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K-25 Oral History Interview

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Interviewee: John Shacter

Interviewer: Jennifer Thonhoff

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[1:01:32]

Thonhoff, J.: If I could just have you state your name and spell it for me, please?

Shacter, J.: John Shacter. J-O-H-N S-H-A-C-T-E-R.

Thonhoff, J.: And where were you born?

Shacter, J.: In Vienna, Austria.

Thonhoff, J.: And where were you living prior to working at K-25?

Shacter, J.: In Philadelphia.

Thonhoff, J.: Philadelphia?

Shacter, J.: Pennsylvania. That's where I -- that's where my family -- the American branch of my family lived and I lived with them. That's where I finished high school. And it's where I went to college; got a degree in Chemical Engineering in 1943.

Thonhoff, J.: And prior to that, you said you were born in Austria?

Shacter, J.: Right. I was born prior to that. [laughter]

[1:02:25]

Thonhoff, J.: And can you tell me about Austria?

Shacter, J.: Well, that's the western part of Austria. Tyrol and places like that, like Switzerland. And the eastern part of Austria's less mountainous -- more hilly. And of course, the Danube goes through Vienna. It's a beautiful country. 'Bout 6 million people.

Thonhoff, J.: Wow!

Shacter, J.: Not very large. 2 of 'em, 2 million live in Vienna because it was the capital of the old Hapsburg Monarchy and that took in a lot more countries than little Austria today. And course, the Germans took it over in 1938. When the Germans marched in one side, I marched out the other side. I figured that either Hitler or -- there wasn't room for both of us; one of us had to leave.

Thonhoff, J.: [laughs] And so you said you went to school prior to coming to K-25?

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Shacter, J.:

Yeah. I spent from 1938 to 1943 finishing high school, accelerated English and American History's basically what I needed. The rest of it I had in Austria. And then went to college and got my degree from the University of Pennsylvania. And so in 1943, 5 years later, I got my citizenship papers, takes 5 years, and a few days after that, I was on the Project.

[1:04:10]

And I visited Oak Ridge briefly in 1943. And actually was interviewed by Y-12, by Tennessee Eastman and didn't take that job because they wanted me to just stay down there in the -- as part of the interview and I couldn't do that. I had some obligations up north, told them I'd be glad to come back and they said, "We can't do that." You know, budget situation, so I said, "Well, fine, I'll -- I'll see ya."

And then Union Carbide invited me to New York and I'd already been at Oak Ridge. I interviewed in New York and they said, "We can't tell you where you're going. If -- if you take the job and I hope you do, it's got a lot of math and engineering, it's a secret site, and it's down in Tennessee. And we can't tell you more than that." And of course, I'd just come back from Oak Ridge interviewing with Tennessee Eastman, so I said, "Are you talking about Oak Ridge, Tennessee?" And you could've heard a -- were a lot of desks and interviewers and you could've heard a pin drop. Every -- everybody knew that I had blurbed out something that I wasn't supposed to, that they thought I wasn't supposed to, but I was innocent. Nobody told me to [laughs] keep it quiet, so.

[1:05:41]

The person interviewing me was a former Dean in -- in college, Kleintaub, Dean Kleintaub. Anyhow, I got the job. They didn't throw me in jail and I worked at Columbia University the early part of 1944 and then came down, quote, permanently, in the middle of 1944, assigned to K-25. And the first place where I worked was at Wheat School. Have you heard of the Wheat School?

Thonhoff, J.:

I have.

Shacter, J.:

-- anybody? And that was a school that was of course, evacuated by the civilians and we decided -- not we, they decided to run a -- Union Carbide decided to run a school telling people what K-25 was all about. So I came down there and the -- my teacher was

Paul Vanstrum, then for a week, he had to go to the -- to the plant to start honest work and they went to me and said, "You have -- you're going to be the teacher next week." So I was a [laughs] rapidly transformed teacher and then the next week, I told the rest of the groups what Paul Vanstrum had tried to tell me in the -- in the first week. So things moved pretty fast.

[1:07:14]

Thonhoff, J.:

Yeah.

Shacter, J.:

We -- they called us "baby engineers" and it wasn't too long before some of us had to do the work of really experienced people that we would never have gotten the chance to do in a normal situation, but they were so short of technically-qualified people that they gave us responsibilities that were unusual for our age. So we had a lot of fun, worked long hours.

A normal working day was not 8 hours, but -- and we would live in dormitories in Oak Ridge, took the bus out and back through a number of gates and all that stuff. Course, the whole city was gated and -- behind a fence. So it was an unusual situation.

[1:08:12]

And I loved to dance, so I went to the local dances and met a lot of gals. That's also how I learned English because I figured if I'm going to ask an American girl for a date, I'm not going to ask her -- I'm not going to be able to ask her in German.

Thonhoff, J.:

[laughs] No.

Shacter, J.:

[laughs] When I came into this country, I was 17 years old and that was a mighty incentive for me to crash learn English.

Thonhoff, J.:

Yeah.

Shacter, J.:

And course, fortunately, the -- my family didn't speak any German, either. So it was sink or swim. So I had one -- I had German/English dictionary -- elocution dictionary in one pocket and an English/German dictionary in the other pocket and off I went to the races.

Thonhoff, J.:

Wow!

Shacter, J.:

Didn't take too long.

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Thonhoff, J.: No.

Shacter, J.: I have big ears and I could hear my own accent. [laughs]

[1:09:07]

And my friends kept correcting me. I still remember Cuthbert Daniel was a statistician at K-25, kind of a crazy guy. And he says, "John, you ask me to correct your English." Said, "That's right." He said, "The word H-O-W does not rhyme with the word K-N-O-W." [laughs] I thought about it and he was right! [laughter] I had been rhyming it. So that's how I learned -- with a lot of help -- that's how I learned to speak English with less and less accent.

Thonhoff, J.: And you wanted to get rid of your accent?

Shacter, J.: Sure! Why not?

[1:09:51]

Thonhoff, J.: What are your first recollections of K-25 when you first got there?

Shacter, J.: Well, there was nothing there. They were building the buildings, the individual buildings and I knew about the principle of separation, you know, wasn't that complicated. In fact, I'm a co-author of gaseous diffusion chapter in the Encyclopedia of Chemical Technology that John Wiley publishes. And I was one of two or three co-authors in each edition, explaining to the reader what gaseous diffusion is.

Thonhoff, J.: Can you go over some of that?

Shacter, J.: Yeah, well, gaseous diffusion, basically taking two components that you would like to separate, in this case two isotopes, both uranium hexafluoride -- oh, this is unclassified -- and you take the mixture in a tank, basically, and you got membranes in the tank. Some people call them "barriers", whatever, and the lighter isotope goes a little bit faster than the heavier isotope, so it zig-zags around and finds the pores a little bit easier than the heavier ones, so you get a tiny separation at each stage, each tank. But then you wanna go from normal, which is less than 1% Uranium 235, which is the isotope that you want, and you wanna get up very high, so it takes a lot of those tanks in series to make the -- complete the separation to the point where you wanna stop. And, of course, you gotta have

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something pumping the gas around, so you have compressors and in the old stages, you had two compressors per stage.

[1:12:04]

In the new stages that Carbide later on designed -- and by the way, I have the -- the \$1 certificate that everybody got for inventions on changing the stage design from the old type to the new type -- that was one of the patents that -- well, normally, it would be a patent.

Thonhoff, J.:

Right.

Shacter, J.:

In this case, because of classification and also because the government is not very business-oriented, instead of taking a patent, it was an invention. And I got a letter from Clark Center, this form letter from Clark Center congratulating me on the award of the invention which never was a patent and -- and a dollar. A shiny new dollar fastened to the page, so each time I made an invention, I got a brand new dollar.

[1:13:03]

Thonhoff, J.:

Wow!

Shacter, J.:

Yeah. [laughs]

Thonhoff, J.:

And so what did you invent?

Shacter, J.:

I invented the layout of the stage, I mean, fact that it had one compressor rather than two compressors, all that stuff that goes with that, much more efficient stage. I invented the cell design. The cell has several stages in it and can be -- can be isolated, and then I developed the whole cascade which all of the cells and buildings and how to connect them.

Thonhoff, J.:

Wow!

Shacter, J.:

Some of it was with co-authors and some of it was myself. So when you look at the key differences in some of the demonstration cells today of the old stages versus the new stages, old stages had two centrifugal compressors and the new stages had one large compressor per stage and other changes that -- that are readily apparent to the eye when you look at it from the outside. Those differences were due to the inventions that I -- that I either made -- the -- alone or with one or two co-authors. So I got credit for that.

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Now, it didn't make me rich, [laughs] but I got \$1 for each invention. [laughs] That's better than zero.

[1:14:37]

Thonhoff, J.:

Indeed!

Shacter, J.:

Not much, but a little. [laughter]

Thonhoff, J.:

Little bit.

Shacter, J.:

Yeah, a little more prestige.

Thonhoff, J.:

Right. And you have it to keep forever now.

Shacter, J.:

Uh-huh. (affirmative)

Thonhoff, J.:

And --.

Shacter, J.:

Talk about prestige, let me just say my first title in joining Union Carbide was Junior Cadet Engineer.

Thonhoff, J.:

[laughs]

Shacter, J.:

And I thought that was insulting because I thought Junior Engineer would've been enough. Or Cadet Engineer would've been enough. But they called me a Junior Cadet Engineer [laughs] which I thought was very insulting.

Thonhoff, J.:

Exactly!

[1:15:14]

Shacter, J.:

But I didn't stay in that category very long, got a big raise. [laughter] \$2 or \$3 a day. [laughs]

Thonhoff, J.:

What years were you there at K-25?

Shacter, J.:

1944 to -- well actually, later on I traveled between -- among the plants and Oak Ridge National Laboratory, but my home -- my office was at K-25 until I left in 1955 to go to Germany and work for the intelligence people and interviewing returnees from the Russian program we -- we figured out from the returnees what they were talking about. And then came back and left for good -- for 10 years -- in 1956. And then came back in '66 to eventually retire from this -- from Oak Ridge.

[1:16:20]

But in the meantime, I spent time up in New York and that was fun because that had nothing to do with nuclear energy. It was Union Carbide Corporation. And they asked me to first head new ventures, new business ventures which I did for a while and then made me head of Corporate Planning. And that meant that I had to re-define what we were basically in business for and how to define it and how to review managerial performance to see whether it was consistent with the definition. And then in the course of doing so, of course, had to get into financial stuff, too. And I remember meeting a lot of top bankers in New York. They didn't give me any money, so I'm [laughs] -- still didn't make me rich, but I did have a lot of fun talking to the -- I think the top people that worried about stuff like that, you know, what makes a business run.

How can you tell -- how can the top guy tell whether the guy under him is successful or not? What should he measure? And that's what I got into. And we eventually -- the little group that I headed eventually put out a what they -- what we called a planning manual that tell -- told you how to plan and on what basis to judge success and then it was used for performance reviews of both the business and the person. And the guy that was my boss for a while in the early days was Bill Humes who also came from Oak Ridge to the Corporation. And he was -- he's still living, is in Oregon, and I talk to him on the phone from time-to-time. Brave guy! And he's the guy that asked me to join him and move from Oak Ridge to the Corporation in 1956.

[1:18:32]

So that (indiscernible) that -- that's my career, so I got into technology, I got into management, but even after I got back to Oak Ridge in '66, '67, I was assisting the President of the Nuclear Division in management. I was an assistant in charge of teaching people management and -- really management and technology.

And then later on, I got into education in -- first on the college level and later on, after I retired, in public school. I even teach today. Mostly math, science, stuff like that that few people like to teach. And the kids hate math, but they like money, and I take full advantage of that, so when I teach 'em math, I'm explaining to them -- well, first of all, the examples come out of the money area. And I explain to them that there's no such thing as loving money

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and hating math because if you don't know numbers, you're going to be lost in money.

Thonhoff, J.:

Exactly!

Shacter, J.:

So I explain to them, you know, how -- that we live in a society where it's possible for a person to succeed or fail, but -- take chances, form your own business if you want to, work for somebody else if you prefer, and figure out what you're going to be doing when you get out of school. Because the purpose of an education is not to just educate you for nothing, but to educate you hopefully for a more pleasant and successful quality life, including quality employment or quality higher education afterwards. And by the way, we ain't doing so hot. I can tell you that right now.

[1:20:31]

Thonhoff, J.:

I know.

Shacter, J.:

Most of the kids getting out of high school don't know beans --

Thonhoff, J.:

Sure.

Shacter, J.:

-- about the world outside in every aspect. In fact, I've invented a 30-some question quiz that I can give to a high school graduate or a -- adult, for that matter, or a teacher. You say you've been in teaching before --

Thonhoff, J.:

Yeah.

Shacter, J.:

-- and you'd be surprised how few people can answer my basic questions and thereby prove that they really weren't well-educated for a good part of what life offers.

Thonhoff, J.:

Yeah 'cause one of my math teachers was actually telling me the same exact thing and he related math to money and life and everyday situations --

Shacter, J.:

Sure!

[1:21:20]

Thonhoff, J.:

-- every time would relate it back to money and that had me more interested. I like math anyways, but it had me more interested in learning, you know, what the ties were and how it would show itself in my life.

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Shacter, J.: Well, the textbooks are horrible. First of all, they're big, fat, they give kids hernias, but they don't give them education. [laughter] They're real complex and, you know, they outta put in about 30 pages, but they've got 1,000 pages.

Thonhoff, J.: Yeah!

Shacter, J.: And the other thing is that when they -- when the -- when they, for example, take statistics. They teach elementary kids about statistics. What do they teach them? They want to know what the difference is between media and average and mode and all kinds of stuff that's useless; just a bunch of definitions. Instead of teaching them that life -- if you're going to go through life and make decisions -- make decisions like, you know, money and stuff, but also who you're going to marry and all that stuff, you're talking about the future and the future's always uncertain.

[1:22:40]

Thonhoff, J.: Right.

Shacter, J.: And that's why we need to have probabilities. And the most important thing about statistics are not those silly definitions about averages but learning about -- how to work with probabilities.

Thonhoff, J.: Right.

Shacter, J.: And -- so that you realize that you're better prepared to make decisions the right way about the future.

Thonhoff, J.: Right.

Shacter, J.: But we don't teach statistics that way.

Well, at K-25, to get back to those early days, I guess I -- I enjoyed it even though we worked very hard. I enjoyed it; it was challenging both technically and people-wise. I soon became a manager and the thing that I'm proud of is that the people that worked for me generally remain my friends afterwards. I don't -- there's very few people that worked -- that ever worked for me that didn't remain as my friends when they didn't have to.

Thonhoff, J.: That's a real big compliment.

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Shacter, J.: [laughs] So I consider that a mark of success even if I didn't get filthy rich.

Thonhoff, J.: Absolutely! And if people asked you about what was going on at the facility outside --

Shacter, J.: Yeah.

Thonhoff, J.: -- what would you tell them?

Shacter, J.: We're producing front ends of horses --

Thonhoff, J.: [laughs]

[1:24:06]

Shacter, J.: -- to send to Washington for final assembly. [laughter] We had a few other things like that.

Thonhoff, J.: What are some of the other things, the stories, things that you would tell the people?

Shacter, J.: Well, even my wife who was a teacher in Oak Ridge, married her - - met her folk dancing and married her, one of the smartest -- probably the smartest decision I've ever made, but she -- I couldn't tell her what we were doing and she never really asked because everybody knew that slippages could occur, even unintentionally. And really, the -- the test of finding out why the person had to know something was a good test. And -- well, even today, I wish fewer people knew about how to make bombs and that kind of stuff. The knowledge of how to make a crude bomb has since proliferated. And there are too many jerks or criminals that populate the world today that know that kind of stuff and we're, therefore, living in a very dangerous world.

[1:25:40]

Thonhoff, J.: Right.

Shacter, J.: If I could turn the clock back and I can't, I would've preferred not to have nuclear energy in existence because I think the threatening part of it is worse than the beneficial part is good. And I think we're lucky that so far nothing, no nuclear war or attack has happened since Hiroshima and Nagasaki days. And most panels that advise the government today -- not most, all panels that advise the government today say that we cannot count on the safe period

to continue indefinitely. So obviously, we're too smart for our britches. We know too much technology and not enough about how to get along with people.

[1:26:38]

And education, you know, we -- we try to form a democracy and take pride that you go to a voting booth and pull a lever like a slot machine, and that's supposed to be a sign of democracy? To me, it isn't. If the person doesn't know beans about what they're voting on and they don't know who, you know, who their senators or -- or anything --

Thonhoff, J.:

Right.

Shacter, J.:

-- they outta stay out of the voting booth as far as I'm concerned, and not dilute the vote. So I'm not one of those that says, you know, get democracy, all you need to do is go to the voting booth and we'll have a democracy.

The Germans produced Hitler and you could argue that it wasn't because they were uneducated. They were the most uneducated people in the world. They were educated, but they were educated in special ways and -- nobod -- somebody forgot to tell them about -- how to get along with people and relationships and so forth. And so they were trapped after World War I. In Weimar Republic, the Weimar Republicans survived democracy; didn't survive when Hitler came into power.

It can happen to any people that are forming a democracy without knowledge. There's a joke of the guy that asked his friend Joe, "Joe, do you think our problems are due to ignorance or to apathy?" And Joe thought a while and then he replied, "I don't know and I don't care." [laughter] So it's both ignorance and apathy.

[1:28:32]

Thonhoff, J.:

Absolutely!

Shacter, J.:

[laughs] What else can I tell you?

Thonhoff, J.:

You know, why don't we go ahead and change tape? We'll do another tape and I'll go on to some of your --

[End Tape 1, begin Tape 2]

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[2:00:07]

Shacter, J.: Getting a little philosophy which [laughs] you didn't bargain for.

Thonhoff, J.: You know what? That's -- I actually really like that. I have a lot of the same philosophies that you have about teaching people to get along with people rather than to destroy them.

Shacter, J.: But you can't just do it to one side.

Thonhoff, J.: Right.

Shacter, J.: Yeah, a lot of people think it takes two to fight. Doesn't. Only takes one to fight.

Thonhoff, J.: It takes one to fight.

Shacter, J.: One attacker. [laughs] And we -- we should've learned that lesson. But, you know, thousands of years ago, between Athens and Sparta, that lesson was taught.

Thonhoff, J.: Right.

Shacter, J.: Athens was peace-loving, but that didn't stop them from losing the war.

Thonhoff, J.: Exactly. What are your most vivid recollections of K-25?

[2:01:11]

Shacter, J.: Well, the -- the things that are easiest to talk about are the funny things that happened. I recall, for example, that I -- I couldn't -- I didn't know how to drive a car. And in Philadelphia where I went to high school -- finished high school and college, so when I came down here, all the fellas knew how to drive the cars, but I didn't. So it kind of made me angry and I went back on vacation to Philadelphia and I took out a six-hour -- I mean, six-lesson, three-hour driving course. But I took it all at once because I didn't have much time. So for three hours, I learned how to drive a car.

It was snowing in Philadelphia, I drove to the police station with the instructor, and I passed the test, but what they didn't realize -- see, the only reason I passed the test is because I -- the snow permitted me to drive very slowly so I could steer all right. [laughs] But the fact was that I was really not a -- really not prepared for driving. [laughs] In ordinary weather. But they

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thought I was a very safe driver because I was driving slow, they didn't realize that was my top speed. [laughs]

Thonhoff, J.:

That was a fascinating story.

Shacter, J.:

So then I came back to Oak Ridge and we had a truck in our group and keys were on the board. And you -- one of us would take the keys -- I said one of us, one of them, would get the keys off the board and drive the truck.

[2:02:58]

Well, after I had my driver's license, I rushed to the board and driving to the lunch, and I had the keys and got in the driver's seat and impressed everybody with the fact had a driving license and it was raining. And I started the truck with people inside the cab, crowded, and people riding in the back of the truck. And all of a sudden, as I was headed into the street, they -- I heard the thuds of the fists on the top of the cab. And I looked around and there was a fire engine coming behind us directly at the truck. [laughs] Two or three people jumped off the back end of the truck. [laughs] We couldn't hear 'em because the windows were up. None of the people in the cab, it wasn't just me, heard that fire engine approach.

Thonhoff, J.:

Wow!

[2:03:57]

Shacter, J.:

But it approached. And when you were in the back of the truck, you knew it was approaching. [laughs]

Thonhoff, J.:

A little scary out there. [laughter]

Shacter, J.:

So they jumped off and for a while, I had a hard time getting those keys off the board; somebody would always beat me to it. [laughter] Even though it was really not my fault that [laughs] -- that we couldn't hear 'em inside of the cab. So that was one of the funny things.

Was a time that Clark Center had a visitor from Texas who wanted to see the plant and Clark -- Clark Center was very proud of K-25. He was the head guy. And he drove him all around the place because Texas guy was a millionaire and he was well-connected politically. That's why he earned the right to have Clark drive him around. And after the tour, Clark sat and turned to the Texan and

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said, "Well, what do you think of it?" And the Texan said, "Heck, we got outhouses in Texas that are bigger than your plant." And Clark Center looked him up and down and says, "You need 'em!" [laughter] He -- he was quite a -- he didn't laugh much, but he was a very -- had a very dry sense of humor.

[2:05:22]

Thonhoff, J.: (indiscernible)

Shacter, J.: And this is a typical story on Clark Center. What else can I tell ya?

There was one guy that came down from Union Carbide from South Charleston who was Clark Center's boss. And he was interested in saving money and he would go to the laboratory and look around, says, "You got too much glassware and stuff." Here we were trying to build something to make a new bomb [laughs], spending billions of dollars [laughs], and this guy was interested in the glassware. How much stuff -- how much -- or whether the girls on the -- on the -- on the boards were asleep or not; didn't have anything to do.

You know, we were -- we were overpopulated with workers in those early days. We didn't know whether we would need 'em or not; nobody had ever operated a plant like that. So there were a lot of people hired that really weren't -- weren't needed. In fact, if you have too many people, you can get in trouble sometimes because they don't know what to do and they do the wrong thing sometimes.

[2:06:29]

Thonhoff, J.: Right.

Shacter, J.: So the -- the employment was sharply reduced from the early days not because the people were lousy or anything like that, but they weren't -- there weren't enough jobs. They weren't needed. Just sitting there and watching the valves is for the birds. So K-25 started with a very large complement of people and a lot of them were not needed and were let go. And it was trimmed down. And there were certain, gals mostly, that operated instruments that I will not get in -- I don't think it's classified, but I like to stay away from things even in the gray area, so I'm not going to tell you what they were doing.

[2:07:24]

But we supervisors were on bicycles. And I had to be careful that I didn't spend more time with one station than with the other station because the gals were keeping track, and boy, if you spend too much time in one station, you were being accused of being partial. [laughs] So I learned a lot about supervision at a pretty young age. [laughs] Also learned a lot about girls. [laughs]

Thonhoff, J.: There you go! [laughter]

Shacter, J.: What else can I tell ya?

Thonhoff, J.: What did you like the most about working at K-25?

Shacter, J.: Well, the opportunities that in a normal situation, I wouldn't have - - just fresh out of school, one of the baby engineers, I wouldn't have gotten the opportunities that I did get, so my early career was like a whirlwind. And it didn't take me long to get into management, both technical management and other management. And I learned a lot about research, development, design, I headed the design group, that's when I got those inventions covered, and production. And the only thing we didn't have was sales. [laughs]

[2:08:44]

The government was the boss and the government knew what they wanted. It wasn't until much later that gaseous diffusion produced a product that could be sold to -- to reactor people. Because one of the things you -- if you enrich uranium, it -- it produces fission which is the energy-producing act much easier in a smaller scale than if you don't enrich it. It's very hard to build a reactor, nuclear reactor, with -- with -- with normal material, feed material. You have to have enriched to really shrink the size of the reactor, the whole reactor, which is enormously expensive. A little bit of enrichment of uranium -- this is -- everybody knows this, not classified at all, but if you enrich the feed to the reactor slightly, you shrink the capital cost which is practically the total cost of nuclear energy. Leaps and bounds. So then it was a -- we became a sales-oriented organization. Except we didn't -- nobody knew how to sell, including the government, or to run an operation that was selling something. So the government screwed it up promptly and we held the price high too long and all the foreign competitors, you know, we held an umbrella, a price umbrella, over their head, in effect. So it didn't rain on them. And they were able to operate ineffectively, or inefficiently, for a while and we still gave 'em a chance to get in the business. Of course, then they learned and

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became very capable. The same people became very capable competitors.

[2:10:43]

Now, in a normal situation, a business manager wouldn't be caught that way. When he sees competition, he starts lowering the price. You know, it's just common sense.

Thonhoff, J.:

Yes.

Shacter, J.:

But the government didn't do that because every politician has a short-range interest and he couldn't care less about the long-range interest. That's not true of all politicians. But [laughs] most of 'em. I'm not going to be kind to them. Most of them. [laughter] So consequently, the country doesn't do much long-range planning. We're running on a near-term basis and the near-term goals and the long-term goals are not always the same. So -- and that's true today, and I guess it'll be true tomorrow that -- and that's one reason for getting the ordinary voter more educated because he can smell that and a politician that's short-range oriented -- oriented toward his next election and what makes friends and influences people, will not get re-elected if he has a smart population.

Same thing on media. By the way, I'm a member of the Society of Professional Journalists 'cause I've written columns and stuff. And it's obvious that news -- that the media, when you ask them, they'll admit that, caters to an audience with a junior high school education. Everybody knows that. So that means that the real important things sometimes cannot be discussed. Because they -- they would lose readership and go bankrupt is what their fears. So really, a educated population will give you better media as well as better government and better information, and a poorly educated population, which we have, by and large, you know, exceptions, ye and me excepted [laughs], but basically, we have a poorly-educated population. Not as poorly educated as, say, I don't know, the Hottentots. Don't want to insult anybody.

[2:13:11]

There are plenty of nations where the populations are even more ignorant than our population, but for the -- for the largest power in the world, to have as high an uneducated population is inexcusable. And it has lowered the quality of the media and the effectiveness of the media as well as the quality of the government.

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Thonhoff, J.: Absolutely!

Shacter, J.: On both sides and that's got nothing to do with whether you're a Republican or a Democrat. Yeah. Both parties. Right now, the -- both parties are neglecting the border between the United States and Mexico, and the reason they do is because in the next election, the rising Mexican or Spanish speaking portion of the population may not vote for you if you do the wrong, quote wrong, thing, so a lot of our policists today are geared by the fact that the ordinary politician has his wet finger up in the air and doesn't dare -- goes by polls -- another silly thing -- but he's right and I'm wrong. I mean, if he wants to get re-elected, he's got to do it his way because he can't single-handedly educate everybody, but -- but my point is all of us need to get active on this because we ain't going to be on top of the heap very long in the future if we don't get our people better educated.

[2:14:59]

Thonhoff, J.: For sure not. What did you dislike about K-25?

Shacter, J.: Not very much. The -- the community was a little rough, you know, buses and people going through the buses checking identifications and that kind of stuff. We ate a lot of dust; both in Oak Ridge proper and also at the plants. And --.

Thonhoff, J.: What's the difference between Oak Ridge proper and the plants?

Shacter, J.: Where the people lived.

Thonhoff, J.: Okay.

Shacter, J.: The plant is where they worked.

Thonhoff, J.: Right.

Shacter, J.: And the town is where they lived and if for no other reason than safety, they didn't know how dangerous those plants were gonna be and so they separated them by -- preferably by hills, not only distance, but Tennessee is hilly and they would put Oak Ridge proper, the residential area, in one valley, in one part of the valley, would put the plants in different valleys -- each plant is in a valley -- separated by mountains or hills is a better way to say it -- from the next plant as well as the residential area. Although people didn't talk about it, that was done in the early days to -- from a safety point of view. If -- if you had one plant exploding which

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was highly unlikely, never happened, at least it would only affect that plant, not the next plant, and not the residential area.

[2:16:37]

Thonhoff, J.:

Right.

Shacter, J.:

So safety and security were two factors that dictated that the plants would be in dispersed areas, not one right next to the other.

Thonhoff, J.:

You're talking about safety. What kind of safety precautions did they use at the plant?

Shacter, J.:

Enormous emphasis on safety. That was one that that Carbide believed in and if you were supervisor and had what they called lost time accident, which wasn't just an accident but you lost some working time, that would be a black mark against you. And people avoided it like the plague. And the safety record on the Project, in all of the plants including Oak Ridge National Laboratory, was much better than industry at large. You could work in Oak Ridge at any of the plants much more safely than you could in ordinary industry or business, according to the statistics of accidents or lost-time accidents.

[2:17:55]

Thonhoff, J.:

And how did they monitor that?

Shacter, J.:

Lot of safety people running around, hopefully catching things before they got to the stage of lost-time accidents. If there was an accident, the safety people would consider it as a negative on their -- on their performance review 'cause they didn't catch it ahead of time. So we spent a lot of money on safety as well as security.

Thonhoff, J.:

Did they provide any type of health facility or anything?

Shacter, J.:

Oh, yes. They had health physicists all over the place. A lot of them were -- had worked at Oak Ridge National Laboratory and served as consultants to K-25 and to Y-12, but there were also experts at K-25 and at Y-12 itself who knew a lot about nuclear safety and radiation safety. And you had badges that recorded how much time you had spent with how much radioactivity.

[2:19:16]

Thonhoff, J.:

And how would?

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Shacter, J.:

In most cases, the badges were almost useless because they didn't show anything 'cause the -- the procedures had been developed to avoid radioactive exposures to the maximum possible extent. But, you know, there were always some slippages and there were people that were -- few people that were irradiated.

But if you really want to go into radiation and stuff, get familiar with the Navy test in the Bikinis where they had ships that were intentionally positioned under the atomic bomb that was a test bomb so that some of them would be sunk. Close enough to zero, to point zero. And I think what they were trying to prove is it ain't all that big a deal, you know. An atomic bomb is just a big bomb, see? You know, our ships and we dare to put 'em around. Course some of them had sailors in them. And some of those guys got irradiated. And some of the dosages were unexpected. And when you go on a ship -- on the outside of a ship that has been in a radioactive lagoon and is building up barnacles and crud on the ship and you ask a young sailor -- I'm thinking of one that lives here in Clinton -- he was 17 ½ years old, you know, and he was gung ho trying to save the country, volunteered as a Navy seaman and they told him to clean the barnacles off the ship.

[2:21:07]

Well, shoot, they gave him a short spade and straightened the blade and asked him to start scraping. Well, he was covered with that stuff and it was radioactive. That's -- that's the kind of thing that happened in the Bikini Islands; it didn't happen at K-25, Y-12, or ORNL or X-10 as it was called. [laughs] The -- you know, we were much more cautious than that. But there still were slippages and sometimes the radioactive liquid would spill, wasn't supposed to. And -- and ventilation systems sometimes had radioactivity that wasn't supposed to.

Thonhoff, J.:

What would you do when something like that would happen?

Shacter, J.:

Get in the shower as quickly as possible. There were very few, you know, less than number of fingers you have on one hand, practically, where -- where people were obviously radiated to the point where some of the -- their future -- exposure to sickness was affected.

[2:22:26]

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And -- and it's always very hard to prove that a cancer that you get 20, 30 years later was caused by your exposure to radiation because the same cancer can be produced naturally or in other ways. So it's somewhat of a guessing game, but even so, the government has paid out hundreds of thousands of millions of dollars to people on the possibility, probability that some of their cancers, particularly certain types of cancers like thyroid cancers, were produced by radioactivity, by the earlier, much earlier, exposure to radioactivity.

Thonhoff, J.: How did people communicate with fellow workers at the facility?

Shacter, J.: Well, transportation was in K-25, was bicycle. And if you wanted to talk to somebody person-to-person, you'd get on hop on your bicycle and ride to the place where you knew the person worked.

They had loudspeakers, you know, portable loudspeakers. They had -- they had the Bell telephone system. They had local telephone connections that weren't -- that did not go to the Bell system, which was good for security reason in some cases. So they could talk that way. That's about it.

Thonhoff, J.: And how did people communicate, not just the way they did.

Shacter, J.: What -- what they did?

Thonhoff, J.: What was the general feeling of the people there in the plant?

Shacter, J.: They worked hard, spent many hours at the plant. They tried to make it as -- they were young -- they tried to make it as much fun as possible. You know, some of it was grimy and not -- and work itself wasn't always that much fun, but by and large, the people collaborated well and many friendships for life were formed in those days.

[2:24:53]

Now, you also had some people that were a little bit on the obnoxious side, you know, a certain percentage, but everybody has that. But you tend to remember the -- the large masses of fellow employees and they were okay and it was a very enjoyable period of your life. I learned a lot a lot earlier than I would've learned if it hadn't been for that kind of a unusual situation.

Thonhoff, J.: What are some of the lessons that you learned from being there?

[2:25:36]

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Shacter, J.:

Well, of course I was critical of the old people, particularly when they came from companies that are dealing with us that hadn't gone through that kind of let's invent ourselves into business process. And my counterparts in the other businesses and companies were much older. And so you couldn't help but develop a feeling that you -- when you get old, you don't want to be like them, set in your ways, hard to convince, know everything, you know, when in fact, you didn't. [laughs]

One of the things I learned is I know how to say "I don't know".

Thonhoff, J.:

That's a wonderful lesson!

Shacter, J.:

That's a very important phrase. I don't know. And if -- if you should know, you can always say "I don't know but I'll try to find out." And if I find out, well, then I promise to call you back whether or not I'm successful in finding out. And today, you have internet and you've got so many sources of, you know, I doubt that many people have to rely on their Encyclopedia Britannica with all the volumes and stuff 'cause you punch what you want to know about on the internet and get more information than you know what to do with.

Thonhoff, J.:

Right.

Shacter, J.:

So there's really no excuse for not looking things up as long as you can read and think. And interpret. But the words "I don't know" are very important and a lot of people go through life without ever having learned them.

[2:27:16]

Another important thing is to be able to make fun of yourself. Not a lot of people, but of yourself. It's too easy to make fun of other people. [laughs]

Thonhoff, J.:

Oh, absolutely!

Shacter, J.:

But you outta be able to make fun of yourself. And -- and I find when you belittle yourself, it builds -- it builds your image up in other people's minds because they -- they think of you more highly. Also if you can use the phrase "I don't know" and you do answer their questions, you're more credible because they know if you are talking, at least you think you know what you're talking about because if you didn't, you would tell 'em "I don't know" --

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Thonhoff, J.: Right.

Shacter, J.: -- and so the -- your credibility builds up if you use the phrase "I don't know". And I learned that pretty early at -- with the young people and interacting with the older people and stuff. And I -- I never did take myself terribly serious.

[2:28:18]

Thonhoff, J.: It depends how you laugh.

Shacter, J.: And my -- my wife has a good sense of humor and, you know, we both do a lot of kidding. And if young people learn that, our divorce rate wouldn't be 50%.

Thonhoff, J.: Absolutely!

Shacter, J.: I keep telling my kids in the school, whether you like it or not, if you don't learn to make good decisions, you have only 1 out of 2 chances, 50-50 chance of getting a divorce, so be very careful when you pick that partner and learn how to make fun of yourself.

Thonhoff, J.: Absolutely!

Shacter, J.: So those are the kinds of things that I learned, to answer your question.

Thonhoff, J.: We're going to change tapes.

[End Tape 2, begin Tape 3]

[3:00:07]

Thonhoff, J.: -- an interview in the morning and an interview in the afternoon. I'm -- would you like something to drink? Some water, a Coke, diet Coke?

Shacter, J.: Do you have a diet Coke?

Thonhoff, J.: I have a diet Coke. Let me go get one for you real quick.

Shacter, J.: I told you that I believe in the using the phrase "I don't know" --

Thonhoff, J.: Right.

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Shacter, J.: -- and being honest in work, you know, professionally, and in life.

Thonhoff, J.: Sure!

Shacter, J.: And there's another advantage. And as you get older, it becomes more and more of an advantage because if you keep hedging and lying, I -- I gotta remember what I told everybody. So I [laughs] am at least a consistent liar. [laughter] My memory isn't that good! And if you -- if you keep telling the truth and honest, you don't have to remember 'cause you just remember the truth and there it is. So as people have -- get older and they have poorer memories, they're much better off being straight --

[3:01:32]

Thonhoff, J.: Yeah, you can't keep it --.

Shacter, J.: -- and my wife is better at this than I am. I mean, she absolutely cannot lie. Not -- it's very hard for her to even use a white lie. And, you know, I respect her for it. She -- she improved me. I was pretty good in that direction, but she's -- she's an extremist. And so was her father. He was a politician, but if he didn't -- if he wasn't going to vote for you, he was going to tell you he wasn't going to vote for you.

Thonhoff, J.: And what did you --?

Shacter, J.: Most people --.

Thonhoff, J.: Go ahead.

Shacter, J.: Most people aren't that honest, particularly in politics.

[3:02:14]

Thonhoff, J.: Yeah, no kidding! When did you meet your wife?

Shacter, J.: I met her in 1947 and we married in 1948 and our first daughter was 1949. Our second daughter was 1951. So it was -- we were all in Oak Ridge still at that time.

Thonhoff, J.: And how'd you guys meet?

Shacter, J.: She -- she was an Oak Ridger and was in the same town for quite a period of time before we met. We met folk dancing. Both of us like to dance. I also like to play the piano and stuff or acc --

accordion. And she -- she was a gym teacher and -- physical ed teacher and her girls -- she was supposed to teach folk dancing to her girls. And this stuff of put your little foot and stuff, you know, after a while gets on your nerves and it's not that challenging and she wanted to learn some foreign dances like Russian dances and so forth. And we were doing those in our folk dance group so she decided to -- join just to get material for teaching her girls in the junior high school in Oak Ridge. She taught in Jefferson High, which at that time was located in Robert -- what is now Robertsville. There are two junior high schools. And at that time, there was only one. It was called Jefferson, but it was located in -- excuse me -- in Robertsville and today, the two schools are competing, I mean, they're parallel. And Jefferson, the name Jefferson, is with the other school, the newer school. In fact, her gymnasium no longer exists. But she always liked physical activity. She's got a good head on her shoulder, but her professional teaching career was always physical. She liked sports, still likes sports and herself and to -- and to teach it.

[3:05:00]

So we were somewhat different in our emphasis. I like to dance, too, so we overlapped there; we both like music, but I would say that a large portion of my interest, like, academic education. She doesn't feel she would be good at it or maybe as good as I am and so she has -- she doesn't mind my having an interest in those directions, but she doesn't participate, which is all right. You don't have to marry somebody that is identical to you. It'd be kinda boring, so. What else do you wanna know?

Thonhoff, J.:

Let's go back to the plant and look at some of the working conditions. What did you say and how did you communicate with your family and friends about the secret facility? How did that go?

Shacter, J.:

Well, we -- we didn't tell outsiders, family included, anything about conditions because I didn't even -- I couldn't identify what we were manufacturing or doing in the plants, so as far as they were concerned, it was a bunch of buildings.

Thonhoff, J.:

Right.

Shacter, J.:

Gigantic buildings and with no clue on what was going on inside. And in fact, if you had gone inside, you would've seen a bunch of pipes and stuff that you still wouldn't understand what the heck is going on. You had to have a technical education and be pretty much aware of what was going on to detect what the possibilities

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were. Otherwise you'd be just as confused inside the plant as you would outside the plant and you couldn't tell what was being produced.

[3:07:22]

Now, Y-12 had a different process. They had the calutrons, you know, the magnetic separation. But it was somewhat true there, too, that if you saw a bunch of chemical or mass spectrometer type calutron, you saw a big facility with a bunch of knobs and people and you wouldn't know what's going on there, so. There was no way for an ignorant person to just look at the plant outside, or for that matter, inside and have a clue on what was going on. You had to know.

Now, in my case, when I joined the Project as a chemical engineer from University of Pennsylvania, it didn't take me more than about a day or two to figure out what was going on because number one, my co-workers, some of them had gotten there a few days earlier. They had -- they were told and so when I was at Columbia University at the Schermerhorn Building, I would say, oh, from the second or third day on, I knew what we were doing and why.

[3:08:42]

Thonhoff, J.:

It's like --.

Shacter, J.:

And we were -- we -- we thought we were racing the Germans to the atomic bomb and if they'd gotten it first, they might've won the war. Same thing on the Japanese side.

Thonhoff, J.:

Right.

Shacter, J.:

So we were under the impression that we were -- we were racing the Axis meaning Jap -- meaning Japan, Japan and Germany, to the bomb. And if they got it first, they would give us an ultimatum if they're kind. If they're not kind, then you know, just bomb us and -- and have us give up.

And of course, there's the question which at that time was a very lively question on whether we should bomb the Japanese or not. And there were groups of engineers and scientists who differed in their views on that. Some of them thought that we should not use it and just tell 'em that we've got it and trust that they would believe us and other people said if you're going to demonstrate it,

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demonstrate it in the ocean off Japan and let 'em see the big waterfall and convince 'em that way.

[3:10:09]

Well, it depends on where you were. I -- I had friends that were in the Navy at that time and they were preparing to invade Japan and the predictions were that we were going to lose millions of sailors and soldiers trying to -- because the Japanese were known -- many of them -- to fight to the death. And if you -- if you're attacking them in their own land, you can bet your last penny there were going to be some Japanese that would try to inflict as much damage as possible, making Iraq look, you know, like it's innocent in terms of -- versus what we would've encountered if we had invaded Japan itself.

So you had different factions among the engineers and scientists on how we should proceed once we had the bomb. And the people that voted to bomb a place at a time and I guess we would've kept going if they had not surrendered. And Hir -- Hirohito surrendered. And military knew it was hopeless after the second bomb.

Thonhoff, J.:

Right.

Shacter, J.:

So the people -- the people that advocated using the bomb won out and Truman, by that time, Roosevelt had died and Truman had decided to use the bomb. With 20/20 hindsight, I think we probably should've demonstrated it in the ocean and if that hadn't worked, then we didn't have too many bombs. We couldn't afford to. We had two or three and we used two at that time, so we didn't have the luxury of wasting too many bombs. But we probably could've demonstrated it offshore and been convincing enough. See that big rising column of water and coming down in a mushroom and all that stuff. And then imagine doing that over one of your cities. That might've been convincing enough.

[3:12:45]

Thonhoff, J.:

What was your reaction?

Shacter, J.:

My reaction?

Thonhoff, J.:

Uh-huh. (affirmative)

Shacter, John

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Shacter, J.:

Well, I was glad the war was over. I didn't enjoy reading about what happened to the Japanese in Hiroshima and Nagasaki. Of course, these were the same people that attacked Pearl Harbor and killed our side and they were also the same people that launched Bataan March and all the cruelties in the prison of war camps. So you were fighting a pretty determined, cruel enemy overall. And it was hard to get people to be very sympathetic to an enemy when it came your turn to inflict damage.

Thonhoff, J.:

Right.

Shacter, J.:

And I did belong to an organization of scientists and engineers in those early days. And I did become interested in social issues at that time. And I thought at one point that we needed a world government because of the atomic bomb so that we would not, you know, they had a police action instead of a war action when nations disagree. Well, then you get into things like that, one man, one vote, so that every Hottentot has the same vote as every American, and again, you got some of those questions to resolve.

[3:14:29]

We haven't even completely resolved 'em in this nation. The -- the founders -- forgive me. The founders didn't want the women to vote. We weren't one person, one vote. We weren't even one man, one vote. You had to have property in the early days to vote. So they clearly didn't define their form of democracy as a one person, one vote system. You had to earn the right to vote by being successful in life or owing -- owning [laughs] property. Now, not having girls vote and having to own property sounds crazy by today's standards and I agree with today's standard. But I wish -- I sometimes I wish I had a way of -- a fair way of having voters that want to get into the voting booth prove that they can answer certain elemental questions to earn the right to vote. And we could come up with something that wasn't race-baiting and stuff, but, you know, fair. I might argue for a -- for a -- well, to earn the right to vote.

[3:16:02]

Thonhoff, J.:

Yeah.

Shacter, J.:

Might give us better education, too, because I think it would tell the kids that they would be second-class citizens if they didn't -- if they couldn't answer simple tests.

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Thonhoff, J.: Might be some motivational --.

Shacter, J.: Yeah. That education really does give you some qualities that -- of life -- that an ignorant person doesn't have. And just go down to the lake and fish is not enough as a. Unfortunately, we have many parents that worse than the kids. I don't blame the kids. I blame the parents. And so if you -- if you grow up in a family where maybe they're located in Harriman, I don't know, places near Brushy Mountain Prison because the father's in prison and the mother's an alcoholic and you grow up in a family like that, watch television till 2:00 in the morning, and go into the classroom the next day hungry and sleepy and draped over your desk, it's tough to ask that teacher to educate that student.

[3:17:25]

Thonhoff, J.: Right.

Shacter, J.: And we're too reluctant to use sterner methods of dealing with the parents.

Thonhoff, J.: Right, we're still really political (indiscernible).

Shacter, J.: Yeah. Babies having babies is another thing closely related to that. So we are -- it's very difficult to ask those kids to perform and compete with the other kids that come from successful families. And statistics show that the success of our educational system is very much dependent upon the educational level and the money level of the parents. So it's not just the schools when you're talking about education today, you're talking about a combination of community environment, home environment, and the schools.

Thonhoff, J.: Right. It takes several elements.

Shacter, J.: Right. And that's why some people vote for pre-K education, you know, grabbing 'em at the age of 3 and 4 and preparing them for the competition with the kids from the successful homes.

Thonhoff, J.: Sure!

Shacter, J.: And that's why I also enjoy, going to a class today of even 4th and 5th graders. Little girls run up to me and they hug me. And I don't think it's my personality that's the only thing that's involved there, [laughs] to be honest. I think it's also that they're missing adults that make them feel like they like 'em.

Shacter, John

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Thonhoff, J.:

Yeah. Absolutely!

Shacter, J.:

I do make the kids -- even when they can't answer my questions and I -- and I razz them a lot, you know, tease 'em a lot, and I tell them if you can answer my questions, then it's too easy. I don't want to teach you what you already know. I gotta teach you what you don't know. So be prepared if you answer all my questions, I'm going to make 'em tougher and tougher until you can't answer them. And that's where I'm gonna start teaching.

[3:19:35]

'Cause I got -- I got to visit a class, I don't know those kids, but I know what they don't know. So I gotta have a series of questions that I might say if I'm teaching percents. I might point at a kid and say, "What's 100% of 3?" And if the kid can't tell me what 100% of 3 is, that kid doesn't know much about percentages.

Thonhoff, J.:

Right.

Shacter, J.:

And I don't have to ask a second question.

Thonhoff, J.:

Yeah.

Shacter, J.:

That's enough. [laughter] So now I gotta start basic, very basic --

Thonhoff, J.:

Right.

[3:20:11]

Shacter, J.:

-- but if he can answer that question, then my next question is, "Okay, what's 110% of 3? What's 101% of 3?" And then, you know, a lot of people can tell you what 100% of 3 is but they can't tell you what 110 or 101% of 3 is. Or if I'm teaching -- today, when I go to a 5th grade class and teach math, one thing I want to find out is whether they know their multiplication table or not.

Thonhoff, J.:

Yeah!

Shacter, J.:

So I start off and I point at a kid and say, "What's 7 times 8?" If that kid can't ans -- eyeball me or wants to pull out a calculator or something, it's a dead giveaway.

Thonhoff, J.:

Right.

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Shacter, J.: So I don't want him to come fire back and say -- eyeball to eyeball and say, "It's 56." Well, if they say that, my next question is, "What's 56 divided by 7?" And if they don't know that that's 8 or 56 divided by 8, the answer is 7, if they don't know that, gotta touch -- start at that point.

[3:21:19]

Thonhoff, J.: Right.

Shacter, J.: And if they do know that, then I say, "Okay, watch it. What's 57 divided by 7?" They say, "You can't do that!" [laughter] I said, "Believe me, I just did!" [laughter] So then they gotta think. Some kid, some smart aleck will say, "57, the answer is 8, remainder 1." You know, that's true. I say, "Or 8 remainders." You know, I make 'em tougher and tougher. I hate remainders. Give me the answer without remainders. I want it some other way. And you're supposed to, then, go into mixed numbers. The answer is $7 \frac{1}{8}$ instead of remainder 1. And I really prefer that to this remainder business.

Thonhoff, J.: Right.

Shacter, J.: I learned math in Austria and they didn't teach us remainders. You're supposed to know that the remainder's 1 or 2 or whatever, divided by whatever you divide it by and answer it that way.

[3:22:33]

Thonhoff, J.: Right.

Shacter, J.: And I think that makes more sense. So.

Thonhoff, J.: Sure! It became really clear to me really fast. Let's go back to the Manhattan Project specific --

Shacter, J.: [laughs] Okay.

Thonhoff, J.: -- recollections. Wait, no, let's not do that. Let's go to the post-Manhattan Project. We already did that. How do you think that history will view the Manhattan Project and its outcome?

Shacter, J.: Well, it's already viewing it. It was slapped together with national emergency, racing the Germans. We didn't realize that although Germans did take heavy water from Norway and stuff like that, they did things, made us aware that they were also working in -- in

atomic energy. But they weren't as fast as we thought they were. We gave 'em too much credit and -- but the way the Project was run under -- under Roosevelt and the top scientists were very creative, worked well together. Oh, there were little jealousies, but by and large, people were pulling together because of under danger, you tend to pull together. You don't play games when -- when survival is at stake. Wish we learned it today.

[3:24:10]

So, I think Manhattan Project was a good example of a massive collection of smart, inventive people who were trying to survive and worked for their families' survival and their friends' survival and -- against the dictators of Hirohito and -- and Hitler and Mussolini if you want to get a second, a lower type. Mussolini would've liked to be a Hitler but he wasn't strong enough. He wasn't -- Italy wasn't as well prepared to attack and so forth as Germany. So you had that, you -- you needed to defend and the Manhattan Project was a key portion, wasn't the whole thing, but it was a key portion of not being -- of not losing to Germany and -- and Japan. So it was, I would say, by any measure of that, the Manhattan Project demonstrated something that we hadn't -- didn't need to demonstrate and had never demonstrated before, that you could go into a new area of technology not knowing for sure whether you -- whether it was even feasible to reap success and spend the nation's millions and billions at a time when -- when you were fighting and money was scarce, for the nation to cough up millions and billions of dollars on a very risky undertaking and have -- and come out with more than one solution, you know, because we separated isotopes in two or three conceivable ways that, you know, K-25 turned out to be commercially successful. So did the centrifuges later on.

[3:26:36]

But -- so -- and also, we could've just on the uranium side, been successful and beyond successful on the plutonium side of the reactors or vice versa. As it turned out, we were successful on both sides and produced, later on, tritium and, you know, went into the H-bomb business, knew about -- learned about fusion as well as fission. And that's not just the scientists in this country but overseas, too. Germany, Japan, they learned about fusion.

[3:27:20]

Thonhoff, J.:

For somebody with -- wouldn't.

Shacter, John

Shacter, J.: So -- to finish the question --

Thonhoff, J.: Sure.

Shacter, J.: -- it was an unprecedented success, the Manhattan Project. Surprisingly so. You know, you might not have predicted it.

Thonhoff, J.: Yeah.

Shacter, J.: It's easy to look back and say, you know, so what's the big deal? It was a big deal.

Thonhoff, J.: For somebody who doesn't know, what is fusion versus fission?

Shacter, J.: Well, fission, first of all, the heavy isotopes, the heavy atoms can be made to split. And that was known before the Manhattan Project, quite a few years before. What was not known was that they knew that to split the -- the heavy atoms, they needed neutrons, so they would throw -- they would produce neutrons, throw 'em in, and split the atom. Well, that's no big deal because it's very expensive energy wise, money wise, and you get nothin' but a split atom.

[3:28:39]

What they found out later is that in the splitting, you were losing some of the mass and that mass was going into energy. That was one thing they found out. The other thing they found out is that there was a way of splitting 'em and produce neutrons, the very thing that split 'em in the first place. So instead of keeping to produce neutrons to keep the reaction going, the reaction would produce its own neutrons. And that's what's called a chain reaction. So the chain reaction worked, you didn't have -- all you had to do is start it; you didn't have to feed it any -- any more. Once it started, it gave you these smaller masses and some of the mass, trivial portions of, not whole atoms, what they call binding energy. It's a very small portion of the mass was converted into energy. That's what produced the nuclear explosion.

[3:29:45]

Now, in fission --

Thonhoff, J.: Hold on. Just one second. Let's change tapes.

Shacter, John

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Shacter, J.: Wow.

[End of Tape 3, begin Tape 4]
[4:00:08]

Shacter, J.: That's what makes me a good teacher is that I am able to think like a dumb -- meaning ignorant [laughter], I shouldn't use the word dumb -- ignorant is -- is true.

Thonhoff, J.: Exactly.

Shacter, J.: And you can be very smart and ignorant.

Thonhoff, J.: Oh, absolutely!

Shacter, J.: But, you know, everybody does things that I don't know today.

Thonhoff, J.: For sure!

Shacter, J.: And I'm a lot older.

Thonhoff, J.: Okay.

[4:00:41]

Shacter, J.: On fusion, we worked the other way. You take little atoms like hydrogen, tritium, this kind of thing and you put 'em together under the right condition in a plasma, which is a very hot environment, and that's the same thing that takes place in the sun. The sun doesn't have to create its plasma; it is already there. And little hydrogen atoms bind together and build up, and for some reason, instead of, you know, you would think that with the heavy isotopes, the heavy atoms splitting, you release some masses, I told you, that form energy.

Thonhoff, J.: Right.

[4:01:26]

Shacter, J.: Well, surprise, surprise, when you put the little ones together, you also lose some energy. It doesn't go gain. You lose some. In other words, you lose -- as you go from either end of the atomic table toward the center, you lose a little bit of mass and get -- and gain energy. Tiny little fractures of the mass converts into energy. That's true at the high end and that's true at the low end. So as you move toward the center, you don't always get to the center. But as

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you move the hydrogen fusion toward the center, toward heavier molecules and atoms than hydrogen, then you gain. You gain energy. Lose -- lose a little mass, gain a little energy. And of course, putting it together is a lot of energy.

Thonhoff, J.:

Right.

Shacter, J.:

So you gotta drive the hydrogen into the plasma.

Well, from an atomic bomb point of view, that gave you another step in severity because if you use the atomic bomb to generate a hydrogen bomb, then you're going up by factors of many, you know, hundred, thousand, whatever the limit, there's practically no -- no decent limit. The -- the hydrogen bombs that we can produce today are very many times more powerful than the original A-bomb. And -- but on the other hand, it does require some additional money. For -- for the bomb, not very much. I mean, it's not -- it won't kill ya to go from A-bomb to H-bomb.

[4:03:29]

In energy-producing reactors, if you're talking about fission energy and fusion energy to make power, to make energy, not -- not bombs, then you're really talking about a new level of technology and it's not as simple as I was -- the principle is still simple, but the -- but doing it becomes a major undertaking. And we, frankly, don't know how to do it today, although we seem to be moving closer to the feasibility, it's not feasible today. Nobody knows how to carry out a fusion reaction slow enough so that it doesn't become a bomb but -- but produces energy. It's still a dream today. Now, some people think we're fairly close; other people say that's what you told us 50 years ago, you know. We're about as close today as we were 50 years ago, so. You have pessimists and optimists.

Thonhoff, J.:

Absolutely!

Shacter, J.:

But fusion energy does not exist is the honest way to say it. If it did exist, it would work like I told you. But -- but nobody knows how to run that plasma and practically and produce fusion in a commercial, acceptable way today, so it's a dream. There's only fission. You can spike the fission with a little bit of light atoms added to the fission, but really, it's fission as far as nuclear reactors are concerned. There are no nuclear fusion reactors. There are only fusion bombs. And they get generated by fission bombs. So it's -- the picture is a little different whether you're talking about energy producing or whether you're talking about bombs.

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[4:05:29]

Thonhoff, J.: Right.

Shacter, J.: Bombs, we know, we've produced. Energy-producing reactors, fusion reactors, are still a dream. And they may not be so cheap. You may get there and find out that it's not commercially all that attractive. 'Cause we really don't know where we're missing, exactly, and what we will have to do to get there practically.

Thonhoff, J.: Right.

Shacter, J.: And if you pour more energy into it than what you get out, there's no big deal, I mean --

Thonhoff, J.: Exactly.

Shacter, J.: -- who would like to have fission -- a fusion reactor where you have to put energy in instead of getting energy out? Doesn't make any sense.

Thonhoff, J.: Yes.

Shacter, J.: And nobody can tell you that we know how to get more energy out today in mass scale. Then when you add to that economically acceptable, you're putting another layer of requirements on it.

Thonhoff, J.: Right.

[4:06:29]

Shacter, J.: There's no big deal if it produces more energy than you put in if it's very expensive. And if it's more expensive than wind energy or solar energy or whatever, biomass, like wood and trees energy, then what's the big deal?

Thonhoff, J.: Right.

Shacter, J.: It's a competitive game.

Thonhoff, J.: Oh, indeed! That is (indiscernible).

[4:06:55]

Shacter, John

Shacter, J.: So we're quite a distance away from -- from a practical fusion reactor for energy producing purposes.

Thonhoff, J.: Let's look at the Cold War era. What was the work that was done at the facility after the Manhattan Project and during the Cold War era?

Shacter, J.: From my point of view, I'm not sure, I know what you're asking. We're now in the Cold War era and what?

Thonhoff, J.: Like '48 to '64, in that time frame.

Shacter, J.: What happened technically or politically?

Thonhoff, J.: What kind of work was being done there at the facility?

Shacter, J.: Well, I left, of course, in '57 although I know what went on and I came back in '67, so it was 10-year period when I was up in New York --

[4:07:51]

Thonhoff, J.: Right.

Shacter, J.: -- working at Corporate staff and stuff like that.

Oak Ridge, in those days, made plant improvements. You know, they learned how to maybe pass the gas in more efficient ways and those improvements were made in those days. Now, unfortunately, centrifuges competed with -- not our centrifuges but centrifuges made by EURENCO and other people competed and were able to go lower than our government-imposed price, which I said earlier, we were too dumb to -- and that was dumb, not ignorant. [laughs] We were too dumb to realize that when you got competition, you don't wanna hold the price umbrella over them.

Thonhoff, J.: Right.

Shacter, J.: So we screwed up and eventually, they threatened to put us out of business. We -- we're hanging on by our teeth today, to still be producing fuel for reactors. And most people will tell you that if you're going to build additional plants, they're likely to be built of centrifuges and not gaseous diffusion. And that, I think, we could've avoided in -- in one of two ways. Either drop the price and at least postpone the centrifuge -- the new centrifuge plants because they wouldn't pay off if you lowered the price, or if that

was inefficient, I mean, not adequate and they still were threatening, then you -- then we could've gone into centrifuges and built competitive centrifuges, which we did not do.

[4:09:45]

Now, who's fault was it that we didn't -- that other people could out-perform us? Now, remember, we out-performed them in the early days with gaseous diffusion and calutrons and all that stuff. We were tops. Nobody could compete with us. The picture reversed when the outsiders came in with little centrifuges that they didn't care how long -- well, that's not the way to say it. They -- they were willing to use little centrifuges and -- and considered them expendable. If you lost one little centrifuge, who cares? And they designed the plant to live with a bunch of dead centrifuges. And not do maintenance until you're ready to do maintenance.

Now, that's not our technology. That's the competitor's technology, EURENCO things. And they were able to put a plant together that -- that beat our technology. And we -- we were going to bigger and bigger centrifuges. Gigantic! I mean, one of our centrifuges could take care of not millions, but a lot of their little centrifuges. But what good is it if it's too expensive to build the big centrifuge and operate it when the other guy was willing to operate with a bunch of dead little centrifuges because he had enough live left to justify continuing operation? Then when he shut it down, he took all the little dead centrifuges and replaced 'em.

So, much as I regret to say so, as dominant as we were in the early days, we lost that dominance in terms of competitiveness under the government in the later years and including today. If we wanted to be competitive in the centrifuge business, we would have to do it either some brand new way that hasn't -- that nobody has invented yet or -- but could work toward with big centrifuges -- or -- or go to the small -- go to the design philosophy that our competitors followed very successfully.

[4:12:18]

So we're no longer recognized the world over as the leaders in isotope separation, specifically uranium isotope separation. Now, a lot of people don't like to hear that, but that's -- that's the truth. I think it'll do us some good -- it ought to do us some good to realize that you win a few and you lose a few and learn from their losses. Don't deny it. So, in overall answer to your question, both our

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management under the government, business management, technical management, suffered in competition with EURENCO and other people that took a different path. So they out-performed us. We were losers. Now, I guess I don't have, personally, as much at stake because in those days, I was up in New York. [laughs] So it's those other guys that lost it. [laughter]

Thonhoff, J.:

What are your thoughts about how the activities accomplished revolutionized the world?

Shacter, J.:

Well, United States is sitting comfortably with one heck of a lot of coal. If the Middle East is the -- is overflowing with oil resources, we're overflowing with coal resources in the United States. And the problem with coal is, it's okay, it can be done cheaply, but it is messy and screws up the environment. So then we put a lot of money into scrubbers and all kinds of absorbers so that we take out the stuff that we don't want to put out in the stack, including mercury and all kinds of sulfur components and nitrogen and warm up the globe -- global warming and all that stuff that comes very heavily with coal. So now it depends how much money you want to spend for clean air and clean water and all that stuff, and when you take that into account, then coal becomes more expensive and nuclear could compete with clean -- clean coal. So compete, but not -- not overwhelm it completely. It's not like you can improve by a factor of 10 or anything like that. And they way we build nuclear plants under the government with a lot of help from extremists on the environmental side, the way we build those is very inefficient. And whereas it ought to take us about three years to build a nuclear plant, it started to take us 13 years to build a nuclear plant.

[4:15:35]

But when you're spending a lot of capital money and you don't get any product out of it, it's just sitting there going through a bunch of bureaucratic somersaults, with a bunch of environmentalists and judges making decisions when they don't know what they're talking about and they're both; they're dumb and ignorant. [laughs] Forgive me. [laughter] But when you're facing a situation like that, then the nation is suffering some economic damage that -- that -- it shouldn't have to.

Thonhoff, J.:

Right.

Shacter, J.:

Damage-- because there's no excuse for a nuclear plant taking 13 years to be built. It doesn't make it any safer. In fact, you could

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argue it makes it less safe because some of the parts are 13 years old and some of the parts are brand new and you're putting 'em all, slapping 'em all together at the last point and then put the plant in operation. A lot of times, the equivalent of rust sets in to the early stuff before you can ever operate it.

[4:16:48]

Thonhoff, J.:

Right.

Shacter, J.:

So the way we went about authorizing nuclear plants is very silly. And we're still suffering from that. And -- and besides that, we're not educating people properly on nuclear energy and oil and coal and all that stuff.

Now, the oil situation is that the Middle East is lucky enough to sit on oil. Now, they formed the cartel. That's illegal in the United States, but internationally, they didn't have anything, so what we could've have done or what could we do tomorrow? We could say okay, if you're gonna form a cartel, this is the mean. I'm gonna be mean. Mean kind of strategy. If you guys are going to charge us by forming a cartel and keeping prices of what costs you practically nothing to get it out of the ground, almost produces itself and you're going to charge us a fortune for it, which you are today, I'll tell you what we'll do, what we'll threaten to do. We'll form a food cartel and we'll prevent you from eating. We'll threaten to prevent you from eating because you don't have any -- enough food in -- in much of the oil-producing world. You got a lotta oil and you got a lotta sand. Okay, so we can -- we can make a list of the things that you need and we're going to form a cartel. And we'll pick the price of what we're gonna charge you, not just the United States, but Argentina produces a lot of meat. We'd have to get together with a lot of countries and form a mean strategy. If -- we don't even discuss this. You haven't seen anything about it in the papers. It's probably new to you; the thought is probably new to you.

Thonhoff, J.:

Right.

Shacter, J.:

But it -- it's a hard-nosed way of dealing with it and you would force the oil producers to come to grips with what's good for the goose is good for the gander and they'd have to be more reasonable.

[4:19:04]

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The counterpoint to that strategy, the mean strategy, is that you're dealing with countries that, as I said, have nothing but oil and sand. And if you force 'em to get rid of their oil at low prices by this mean strategy, you're really creating a very dangerous future for them because what're they going to do when the oil runs out and it's gonna run out in decades, not in centuries. We don't know exactly how many decades, but it ain't centuries.

Thonhoff, J.:

No.

Shacter, J.:

So we know that after they sell all their oil, they'll have start selling sand and nobody wants to buy sand, see. So that you -- they are facing, nationally, from their point of view, a grim future. We don't discuss any of that stuff because they ain't too many people know about it and they can't talk well and they can't teach well and the population is lost and the media are lost.

[4:20:12]

If I gave this talk to a media person, you're at least patient enough to listen. If I talked to a media person like that, the first thought they'd have is that this guy is crazy. If he's right, why haven't we heard all this before? See? But that's the situation. So when you talk about energy strategy, it's complex and you have to decide, you know, which way's up? What are you trying to achieve?

Thonhoff, J.:

Excuse me.

Shacter, J.:

So if I think selfishly for our side, I come up with a mean strategy. If I -- if I want to be fair to the other person and -- and take their interest into account, then -- then I have to compromise and not -- not rely on the mean strategy --

Thonhoff, J.:

Sure!

Shacter, J.:

-- and so that forces you to determine who you are and -- and which way is up. And that's an area of public policy that very few people can navigate in.

[4:21:16]

Thonhoff, J.:

Right. It's one that's not getting navigated in.

Shacter, J.:

So I'm answering your question in a fundamental way. But you need to know that if you're really going to do energy planning --

Shacter, John

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Thonhoff, J.:

Right.

Shacter, J.:

-- you need to know what the truth is and then you can proceed to come up with some practical options. And it's always options, not just, I don't know of any major decision that just has one solution. There are always options, so you're comparing options with uncertainties in the future and you do the best you can to pick the strategy that you think maximizes your chances of success. Don't guarantee it. But it seems to be better than these other options. So decision making for -- in a serious way, amounts to selecting choices among options.

Thonhoff, J.:

Absolutely!

Shacter, J.:

And most politicians aren't very good at it.

Thonhoff, J.:

Let's go back to your actual job and what you did at the facility.

Shacter, J.:

Well, it varied. When I was up in New York, I did research on the separation medium itself and when I came to Oak Ridge, I taught in the Wheat School, as I told you, for a few weeks and told people how gaseous diffusion works, and what you had -- how you -- how you had to operate it and what kind of contingencies you were facing. Things could go wrong. What were you going to do if it does go wrong? What options do you have for putting it back in control if it goes out of control and so forth --

Thonhoff, J.:

Excuse me.

[4:23:25]

Shacter, J.:

Then I got into, really, production, development, design, all of those. And as I said, the only thing we didn't have was selling -- sales, in those early days because there was no need for it. The person that sponsored us -- I mean, the group that sponsored us was the government. They knew darn well that they wanted the product; they wanted the ingredients for the bombs, so there was no selling involved. There was just producing it involved.

Thonhoff, J.:

And what did you specifically do after you taught at the Wheat School?

Shacter, J.:

I supervised groups of operators in the plant. I told you about the story of the girls and -- and making sure you spend enough time with each group, and so I did that for a while. And then George Felbeck who was a vice president of Union Carbide came down

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and he looked us -- and he eyeballed us and said, "You guys are acting too smug. You -- you made this plant successful, operating it, don't tell me that if you had to do it again that you'd build it the same way. Why don't you form a group that pretends that somebody's just asked you to build that plant all over again. How would you do it today with what you know?"

[4:24:59]

And I headed that group. So he asked about what most people thought at that time was a very crazy theoretical question. Well, as it turned out, they wanted more plant. And so the inventions that I made in those early days were needed. They were used; they weren't just put away, filed away.

Thonhoff, J.:

Right.

Shacter, J.:

They were used. And they were used in the new plants. They were -- the earlier plants were designed by Kellex, which was a sub-company of Kellogg. The later plants were designed by Union Carbide. And Union Carbide-designed plants took advantage of the inventions that I made and that other people made, and I've already told you about those.

Thonhoff, J.:

Right.

Shacter, J.:

So I headed that design group. Then Y -- then Y-12 had a problem of separation. We worked with them, too. And we weren't very popular with Y-12 in the early days because we put 'em out of business. S-50, the same thing. Have you heard of S-50?

[4:26:12]

Thonhoff, J.:

I haven't.

Shacter, J.:

Thermal diffusion?

Thonhoff, J.:

Uh-huhn. (negative)

Shacter, J.:

Well, it existed. At one time, thermal diffusion was supposed to be the successful diffusion process. Until gas diffusion put 'em out of business. So there was a S-50 thermal diffusion plant. This is not classified. Not far from the power plant location. That was supposed to be enlarged; it was never enlarged because we could do with our little finger what they were doing with a very expensive plant so the process disappeared.

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[4:26:52]

Then we also put Y-12, gradually, out of business and I remember Clarence Larson who was in charge of the Y-12 plant in those days. And he came over with his assistants and he says, "We just improved the Y-12 process. We're going to put you out of business." Well, in the meantime, K-25 was improving also. I told you also we -- we reduced staff enormously. All those extra girls and operators weren't needed, so we reduced our costs down to practically power, the energy we used to circulate the pumps and stuff. And then we had the more efficient designs that I just also told you about, so we put, eventually, all --.

For a while there, Y-12 was hoping that we would do the early separation from feed up, feed concentration up and then they would take over and do the final. But they weren't even competing in the final step, so eventually, calutrons were put out of business, which meant that Y-12 was put out of business. So then Johnny Murray and people at Y-12 converted the plant to a weapons plant. And Y-12 got into the weapons business instead of isotope separation. And that gave 'em a new lease of life, but they were no longer competing with us because we weren't making any weapons at K-25 and they weren't separating any isotopes at Y-12. So they shifted into a different kind of business, which they're still in today, but it isn't isotope separation. So that's where I worked the latter part of my Oak Ridge years is, basically, putting Y-12 out of business and making gaseous diffusion successful. Don't tell that to the Y-12 people. [laughter]

[4:29:09]

[crew talk]

[End of Tape 4, begin Tape 5]

[5:00:09]

[crew talk]

Shacter, J.:

You were asking what other things went on and -- in those early days and of course, one of the things that I was involved in was getting Paducah and Portsmouth on the map. They were gaseous diffusion plants and Paducah duplicated the stages that we had in K-25 as well. Portsmouth had additional stages that were of a different type and I don't want to describe it much, but it also involved inventions that I made. The basic type of gaseous

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diffusion that they used, if you look -- if you were to look at the individual -- at the plant on the inside, you would see that it looks different from the stages that -- and the plant on the inside of either K-25 and -- and Portsmouth, Oak Ridge and Portsmouth and those differences are due to the inventions that I made. Keep in mind I'm very careful and not saying the word "patents" because they didn't -- we didn't award patents in those days; we should've probably. Secret patents. But I got plenty of letters from Clark Center with dollar bills in it and the one for Portsmouth was included. So that was also part of the work that was going on.

[5:02:24]

And I think I mentioned that we also helped Y-12 and worked with Oak Ridge National Laboratory in producing -- in separation, you know, forming separation processes, designing.

Thonhoff, J.:

And was there any conflict that occurred with the management?

Shacter, J.:

Well, had a batting average. Not all of my ideas were accepted and I usually thought I was right even the ones that weren't accepted, so [laughs] wanna call that a disagreement with management. Bill Humes was one of my favorite people. But I made a suggestion concerning the Y-12 process that he didn't accept as fast as I thought he should've and as a consequence, I feel we wasted some money on a outdated proposition. Had they accepted my suggestion, we would've saved that money. However, in fairness, it's easier to conclude that looking back with 20/20 hindsight and it wasn't all that sure that I was right. I turned out to be right and so I can be smug and make the statement, but it would've been much harder to make at the time.

Thonhoff, J.:

Right.

Shacter, J.:

I thought I was right, but I -- I couldn't prove it. And I could've turned out to be wrong.

Thonhoff, J.:

Your inventions that you're talking about, can you talk about some of those things, or is that information classified?

[5:04:17]

Shacter, J.:

Well, I've already told you a little bit about it. Instead of having two compressors for each stage as the K-25 Kellex, K-25, K-27 Kellex designs did. My designs had only one pump or compressor to each stage and it had -- it made more -- it made more efficiency

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possible by my approach than if we had followed the previous approach. Beyond that, I don't think I can go.

Thonhoff, J.: Okay.

Shacter, J.: I've also mentioned that if you went inside the plant and looked at the piping -- you can do that with -- they had demonstration cells for both and there are articles with sketches that show you the essential K-25 type stage and the -- which was the Kellex stage and the Union Carbide stage. And what I'm saying is if you look either at the drawings -- or at those drawings that were published or the demonstration cells, the outstanding differences that you would notice were due to patent -- no, to inventions, almost said it -- due to inventions that I made either alone or with a co-author or two. So I wasn't just wasting my time or twiddling with little things; these were -- these inventions had major impact and they were used.

Thonhoff, J.: What sort of roles did women have at the facility?

Shacter, J.: No -- hardly any managerial responsibilities. I remember when I came back from New York, I remember I had a -- a gal working for me as a secretary that I thought and I told her, she was wasting her time; she should take a course or two either at work or at a university and she hardly needed any courses. She was a professional secretary and -- to go into management herself. I encouraged her to do that. And she eventually did and became a very successful manager and then started and left and started a business in Oak Ridge of her own. But -- so some of the gals were very smart and in comparison to the guys, I think -- I always thought she had many advantages.

[5:07:17]

Thonhoff, J.: Do you still speak with her?

Shacter, J.: Yeah. I -- as I said, most of the people that reported to me are still my friends.

Thonhoff, J.: Do you think she'd like to do an interview with us and sit down?

Shacter, J.: She might.

Thonhoff, J.: She might?

Shacter, J.: I don't know how early she was -- I suspect she was here before 1949, but I don't know for sure.

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[5:07:45]

Thonhoff, J.:

Okay, well when we get done, afterwards we'll sit down --

Shacter, J.:

Okay. Her name is Nataline Ross (phonetic sp.).

Thonhoff, J.:

-- Nataline Ross.

Shacter, J.:

I think she's in Fullbrooke (phonetic sp.).

Thonhoff, J.:

Okay. Wonderful!

Shacter, J.:

She went into the business of producing swimming pools, swimming pool equipment. I'm not sure she produced swimming pools, but she did produce swimming pool equipment and eventually had two stores. I don't know whether she's still in the business or not. But she became a manager as a -- as a female, which at that time was somewhat unusual. Not as unusual as it would've been when I started, you know. In the '40s, it would've been --

Thonhoff, J.:

Right.

Shacter, J.:

-- really noted and yet it was clear to me that she had many qual -- managerial qualities that were above average and therefore would've been out-performing the average guy.

Thonhoff, J.:

Did you notice that women were treated any different besides the fact that they didn't have managerial positions?

[5:09:07]

Shacter, J.:

Sure! It's hard to separate. You didn't have -- when it came time to bring the coffee into the meetings, you wouldn't find the guys doing it; you would find the secretaries doing it. Was that because they were women or because they were secretaries? You know.

Thonhoff, J.:

Right.

Shacter, J.:

So, but that was certainly the case. They had certain duties that it was -- they were taken for granted as being their duties. You could argue that it wasn't so much sex discrimination as it was -- their portion of it was just treating them as secretaries and therefore less pay and less valuable, less money wasted by getting them to make coffee or -- or get coffee from the cafeteria.

Shacter, John

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Thonhoff, J.:

And what about minorities? Were you in contact with any African-Americans?

[5:10:07]

Shacter, J.:

Yeah. Similar. I think they just didn't compete for certain jobs and probably rightly so because they didn't think they'd have a chance. They would just be considered to be uppity and so you didn't see black managers, especially top managers in the early days. But you would see them afterwards and again, some of -- I had a black secretary at one point. And they were capable of doing more than secretarial business. I'm just saying there was a time when you -- when I wouldn't have expected to see a black secretary. But then there were plenty of them and eventually, they worked up the ladder into positions that only white males had filled in the past.

Then, of course, in addition to that, you had the sort of sudden social explosions at Clinton in high school and the schools, you know, when -- when the local people were forced to mix in the public school. Which happened while I was in New York, I believe. So I didn't have first hand exposure to the struggles that went on, but I read about them.

[5:11:52]

That -- those are some of the real differences that existed between the early days and the subsequent days. And of course, technology was refined and many things that were done manually were later done automated. One of the good examples of this is the computer itself. We had at one stage, I should've mentioned that, at one stage, we had about close to a dozen girls punching Marchant and Freedens and all kinds of calculators, machines, like a typewriter except with numbers, in order to solve the technical equations that we had for design purposes. So we worked 10 or 12 gals like we would today work a computer. Much -- except the computer would do a much better job. Okay? And faster.

[5:13:02]

But eventually the Freedens and the Marchants were replaced by the forerunners of today's computers. And they were produced mostly by IBM and I was a user, basically, of those computers in the very early days. So my exposure as a user to a computer dates back to the 1950s.

Shacter, John

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Thonhoff, J.: What were they like back in the 1950s?

Shacter, J.: Very slow by today's standards -- very fast by the standards of what the girls were trying to do on the Marchants and Freedens. You know, everything has its base of comparison. You could look you were on a ladder -- on a technologic ladder and you could look down and you could look up.

Thonhoff, J.: Sure!

Shacter, J.: And we're still cutting back on the size of computers. Those early days, all the computers had to be air conditioned. They were so po -- so big and so powerful that one of the biggest expenses was putting 'em into rooms where they were air conditioned so that they could operate. Today, a computer doesn't care whether you have air conditioning or not. [laughs] Different -- different technologies.

That's also the time transistors were invented, not by me, but by other people and vacuum tubes started to disappear 'cause the transistor was doing exactly the same thing and more than the vacuum tubes were doing. And so instead of having a bunch of vacuum tubes with pretty short lives and then you had to replace the individual vacuum tubes, the transistor's life was much longer. You rarely heard of a transistor having to be removed, replaced. So that whole computing area shifted during my career. And it's still shifting.

[5:15:18]

Thonhoff, J.: Oh, absolutely! It's going to continue to just grow and grow.

Shacter, J.: Yeah, even the things you can do. Earlier, I mentioned internet, you know, punching and unknown word, something that you wanted to know more about into the computer and being flooded with information. And have them present that information in a logical sequence where the information that people asked the most of was taken to be for granted to be more important than the other information which only you were asking for but nobody else. So they would rank it. And they would have in the front end of maybe 1,000 references. First of all, you would only see 10. And all 10 of those would be popular, would've earned the right to be in the first 10 by popular request. So you were going by the experiences of customers before you today.

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[5:16:32]

So if I were to find out something specific like what kind of -- if I'm worried about bio attacks -- what are the most likely biological agents that a terrorist would use today, how -- how are they ranked and listed, I can find that out -- nothing classified about it. I -- I punch the button on the computer and the computer hasn't asked me if I have clearance or not. Just get the answer.

Thonhoff, J.:

Yeah!

Shacter, J.:

And it comes out of authoritative places. Now, you have to learn what an authoritative place is and not pay the same attention to a blogger -- that has an opinion to sell versus a report by the National Academy of Sciences. You gotta recognize that certain sources are more -- more believable, have more credibility.

Thonhoff, J.:

Absolutely!

Shacter, J.:

But what you can do today in terms of getting that kind of specific information, you couldn't do 5, 10 years ago. Not to speak of the '50s, so we've made enormous strides.

Thonhoff, J.:

Absolutely!

Shacter, J.:

Also word processing, you know, write you an e-mail. I changed my mind on the sequence of the paragraphs, I punch a button, and I switch 'em.

Thonhoff, J.:

Yeah.

Shacter, J.:

Without having to re-type the whole thing. Well, I couldn't do that if I would do it by hand. I -- I'd have to do a scissor job and Scotch tape. And a lot of people didn't do that, I mean, wasn't that important to them, so they put out a inferior product that didn't read too well and let the paragraphs stay the way they were staying because of the sequence in which you thought of those things and that may not have been the way, best way at all to present it. From the presentation point of view, you don't care when you thought of it --

[5:18:51]

Thonhoff, J.:

Absolutely!

Shacter, John

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Shacter, J.: -- but from the writing point of view, if you haven't thought of it yet, it's hard to put that paragraph in front. You haven't thought of it yet. [laughs] So there are as much editing, much correcting, much upgrading --

Thonhoff, J.: Right!

Shacter, J.: -- that you can do in today's computers with word processing that you weren't able to do before.

Thonhoff, J.: Let's look at what was it like for your wife and your children?

Shacter, J.: They had a ball, pretty much. Oak Ridge was a neat community for bringing up kids. The educational system was certainly ahead. And recreational facilities, parks and stuff were above -- far above normal for Tennessee. Pretty high up on the national scale and kids loved it. If you -- if there's -- even today, there must be hundreds of organizations in just Oak Ridge. I don't care what you're interested in, chances are there's a bunch of other people interested in the same thing and they formed an organization that you can belong to. So whereas at one time you had churches and attendance at church was -- a lot of people attended churches and still attend churches mainly for people-to-people contacts rather than what a preacher wants you to do and believe.

[5:20:34]

Thonhoff, J.: Right.

Shacter, J.: And that -- that -- that's existed, but in addition to that, you now have organizations where -- I'm the program chairman of an organization called Roane-Anderson Professional Society. It used to be called Roane-Anderson Technical Society, but we didn't like the initials. [laughter] RATS.

Thonhoff, J.: Got it!

Shacter, J.: So we changed it to the Roane-Anderson Professional Society and it's - RAPS. [laughs]

[5:21:10]

Thonhoff, J.: That's a little better. [laughs]

Shacter, J.: Besides that, we wanted non-technical people to feel free to come.

Shacter, John

Thonhoff, J.:

Yeah.

Shacter, J.:

And we arranged good speakers and the last speaker we had was yesterday and he came from the TVA and discussed energy policy. And what the TVA's doing to produce clean air.

Thonhoff, J.:

What's the TVA?

Shacter, J.:

I'm sorry. Tennessee Valley Authority.

Thonhoff, J.:

Okay.

Shacter, J.:

Well, it's a local -- a regional -- the biggest United States utility company. Owned at the present time by the governor, I mean, the government, the federal government, and they're talking about selling it either together or in pieces to private industry. And that would be privatized. But they have an enormous organization and what they're doing is influential because other power companies can't afford to spend their money the way these guys are spending it in directions. So they're, to a certain extent, pioneers. And the head guy of their environmental group, vice-president, visited the Roane-Anderson Professional Society where I'm program chairman and kept us fascinated for $\frac{3}{4}$, for a hour right after lunch in one of the local restaurants not very far from here. The Sagebrush Restaurant, if you saw it.

[5:22:54]

Thonhoff, J.:

Yeah, right over (indiscernible).

Shacter, J.:

They have a back room and we meet there once a month. And I also teach at Oak Ridge Institute of Continued Learning, which is mostly for retired people and seniors and I teach a course, well, it's not really teaching, I moderate a course on options -- on issues and options -- or issues and choices.

Thonhoff, J.:

That's wonderful!

[5:23:28]

Shacter, J.:

And we -- we discuss things that people normally get very emotional about, in a sensible way, respecting each other's opinions, but still feeling free to disagree.

Thonhoff, J.:

Absolutely!

Shacter, John

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Shacter, J.: And -- and I'm pretty proud of that effort and I'm the only one that's doing it for now the 4th year in succession. So somebody's satisfied to ask me back for consecutively 4 years.

Thonhoff, J.: Sure!

Shacter, J.: We need more of that in -- everywhere. Not just -- not just in Oak Ridge.

Thonhoff, J.: True.

Shacter, J.: Including some university campuses where they don't know how to discuss anything unemotional. They'd rather throw pies at the speakers and act like little kids.

[5:24:24]

Thonhoff, J.: [laughs] What do you think is important for the future generations to remember about the K-25 facility?

Shacter, J.: That it could be done. You know. That a bunch of young squirts that didn't have practically, much practical experience could get out of college and do as much as they did by being given, first of all, by a good education and then being given the opportunity to use it and to bring it to practica -- practical fruition. And I think in terms of education, we've probably gone down since then because if you look around the campuses today, a lot of the professors have strong accents. They have a hard time understanding 'em. They're Chinese and Indian and Finnish and Irish and -- because those countries produce students that are eager to come to the United States and fill jobs that should be quality jobs that we don't have enough people, domestically, to fill. The United States produces fewer engineers and scientists today per capita than any other developed or undeveloped nation. We're -- we're last, not first. And that's where our inventions are coming from and we don't even have enough people that qualify to fill those positions. And if you pick up the phone and ask for a service representative you have a problem on the telephone and the person has an accent and you think, well, they have an accent, they're probably located in Knoxville or Atlanta, they may be talking to you from Bombay.

[5:26:23]

Thonhoff, J.: Uh-huh. (affirmative)

Shacter, John

Shacter, J.:

And you don't even know it. And the reason they have an accent is because they're in Bombay. [laughs] And they're answering your question like they're sitting next door.

Thonhoff, J.:

Yeah.

Shacter, J.:

So a lot of this is taking place and we don't realize that this is going to lower our living standard for sure if we don't take care of it, so we -- we're losing out. It's another way of explaining we're losing out on below-par education. I think we've in many areas, retrogressed instead of advanced. And our advancement has been marginal, not major.

Thonhoff, J.:

Right.

Shacter, J.:

And I want to see major achievements. I have a plan where you would save a whole year by the 5th grade. They would have to know at the end of the 5th grade what they're supposed to know today at the end of the 6th grade, so you'd save one year and then hopefully a second year by the 10th grade and that would leave the last two years of high school open for all kinds of advanced subjects. Now that's a major improvement in education!

Thonhoff, J.:

Absolutely!

Shacter, J.:

Because instead of turning kids loose that need remedial education in college or at the job, you -- you would go on the offensive -- best defense is an offense -- and you would turn loose kids that have already invaded the freshman and sophomore years of the colleges.

[5:27:57]

Thonhoff, J.:

Yeah.

Shacter, J.:

And that would enable the colleges to straighten up, too.

Thonhoff, J.:

What do you think needs to be acknowledged as far as the accomplishments?

[5:28:11]

Shacter, J.:

The capability of people to produce results if they're properly stimulated and managed. As a manager, it's to quite a degree, your job, if you're a good manager, to make the people under you work more effectively by giving them that opportunity and some people think good management is the leader taking charge. Yeah, but as

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an individual, there's a limit to how much you can do, I don't care what job you've got, what your position is. The best thing you can do is multiply that by giving the whole team that your supervisor of a chance to produce as an effective team a -- a team of individuals, but also a team of teams. And have that work smoothly. And that's what K-25 gave an example of -- is that it can be done. We had some darn good managers. I'm not saying that every manager was good, but fortunately, a lot of 'em were. They set an example for the other managers and so, basically, K-25 youngsters, baby engineers, were permitted to do a man's job. And they did it. And it speaks well for their managers that they could do it. That's the most important thing.

Thonhoff, J.: Okay. Cut.

[End Tape 5, begin Tape 6]

[6:00:16]

Shacter, J.: -- so beyond that, it's just a question of dealing with a bureaucracy and the fact that I have a private copy of what I said shouldn't hamper anything else that the -- your organization wants to do.

Thonhoff, J.: Right. Well, when we get done, we'll talk to Gary and see --

Shacter, J.: Yeah. I'm talking about private use.

Thonhoff, J.: Sure.

Shacter, J.: Might keep it for my kids and grandkids. [laughs] Still consider that private use.

Thonhoff, J.: If you were going to write a story about Oak Ridge and K-25, what would be the topics that you would want to discuss?

Shacter, J.: Some of the same ones that I discussed, except when you put it in written form, it's, you know, it's a little better organized. You have a chance to organize it. And -- and I got a lot to say about my life in Austria that I didn't bother you with.

[crew talk]

Shacter, J.: Oh. You're still taping?

[crew talk]

[6:01:30]

Shacter, John

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Shacter, J.:

Okay.

Thonhoff, J.:

Well, would you like to talk about your life in Austria previous to coming to the United States?

Shacter, J.:

That's going way beyond what you're interested in, isn't it?

Thonhoff, J.:

Well, it gives us background about you.

Shacter, J.:

Big deal. [laughs]

Thonhoff, J.:

Well, here you are and you've had all these really great adventures.

Shacter, J.:

Yeah, but I thought you're emphasizing K-25.

Thonhoff, J.:

Well, yeah, exactly, but you were at K-25 and your background is important as well.

Shacter, J.:

Go ahead.

Thonhoff, J.:

Okay, well, tell me about it.

Shacter, J.:

Well, I -- I grew up in Vienna as a -- I was a sickly child. I didn't eat enough. My weight was low, below normal and they took it awfully seriously in those days. And, at least in Vienna they did, and so I -- everything was weighed out. We had a little scale and everything was weighed out, I remember. And I was a spoiled brat because everybody [laughs] -- they were interested in me surviving [laughs]. And I always thought I was capable of doing things physically that they didn't let me do. And I was in a -- in a, practically in a wheelchair in 1st grade of elementary school.

[6:02:56]

But that didn't last and then I've always been interested in reasoning and arguing things through and I had two aunts and one was very much on the left and one was very much on the right. And I remember a very frustrating game of ping-pong where I would go to the one on the left and get her opinion on something that I was interested in and she would convince me that she had absolutely the right opinion. And just to check, I would go to the one on the other side and ask her the same question and she was just as convincing that the first gal didn't know what she was talking about [laughs] and the second gal was right. And I didn't know enough about my own thinking to -- and it kind of frustrated

me that, now, why didn't I think of that, you know, when the second gal talked to me, second aunt talked to me. I would ask myself, well, why didn't I think of that? I mean, why didn't I think of it when I was talking to the first person. Why do I have to keep ping-ponging? [laughs]

And so that, I -- I remember vividly -- was one of the best training - - informal training that I had and reasoning, critical thinking, and sharpening my brain to ask good questions. And today, if I know anything, I may not know good answers, but I do know good questions. I ask the right questions. That -- you really have a leg up on the situation if you know how to ask the right questions. I don't get sidetracked into a bunch of trivia. I -- I stay with where the action is.

And I also learned how to participate, you know. If I asked that first aunt a question, how -- how -- how do I think she would answer it? And I got pretty good at predicting 'em. So that helped me, too. And -- and that's translatable to everything. It's not just issues.

Thonhoff, J.:

Right.

Shacter, J.:

I don't care if I face a technical problem or a people problem. When you realize that there's more than one view and that you better be familiar with more than one view before you make up your mind where you -- where you stand, that's -- that's the thing to do.

[6:05:38]

Thonhoff, J.:

Sure!

Shacter, J.:

So that's good early education on -- on my part.

And I was lucky I had those two aunts because if they had believed the same thing, I would've been out of luck. So I needed two people who were on opposite -- tended to be on opposite ends of the spectrum. And it's still true today that, you know, what's the best anti-poverty? Everybody's -- I remember -- what's the guy from Texas, became President?

[6:06:22]

Thonhoff, J.:

George Bush?

Shacter, John

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Shacter, J.:

No, much earlier. Big guy. He followed Kennedy. Lyndon Johnson! When Lyndon Johnson took over, he had a poverty program. You probably weren't born then, but [laughs] believe me, he did.

Thonhoff, J.:

[laughs]

Shacter, J.:

Now, as far as I'm concerned, the best poverty program you can come up with is education. You know, it's too late when you have to give money, throw money at the problem? And then where's it going to stop? How many people can we afford to throw money to? There's going to be fewer and fewer people, especially in a democracy, they all can vote. Why should I be a producer when I can be a consumer? You know, throw the money at me! I'll vote! If I think the Democrats are going to get me more money, I'll vote Democratic. I think the Repub -- if I'm crazy enough to think [laughs] the Republicans are going to do it, I'll vote Republican, right?

Thonhoff, J.:

Right.

Shacter, J.:

So -- so now, who are we? We're -- we're supposed to run a society and -- and be successful at it. It ain't going to be done with compassion alone. In fact, if you get too compassionate then take a gal -- take a teenager that's pregnant and give her a home of her own, allow her to leave her home and live like a queen supported by the government -- by the government and giving out more money each time she has a child, and the formula's predictable. The answer's predictable.

Thonhoff, J.:

Sure!

[6:08:05]

Shacter, J.:

And that's -- so you have to be careful when you do -- when you go compassionate, that you don't screw up the whole situation by not only helping the person but showing, teaching everybody a lesson that if you'll just misbehave in certain ways, the society's going to support you. So what is the best poverty program?

Thonhoff, J.:

Education.

Shacter, J.:

Education. Sure! And let the persons work themselves out. And tell 'em ahead of time if you don't work yourself out, we may not let you starve, but you're sure as heck not going to live like a queen. We're not going to give you a separate apartment. You

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lucky if they put you in a group and let the mothers spell each other on supervising the kids and earning some money 'cause that's the only way they'll eat. Sounds cruel, but if you don't do that, then you're just teaching the new mothers, the new teenagers a lesson that if you get pregnant, the society will treat you royally.

And this is happening in new schools. And some of the girls that are pregnant are very proud to come back to the classes and tell everybody how great it is to be pregnant in our society.

Thonhoff, J.: Are there any more topics that you want to discuss as far as K-25 or any stories that you wanna?

Shacter, J.: I can talk to you about religion. [laughs]

Thonhoff, J.: I don't know. We could do that later. [laughter]

Shacter, J.: Okay. I really think you got most of the stuff. I can't think of too much that happened. The contrast of my work in New York and my work at K-25 was substantial. I mean it was fish out of water --

[6:10:07]

Thonhoff, J.: Right.

Shacter, J.: -- to go to New York. But I've already told you about that and meeting the financial people. And I didn't say that I gave talks at Harvard about how to run a business.

Thonhoff, J.: Wow!

Shacter, J.: So I was -- I was -- didn't take me long to get on top -- get recognized as a leader in management as I was before that in -- in technology. The National Academy of Sciences, I think you read there somewhere, appointed me to a committee that advised an international research organization. It still works in Europe. How to combine management with technology. And so I was asked by the National Academy of Sciences of the United States to be a consultant to that organization and the sponsors of that organization are National Academy of Sciences, not just of the United States, but about close to 20 nations. So it's an international institute and I didn't have too many people that refused to listen. You know. I had things to say to them and I'm sure I helped some of the outsiders, non-United States people even more than I helped the United States people. So that was sort of a contribution on an international plane.

[6:11:44]

And I didn't tell you anything about that -- that much about -- just didn't occur to me. Seemed too far away from K-25.

Thonhoff, J.:

That's perfect!

Shacter, J.:

And my current educational activities. The plan that I have and I'm trying to convince people. I just -- I'm a Kingston Rotarian. Kingston's a small town near here in Roane County. I just ran for Superintendent of Schools and lost; there were 14 candidates and they didn't select me. But I wrote a letter today to the incoming President of the Rotary Club of Oak Ridge and told him that if he will get on the bandwagon on my plan, I will transfer from the Kingston club back to the Oak Ridge club and work with 'em on improving, making major improvements to education.

[6:12:48]

Thonhoff, J.:

(indiscernible)

Shacter, J.:

Now, you don't do that if you want every initiative of yours to be successful --

Thonhoff, J.:

Right.

Shacter, J.:

-- because it's very hard to do that. Your -- your average response will be rejection for one reason or another so you gotta be persistent enough to go back for more.

Thonhoff, J.:

I think you are. [laughter]

Shacter, J.:

I am persistent. That's right. My wife thought I was persistent.

Thonhoff, J.:

[laughs] I'm sure she was right, too.

Shacter, J.:

Her -- her -- her first reaction was a big laugh. [laughs] I didn't ask her to marry me; I just told her I was going to marry her. And she laughed. And I made her pay for it. [laughter] I still remind her of it.

Thonhoff, J.:

I'm sure! [laughter] Does she still remind you of it, too?

[6:13:41]

Shacter, John

Shacter, J.: Yeah. [laughter] She has things to say. She's not the intimidated type.

Thonhoff, J.: I don't think that that probably would've worked so well.

Shacter, J.: That's right. [laughter]

Thonhoff, J.: Well, are you done?

Shacter, J.: I'm satisfied.

Thonhoff, J.: You're satisfied?

Shacter, J.: I told you some of the things that I didn't say, if --. I didn't talk about the international stuff. I didn't talk about basic beliefs. I'm serious when I say religious beliefs. I -- I -- I have a formula that works for me that's hard to argue with. It may not be what you arrived at, but it can't be argued off the stage.

[6:14:39]

Thonhoff, J.: What's the formula?

Shacter, J.: Well, I'm -- I'm -- I have to phrase it carefully.

Thonhoff, J.: Okay.

Shacter, J.: I -- I believe -- I like to believe, see, I don't say I believe. I say I like to believe that there's a hereafter that has something to do with not losing all my friends and wife and all the relationships, so I believe in the -- I like to believe in the hereafter. Ask me to prove it and I can't. So that's why I say I like to believe.

[6:15:16]

And I like to believe in some power, some higher power that makes the -- makes the -- gives the living a purpose. And I believe in that. I like to believe in that. Ask me to prove it and I can't.

On the other hand, the atheist is no better off than I am because if I ask him to prove it, that what I said is wrong, he can't do that, either. So it's a position that I can hold forever and not be subject to any meaningful questioning by anybody can reason and think. And I'm happy with it and I think a lot of people would be happy with it if they thought of it.

Shacter, John

Thonhoff, J.:

Absolutely!
[6:15:51]

Shacter, J.:

But you have to be careful how you phrase it --

Thonhoff, J.:

Sure.

Shacter, J.:

-- and not expose yourself by saying I beli -- I believe that there is, 'cause then you could be challenged.

Thonhoff, J.:

Right.

Shacter, J.:

But if you say I like to believe, that's a more modest statement.

Thonhoff, J.:

Yeah.

Shacter, J.:

And it's impossible to tell me that I'm wrong. How can you tell a person's wrong to like to believe? You know, there is no such thing.

Thonhoff, J.:

There is not.

Shacter, J.:

So, just give you my religious lecture for the day.

Thonhoff, J.:

Wonderful! [laughter] I agree!

Okay.

Shacter, J.:

And I don't need a middleman. And there's certain things I don't believe. I don't believe that the Good Lord, whichever religion tells you that the Good Lord is jealous of a golden lamb or of images, is crazy. I don't believe in it; I don't wanna believe in it. I have more -- more respect for the -- if He exists -- for the Almighty to think that he would be that low in his -- in his qualities. Now, I don't think He's jealous. Why should He be jealous? He might laugh. But why should He get mad if I have an earthen image or a golden lamb, all that stuff?

[6:17:31]

And I believe in the Golden Rule. I don't believe that you're going to be excused forever by just, you know, holding up your three fingers, Scout's honor, I believe. That's -- that's not good enough. You gotta live -- live a good life and if you don't -- if you don't live a good life, I don't care what religion you are, I would question whether anybody could save you, including the head

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priest. Well, you know, you can't blame the priest or the minister or the rabbi for trying to teach you something that'll put him in control and put him in the middleman's position. But I don't need him. I'm on pretty good terms with the Almighty if He exists.
[laughs]

Thonhoff, J.:

You have a great philosophy!

Shacter, J.:

So I don't need anybody to explain Him to me. What -- what are his credentials? And as soon as he wants me to recognize him as the Chief Explainer, I can get some other guy from right next door from a different church, a different religion and he won't agree with him. He'll have some other explanation.

[6:18:35]

Thonhoff, J.:

(indiscernible)

Shacter, J.:

So forget it. I don't need that middleman. He doesn't know any more than I do and that's not much. [laughs] Well, you just got --.

[End of interview]

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