in high school in France. When I came over to the United States, I remember two things: that if I attended a party and I drank too much, which I didn't, but the next day I would have an overhang, you know, that was one of my English traits. And, when I had the course in glacial geology, when glaciers retreat, they leave gravel terraces behind. I called them tear asses. So, my friends never let me forget that very fine English. But, it changed obviously. The one thing, I would sit in front of the television, and for six months, I didn't know what was going on because it was American English. Not that I knew the English, you know, we sort of learned it. But, the one, perhaps, story that I like to tell, I would sit in front of the television, and this little puppet would come on stage. And, this is what I heard. He would say, "Daba daba daba, daba daba daba." And, ten years later I realized what it was. It was the Brylcreem puppet. And, he said, "A little dab will do ya." And, for a foreigner, you know, it's, "Daba daba daba da." So, these are the sorts of experiences in English. Plus, the other thing that a joke, friends of mine after I was in Chile, he said, "You know, you really know a language if you understand a joke, because it's a social satire." And then, he continued, and he said, "You know what? You really know the language if you can tell a joke in that language, and they laugh at it." For quite a while, jokes in English didn't mean anything to me. But then, I learned very quickly, especially from mining engineers.

08:52 Penn State and the Silurian Salt Deposit

Wilkinson:

One of the challenges I am sure you had. OK, you completed your undergraduate work at Western Reserve, then where did you go for graduate school?

Kunasz:

Well, again, I mentioned the name of Dr. Stehli, and I think he had something about getting me into Penn State. So, I went to Penn State. And, my advisors there were Dr. Lauren Wright, Chairman of the Geology Department, who was a geologist who worked on the Western Plateau, the Mogollon Rim, and Dr. Bob Schmaltz, who was the geochemist, because the topic that I picked was the Silurian salt deposit under Michigan, under Detroit, going all the way to Windsor. I often sort of laugh because Detroiters don't realize they have miles and miles of tunnels under their city. And, the topic of my thesis was the significance of laminations in the salt because salt is not white except in high evaporative cycles, when it appears pure white, and dark during wet cycles. Those laminations continued all the way from Detroit to Windsor. So, I picked up a layer, collected many individual light and dark laminations (called varves), and I studied the geochemistry and tried to understand the depositional environment of the Silurian sea at the time. So, I did that and then went on to my PhD program.

Wilkinson

Did you find it difficult to transition from graduate student life to being a working geologist?

Kunasz:

No, really not, really not. At Penn State we lived in graduate circle. Zenia was doing a master's in Slavic languages at the time. Both our children, they were born at Penn State. In fact, it's Bellefonte not Penn State. Penn State has a hospital today. But then, you get a job. It's interesting coming from a Ukrainian background. My parents and Zenia's parents came from Europe. Life was not easy, and you worked, you know. And, when I mentioned to my father-in-law that, perhaps, I'll go with another company, he would say, "Oh, no, no, no, no, keep your job, keep your job." So, for me, having grown in that environment, you know, you don't question it. It is security. Plus, at the university, I never understood "university life" because the concept did not exist at universities in France. I played soccer at Western Reserve, having come from France, and I'm an all-American soccer player. But, no "university life", because I went to work in a chemical lab. And, at first, I cleaned the dishes, and then I became an analyst. So, that was a little bit of income coming in. But it was never something that was sort of given to you on a silver spoon. You just did it.

12:15 Foote Mineral Company – From Fellowship to Chief Geologist

Kunasz:

At the time of the Second World War, there was a program on critical minerals for the United States. And, geologists would go out west and evaluated the occurrence of many critical minerals. Potash, apparently, was one of those commodities; lithium did not as it was not of interest at that time. Clyde Kegel was the President of the Leprechaun Mining Company. I jokingly asked him, sometimes, "What do you do? You jump from valley to valley, as a leprechaun?" But, he decided to analyze the brine in Clayton Valley, which is the first valley north of Death Valley. He discovered some lithium in it, contacted Foote Mineral Company, which acquired the claims. So now, you basically have a hard rock mining company that knows nothing about salt deposits or brines.

So, Foote Mineral Company contacted Lauren Wright, the Chair of the Geology department at Penn State University. Foote's geologist knew him. He says, "Do you have anybody who knows anything about salts?" There I was. They offered me a fellowship. And, for three years, I would go to Clayton Valley, which is just south of Tonopah, Nevada, and studied the available information. And, that was the basis for my doctoral thesis. And, at that time, it was interesting that Chevron wanted to hire me, because a lot of the oil deposits are related to salt domes, and they wanted somebody who had done work on salt to figure out, "Where do we drill?" If drilling is too shallow, they might miss the oil. If drilling too deep, they might spend too much money. Oil, if you remember, was up and down, up and down. I often joked with my wife, "I could have been today a very rich oil geologist or a very poor one." So, I decided to join the Foote Mineral Company, the largest lithium producer in the world at the time.

And so, after two years, I became chief geologist, and my job was to evaluate, especially since lithium had been discovered in brines. I remember at the defence of my doctoral thesis Dr. Williams asking me, "Well, now that you've analyzed this deposit and you know all about it, where are you going to go find the next one?" I answered, "It's a company secret," and I got a big chuckle out of the committee. But, that's what I did. I tested practically all of the salt flats in Nevada and California. I was responsible for the reserves on the North Carolina lithium pegmatite property, and then, the hydrology and the development of the Silver Peak Clayton Valley brine deposit. It was very interesting for me to do that job. So, this is my educational route. And, after I joined, the history at Foote became a bit complicated because Newmont had acquired a big stake in Foote Mineral Company. At that time, Vanadium Corporation of America was a huge consortium making vanadium pentoxide, ferrovandium, chromium, ferrochromium. And, the company merged into Foote Mineral Company.

So, suddenly, Foote Mineral becomes this big company. You know, that it was, the Ferro Alloys Company was much bigger than we were. So, I did work on vanadium in Canada. I evaluated silica; sources necessary for the production of ferro-silicon and silicon metal. I still have some of those metal samples. So, I worked on a number of mineral commodities, but basically, my job was the lithium. So, I traveled practically everywhere. I had the opportunity to visit the largest lithium pegmatite in the world (Manono-Kittotolo in the Congo). However, the political environment is not very stable.

16:30 The Connection Between Lithium, Hydrogen Bombs, and 7-Up

Kunasz:

In the 50s, the Atomic Energy Commission decided to make the hydrogen bomb, and the hydrogen bomb is based on the bombardment of the lithium six isotope, which is the reactive isotope, to create a tremendous amount of energy, which in the case of a bomb, the purpose is something different. Ultimately, as a side comment, if that thermonuclear energy could be harnessed, there couldn't be any problem with energy in the world. The problem is, that during the initial reaction, you have to contain the temperature of the sun for a nanosecond. There is nothing available today except the Tokamak reactors, which uses a force field that would allow that initial reaction to proceed. And, after that, you're fine. The other interesting thing, besides that, the lithium seven isotope, which is 94%, is the common lithium that goes into practically everything. In those days, there was 7-Up. If you drank 7-Up, the 7-Up was because you had lithium seven isotope in it.

So, sort of a side thing, but perhaps one of the major applications, and I love the history. You heat something, it expands. You cool something, it contracts. If you do it too fast, it cracks. If you put lithium into the formulation of the glass, nothing happens. It can go from freezer to stove without cracking, and that's in Corning Ware. Foote Mineral Company sold the lithium to Corning to make that. These are other uses that I like to talk about. The Air Force had a problem with lubrication. What happens, the lubricant is a stearate, and if it's a calcium-based stearate, what happens is that it becomes a soap at low temperature, not very good. The sodium-based stearate, on the other hand, becomes a liquid at high temperature, not good either. The lithium stearate stays a stearate and behaves as a lubricating grease through all the temperature range, which they love. So, today, if you go buy white grease in the store, it's a lithium grease. All of the greases today, practically, are lithium greases. There are other applications: in air conditioning, in pharmaceuticals. There's a big application, but those are the main ones. Obviously, in electronics, lithium metal is the next major component because that runs all the iPhones, all the computers. They're all based on lithium metal batteries and, perhaps, in the future, cars.

19:29 Early Mentors – Doctors Stehli, Wright, and Schmaltz

Wilkinson:

We'll probably come back to some of that later, but let's go back to school a little bit. Were there any of your professors or any of your classmates that were mentors or influenced you in your studies?

Kunasz:

I would have to say that the one that really pushed me or at least directed me to geology would be Dr. Stehli at Western Reserve. And, the one event I remember --he was a great mentor -- I had to write a senior thesis, and I thought it was brilliant, and it came back all red. And, I learned the

lesson very well because he said, "You know what the problem with your paper was, is that you wrote it assuming I will understand what you're trying to say." He says, "You should write in such a way that anybody could pick it off the street, and perhaps not understand all the technicalities, but they would understand what you're trying to say." So, that stayed with me. That was probably the one mentor; you know, that I can remember well. The other two obviously are my advisors at Penn State, Dr. Lauren Wright, on the geology of my thesis, and Dr. Bob Schmaltz, on the geochemistry of my thesis.

Wilkinson:

You did mention that you had internships with Foote. Did you do any other internships before that?

Kunasz:

No, no, no, no, just that one. It was a three-year fellowship that I had to try to unravel the origins of the lithium in Clayton Valley, Nevada. That's what I did.

Wilkinson:

Did any particular political or cultural events affect your studies? We talked a little bit about lithium and brines.

Kunasz:

There really wasn't. In retrospect, today, my son is a surgeon, and he was in the military. In fact, he just got out two years ago as a full bird Colonel, and his friends were all doctors in the military. And, I remember when I would come back from a trip, two years later there seemed to be a revolution or something. They would look at him and say, "Yes, oh yes, yes, your dad is a geologist. Yes, we know, we know." But, even in retrospect having been in Zaire, what's going on today, and if you look at Zimbabwe, what's going on today, some of those places, it used to be easy to go there and work there, but today I just don't know whether I would go. And, you would know well, because you've been in Zaire, obviously. So, but no. Was there an impact on my decision to change or anything? No, there was not, no.

22:20 Expanding Foote Mineral Company from North Carolina and Nevada to Chile

Wilkinson:

So, you talked about your first international job. What were your job duties like in that first year?

Kunasz:

Well, two things: one, Foote Mineral Company had a spodumene reserve of pegmatite in North Carolina, and the job was to direct drilling so that they would identify the best parts of these pegmatites, and then, also track the resource to be sure that we had enough. The other one was with the lithium brine. So, with the brine, that became, truly, the most important part of my activity. Number one, at Silver Peak, Nevada, obviously you have a finite liquid. So, I was able to develop a projection that would tell them how long and how weak your lithium will become with pumping. In Las Vegas, there was a lithium conference, and I talked to the Silver peak hydro-geologist, and she told me, she says, "You know what? We are right on your projection graph." In brine deposits, you start pumping the rich part, and the peripheral dilute brine moves diluting the reserve. There is no

question about it. And then, looking at new deposits, so, this was -- and I have to backtrack-- If I start writing about it, Clayton Valley was the very first lithium brine deposit from which lithium carbonate is the first product out. Well, later, we'll find out that that wasn't so good because all the costs went to the lithium.

Kunasz:

And, in Chile, I'll address that later, lithium is a secondary product. So, basically, it's free, and that caused a certain revolution within the lithium industry. So, I did the exploration in Nevada, on the playas, the dry lakes in California, and then Chile. In 1974, after Allende is deposed in 1973, correspondence starts between the Chilean government and Foote Mineral Company. "We understand that there is some rich brine." "Yes, we have rich brines, but could you tell us how you process your brine in Nevada?" "Well, we're not willing to tell you until we sign an agreement." And, in 1975, Foote did sign a feasibility study with the Chilean government. And then, my job was to conduct exploration over the whole Salar, 35 miles by 35 miles of salt that is very rugged. It's not smooth; everything is just compressed. So, it had to be done by helicopter, portable drill to test the brine. Thank God the brine was only 50 centimeters below the surface, so we could drill two feet and collect the samples as we went. And, when that was done -- well, I don't know if this is the appropriate time -- but then we started to do the work on drilling to confirm that there is enough flow from the salt. We confirmed that there is; it's like a Swiss cheese on top. For those who might be interested, we pumped a hundred foot well. And pumping at a rate of a thousand gallons a minute, just 50 centimeters. It was like pumping from a lake, and it's still like that today.

Some of the other activities besides tracking lithium, involved limestone, which was used in the original process of recovering lithium from spodumene. [This] was called the calcination, which blended limestone with the spodumene, burned it, and then you would get an impure lithium hydroxide. So, I had to track the limestone reserves of the properties in Virginia, where they had the operation. And then, what else? I evaluated vanadium deposits because the Vanadium Corporation of America had vanadium properties in Northern Quebec. Foote was interested in boron, so I did borates. So, I did a variety of industrial minerals, but the focus really has been lithium in pegmatites and lithium in brines, basically. In Chile, just for comparison Silver Peak Clayton Valley, Nevada, we started about 400-500 parts per million lithium. Then, the concentration started going down because demand for lithium increased and pumping increased. You have to remember, there were only two companies in the world that were producing lithium chemicals, and that was a \$100 million a year industry. That said, today, it's way more than that. In those days, we were not concerned very much about looking for more lithium, because I would have loved to do a lot of research on lithium. But, in a business environment, why do we need more lithium? We have enough of it.

27:49 Foote Mineral and Chilean Project Boundaries

Kunasz:

So, this is what happened: the Chilean concentration, if I said 500 to start, maybe it's 200 today at Silver Peak, it is 2,000 to 4,000 parts per million at the Salar de Atacama. It's extremely rich deposit, and I don't think anybody can compete with it. So now, we are negotiating with the government, and suddenly the government says, "You have a brine operation in the United States. You want to control the Salar at the Atacama; you're not going to develop it. You're just going to sit on it, you know?" So, they forced us to the southern part, and this is where I want to point out a very scientific approach to how to draw boundaries on a salt flat. I am in Paris at the international conference on geology. My family is with me. We're all asleep. Three o'clock the morning I get the

call from Chile asking me to define the boundary of the property that the government will let us have. And, there I am at three in the morning with maps on the bed drawing very scientifically. Well, I knew enough about the chemistry, but to do the property that today Foote Mineral Company acquired, and in the North, nobody did anything.

But, I'll address that because it's a very important part of what happened to the spodumene pegmatites. If I may, Chile is a big nitrate producer. To make the nitrate fertilizer, you need potash. So, when you go buying some fertilizer, you know, you have the NPK, the nitrogen, the phosphate, and the potassium. At the time, Chile was buying the potassium from Canada, too expensive. Soquimich's chemists figured out that the brine is so different in the North of the Salar that, if they blend that brine, they can make potassium chloride. And then, that brine, they would transfer it to different ponds and make potassium sulfate which is preferred by potatoes, tobacco crops. So, they made that, and, in the process, suddenly, what do you do with the residual brine that has a very high lithium concentration in it? So, Soquimich decided to enter the lithium business. They were able to drop the price of lithium by half, and they shut down the two North Carolina pegmatite operations. Foote Mineral company shut down in '97. And, the thing that I'm trying to tell all the newcomers into the business is that Soquimich has so much of that lithium brine, they would kill the market if they produced everything. They're very good businessmen, produce enough to satisfy demand, and they pump the excess back into the salt. And, it is a brine that is much richer than what they pump out. So, as the Chileans say, "Ojo, watch out what you are wishing for as a newcomer." So, this is what happened, and my job also was to track the resource at the Salar de Atacama on the Foote side of the property to be sure that there is enough for a long period of operation. And, there still are.

31:27 Transition from Research to Field Work – Ukrainian Background

Wilkinson:

Going back to that beginning, your first job was to direct drilling exploring for spodumene. You're a graduate student at Penn State. Did you have somebody who taught you how to log drill core or how to act around a drill rig? Or did you just have to go out there and learn it yourself?

Kunasz:

No, I had to go out and do it, just had to go out and do it, because they don't teach you those practical things in school. For example, Mary Poulton and Hugh Miller, invited me into the University of Arizona to be what they call a Professor of Practice. Well, what I did is organize weekly seminars because, around Tucson, there are so many retirees from the mining industry. So, I brought them in to talk to them an hour about law, environment, pollution, all the drilling, blasting, etc. They would all come in and talk to the students, and I would tell them that this is what you are going to be doing the rest of your life, and I'm not interested in your books. Read your books; this is what you are supposed to do. I'm trying to give you something practical. We did not have this at Penn State. We had field trips, but none of the experience that you were talking [about], but I became very good at it.

32:56 Dr. Foote and Dr. Richardson – The Influences of a Mineral Collector and a Computer Guy

Wilkinson:

At Foote or maybe even after, but specifically at Foote, early in your career, did you have any major mentors or influences there?

Kunasz:

Well, I don't know, this is for history, but Foote was a big lithium producer. Dr. Foote was a great mineral collector, and those who collect know about him. After his death, the Foote family decided to not continue with the mineral business but to supply of a large quantity of unusual and rare minerals. So, this is how the business developed. But, I often felt that they were a bit of a provincial company. You did your job, and you worked with other people. For example, with the research department with Dr. Richardson, brilliant computer guy in metallurgy, and when I talked to him about the salt in Michigan, and that the salt is layered: thin, thick, thin, thick. He said, "Give me your measurements, you know, see what I can do with it." So, he comes back to me, and he says, "You know, you have cycles in you salt formation." The salt was probably twice the height of this room, and I said, "Well, fine, we have cycles, so?" He says, "Well, my analysis says that your layers show 7, 11, and 21 year cycles. And, my computer program can't go beyond that." I said, "Well, fine. I don't know what it is." Dr. Richardson says that these are sunspot cycles, Silurian, 400 million years ago. The sun controls your climate. End of story. So, these are the people I enjoyed very much. But, otherwise, I did my job, resources, reserves, calculate something, and the salespeople are the ones who sell the product. And, the problem at Silver Peak, you know, that one year I remember they wanted more product. And, I said, "Guys, mother nature is going to give you a problem, and 60 feet under that salt flat is a salt layer." They said, "No, no, we need more lithium." So, we started pumping at a higher rate, and what happened? Salt is very porous and permeable, sucked in freshwater, and overnight a wall the brine in the pond was lost because it collapsed due to salt dissolution. So, you know, these are the sorts of things you can't help; you know, we have to sell lithium. You tell us what to do.

35:27 Career Development – Working on Interesting Projects

Wilkinson:

So, how high did you rise in Foote? What positions did you hold? We'll talk a little bit more about your career after Foote.

Kunasz:

No, I was Chief Geologist. That was my position within the company. Later, I became a board member of the Sociedad Chilean de Litio, the joint venture between Foote mineral company and the Chilean government.

Wilkinson:

We talked a lot about lithium and talked about places you've worked. We know you worked in gold, but where else in the world have you worked, and on what kinds of projects?

Kunasz:

In terms of residing, you know, and working, Chile is the main place. The Russian Far east is the second one, where Cyprus Minerals Company developed the very first western gold mine. Interestingly, it was the result of the Eisenhower People to People Program that put together 18 mining engineers. I was one of them with Steve Thomas. And, we traveled all across Russia, and

we ended up in the Russian Far East, in Magadan. After meeting with the geologists, they came back to Cyprus to ask, and I always remember the question, "We have this quartz deposit with 20 grams of gold in it, okay, and we've done all of this trenching, the tunneling, the sampling, which, you wouldn't believe, took 15% out of the deposit." That's the way the Russians worked. And he said, "how long would it take you to develop this mine?" So, I remember we said, "well, 16 months, 18 months." "Enough," he said, "enough." And, they signed a contract because they had been years on this deposit, and they couldn't develop it. So, this is what happened, and I spent quite a bit of time developing the relationship. And, when I was at the U of A with the seminar students, I had one lesson with them on working in foreign countries. In the Soviet Union, and then in Russia, there were three mining schools, big mining schools: Petersburg, Moscow, and Dnipropetrovsk in Ukraine. And when you graduated, you didn't look for a job. A mine called you, and they said, "We need five mining engineers, please. You, you, you, and you are assigned to a given mine." And, the rest of your life, that's where you worked.

37:48 Differences Between Russian and American Business Practices

Kunasz:

Now here come the cowboys, the Americans. So, we go over their plans, their data. "Oh, John, we need you in South America." John is gone, and then Mike appears, and Mike restarts the same process again. And, the third time, I remember the chief geologist comes to me, he says, "Ihor, don't you guys trust us? You keep on sending these new guys. The data is the same, and we signed a contract." It was the first contract in the former Soviet Union where we had the right to export gold, actually to London; they wanted to pay us in rubles. But, no, no, no, no, London where the gold is delivered. They pay us in dollars, and then we split it at that level. So, this is where I spent quite a bit of time. I had to learn Russian, understanding working with Russia. And, because Ukrainian is my maternal language, it was easier to learn. Russian is to Ukrainian as Spanish (which I speak fluently) is to Italian. They are very close. But, you have to learn it. My wife speaks Russian fluently. I had to learn my Russian. I had to learn the 30% differences. Knowing languages helps you develop a relationship with those people, because there are places where nobody speaks English. So many young managers would come with their contract and believe that in two weeks you're going to sign it. No, relationships first develop. You look at him, he looks at you, a shake of hands, and you are in or not. Although they said it, they rarely follow on their contracts. But, this is so different because here, you change jobs every three years here, two years there, and so on. Although I don't know you, you come work with me, I say, "Hey, how are you?" "Well, fine." It doesn't work with them. And, that's [how] many Western companies make mistakes like that. They don't understand it, the underlying structure.

39:41 Working for Layne Drilling in Bolivia

Kunasz:

So, I would say this, in the between period, I was Vice President of Layne Drilling, a water drilling company and the reverse drilling process in Bolivia. And, my job there was a bit quite funny because Bolivia had a lot of French support. They put out the bid, and they were sure that the French drilling company was going to win the bid, not the American. Layne got the drilling bid. So, as a result, they forced on us advisors from BRGM, you know, the French Government Bureau de Recherches Geologiques et Minieres, to be sure that we do the things right. Then, on top of that, some people in the government didn't want the water wells. They wanted to put a dam for water.

So, here I am, in between, you know, yelling in French, yelling in Spanish, and trying to convince our guys in the U.S. that we'll be doing all right. After much haggling, Layne said, we will pick the drilling site, and if it does not produce water, Layne will not charge for the drilling. It turned out the well-produced 1000 gallons per minute. But, this is where I spent about a year in Bolivia on that. And, I was very comfortable with it because that drilling technology for brines, the dual-wall, reverse rotary technique was an excellent method.

41:49 Technical Challenge of Drilling a Salt Flat

Wilkinson:

Very widespread experiences. Obviously, the challenge you had in Bolivia was between the technical and political aspects. What were some of the biggest technical challenges that you've experienced in your career?

Kunasz:

Probably I would say to try when you're drilling a salt flat and it's sands, it's muds, it's salt, to try to figure out, out of the mud rotary drill, what it is that you're getting under there. So, when the change of technology, the dual-wall reverse rotary, came in that was wonderful because, after that, there really wasn't much challenge. And, the beauty of it is, in a brine deposit, you're looking for liquid. The sediment is a bit irrelevant except to identify the layer – the aquifer from which the brine comes out. What was very interesting, I always joke about it to the people that I can sell you a very expensive testing equipment. You know, when the driller knows when the water starts flowing out of this hole, and I said, "I'll sell you expensive equipment, a 20-gallon bucket, and a stopwatch." That's how, in the early days of exploration for brine, you know how much water comes out, and you don't have to go through all these geophysical things. But that probably would be, in pegmatites, it's very straightforward. You drill, and you know what you have. But, in the brine, this was that technical change that allowed us to really see what we have underground.

Part 2

Coming soon.