Oral History of Robert (Bob) E. Lorenzini

Interviewed by:
Craig Addison

Recorded: February 18, 2004

CHM Reference number: X6196.2011

Craig Addison: To start with Bob, can you talk about your early days in the industry and your work in silicon crystal growth and the founding of the first company that you got involved with?

Robert (Bob) E. Lorenzini: Yes, I can, and it really starts, with my interest in materials as a result of my formal education at Stanford. I came up to study mechanical engineering, and in the series of courses, took the first introductory course in material science and metallurgy and decided that that was a more interesting career than mechanical engineering and switched my major, and got my degree in material science. Back at that time, actually, they were just changing the name from metallurgy to material science, so that was back some time ago; that was 1958 that I got my Bachelor's Degree, went back and got a Master's Degree and did a project on zone melting of metals, which, in fact, was the first real introduction I had to an equipment that could be used for making silicon. And, my first job out of college was at Rheem Semiconductor, and that was the first spin-off of Fairchild. That was 1960, and my job was to help design and build a crystal-growing furnace for growing silicon. So I dove into that project, worked with a machine shop, and with another gentleman by the name of Bill Ford, and we in fact designed and built a crystal growing furnace that was heated with RF energy, which is not being used today, but which was one of the very, very early machines, and successfully grew, I believe it was three-quarter inch diameter crystal, which was very small at that time, and they were maybe 4 or 5 inches long. [We were] able to work out a production process to to grow these one after another, and in a reproducible fashion.

Addison: Who else was involved in crystal growing at that time? I guess Fairchild was doing it as well?

Lorenzini: Fairchild had some activity in crystal growing, Shockley Labs had some activity in crystal growing, there was one or two companies actually attempting to do crystal growing using a float zone method rather than Czochralski. One I remember was Merck Chemical Company who was in it for just a short period of time, and then bowed out.

Addison: How long did you stay at Rheem?

Lorenzini: I stayed there 2 years, I believe, and then was recruited away to a company in Pennsylvania called Allegheny Electronic Chemicals Company in Bradford, and moved to Bradford and found out that that part of the world is very, very cold. I remember, I think it was the winter of 1962, and it was 40 below zero for 5 days in a row, and never got above that, and I decided that this was not the place for me. So only stayed there for one year, but came out after that year to join another small startup business in silicon crystal growth called Knapic Electrophysics that was in Palo Alto. And I was hired there as chief engineer, or engineering manager. And unbeknown to me, the business had been financed by a group of Texas oil people, and apparently, not too long after I had gotten there, they had listened to a business guru that said, hey, this semiconductor business is really a flash in the pan. We suggest that you vacate this business, sell it out, and move on to something else. So virtually immediately, they decided to put the company on the block and sell it. They couldn't find a buyer for it in 2 or 3 months, they were very impatient, and decided just to pull the plug on the business and close it down and had an auction of all of the assets of the business. I had personally saved up a small amount of money, I think $2,000 or $2,500 from my work experience, and decided, well, I'll show up at the auction and buy some things, and start a business of my own. So that was the beginning of the seed of starting Elmat, which was the first company that I started and grew. I showed up at the auction, bought some materials and equipment, and in the

meantime, ran into a fellow who was the primary shareholder and owner and operator of the Port of Stockton Grain Terminal, of all things. And he had a small building in Mountain View [California] that had been built up as a laboratory for another business that he'd backed, and that business had not succeeded, so the laboratory was there, and he said, well, why don't you come move into that building, and I'll make you a good deal on rent, and you can get started. So I started the business. It was over on Terra Bella Street in Mountain View, and I designed and built a resistance-heated crystal growing furnace, and it worked extremely well, and then replicated that. I built four more of them, and set up a crystal-growing operation in this little, small space. It was actually an incubator space, probably 2,000 square feet in maybe a 15,000 square foot building. So that was how it started, and we, my partner, the man from Port of Stockton Grain Terminal, decided that we needed to expand and we bought some land in Mountain View and built a building over on National Avenue, very close to Fairchild, and built that really as a custom building for growing crystals and set up about 20 or 22 crystal growing furnaces in there. [We] built a nice business primarily selling crystals and later on, wafers, sliced wafers to the semiconductor industry. We were approached in 1968 by General Instruments, their Semi-Metals Division. Semi-Metals was a subsidiary of General Instruments, located on Long Island [New York] and they made primarily epi wafers. They had no crystal growing capability or slicing or polishing and they made us an offer that we couldn't refuse, and we decided to sell the business in 1968. So I was then beginning to look around for something else to do. And in the sale of that business had a 1-year non-compete clause which I lived up to, so I had some fun and played some golf, and went sailing, and bought a sailboat, and really thought about what I wanted to do next. And silicon had definitely struck a chord with me and decided I wanted to stay in the silicon business and build another company. So, in that period of time I did quite a bit of design work, actually, on a new type of much larger crystal-growing furnace than the old Elmat furnace. I actually designed it on my dining room table; I had my dining room set up as a drafting room, and still have the original drawings of all of the parts/pieces, nuts, bolts, washers, everything of the original Siltec model 860-D we called it, crystal growing furnace.

Addison: But before you go on to Siltec, I'd like to ask you a few questions about Elmat. Okay, so your partner in Elmat, it sounds like he wasn't a semiconductor guy and knew nothing about the business.

Lorenzini: No, he was strictly an investor, really one of what you might call the early venture capital or angel investors.

Addison: Did he go on to do anything else in the industry?

Lorenzini: No. That was his only venture in semiconductors.

Addison: So, your customers at the time, who were you selling the wafers to?

Lorenzini: We had a number of customers…Fairchild and IBM, International Rectifier; they were a few of them.

Addison: And was there any international competition at that time, from Europe or Japan? Were you up against people selling into the U.S., or was it a very new market?

Lorenzini: It was a very new market. Wacker was selling into the U.S., and Monsanto, I can't recall…Monsanto was getting their operation up and running, and I know that they were very strong in the 70s. That was when they were really building their operation. But at that point in time, the industry was still quite small, and fragmented, and so there was not a lot of either business or competition.

Addison: So, in 1968, that was when General Instrument bought Elmat?

Lorenzini: Right.

Addison: So you took a year off, and then you…?

Lorenzini: Yes, I took a year off between '68 and '69 and founded Siltec in 1969 with, it was a group of investors. It was a very modest, early investment to get going; I think it was around $110,000 total. And started out on Haven Avenue in Menlo Park, leased some space there, and had the first Siltec crystal growing furnace built by a machine shop over in East Palo Alto. Brought it over to Menlo Park and hooked it up, and fired it up, and that was a very good large high-productive machine that with a little bit of debugging took off and operated very well.

Addison: This is the furnace you designed on your dining room table?

Lorenzini: That's right.

Addison: Was it based on what you had at Elmat, or was it a quantum leap?

Lorenzini: Yeah, it was based on the old Elmat furnace, at least, a lot of the principles that we learned in operating the Elmat furnace. But it was quite a bit larger. It had the ability of growing fairly large crystals for the time, and a large crystal for the time was, oh, I remember the IBM spec was two and a quarter inch diameter. And, IBM always wanted to go another quarter inch larger than the industry standard, and they did that for a number of years. But, that furnace would actually go up to three inch diameter. And so we did some really interesting work with that furnace. We were the first ones to reproducibly grow three-inch diameter, zero dislocation silicon, which was quite a breakthrough.

Addison: What does zero dislocation mean?

Lorenzini: Zero dislocation means that, dislocations are a row of missing atoms in a structure. And silicon wafers up to that point had thousands of dislocations per square centimeter of surface area of the wafer. And those would affect the device parameter. So the device industry wanted a better quality, zero dislocation crystal. So there was a race on to see which silicon provider could do that, and do it on a reproducible basis. And Siltec, to my knowledge, was the first one to do that, and that was early 70s, and I don't remember exactly which year, but it was in the early 70s, and we came up with the process to do that, and this was one of the things that really catapulted the sales volume for the business.

Addison: So you started out with one furnace, but how many did you add in the first few years?

Lorenzini: We added, I think, five more, had a total of six of them, and then took over some additional space in the building next door and continued to build more furnaces and we built, I think in that location, 30 some-odd furnaces. We operated them in a complex of buildings. We had at that time, by the mid-70's, two buildings, and then kept adding some additional buildings in that area as we got into more slicing and polishing of the wafers.

Addison: The slicing and polishing, was that kind of a natural step?

Lorenzini: Yeah, most of our customers wanted them in a sliced form, or a polished form, and so we made the investment to do that. At that point in time, polishing machines were really more laboratory units. They were not set up for production, so we ended up designing quite a unique polishing machine. And again, it was designed with very, very high throughput. We used to kid it was like a racing car, and we used to pride ourselves on the very low time between runs. We could keep the machine going virtually constantly and when it came down for a reload it would just be a matter of a few minutes and would be back in production again. That same design philosophy was used in the crystal-growing furnace, because again, productivity, or the amount of material out per day was a very big factor to maintain profitability. And again, we prided ourselves on a very low downtime and very high productivity.

Addison: Going back to establishing Siltec, you said $110,000 with basically a group of investors. Any sort of venture capital money in there?

Lorenzini: There was. The first venture money we brought in was from Allstate Insurance. And Allstate had a venture arm, and they were the first ones in it. We really didn't bring any more venture money in. We were able to run the business generating cash flow and profitability, and really grew the business through internally generated cash flow. Which, many people said, was impossible in a capital-intensive business like silicon crystal manufacturing, but we were able to do it. And we grew the business through the 70s to about, a little over $50 million in sales by 1980, which, I guess in today's dollars, probably adjusting for inflation and all, would be about twice that. So it was quite a feat that I'm certainly proud of, and doing it without external capital was quite a challenge.

Addison: So who were the key people? Obviously yourself, but were there other key founders, or just people putting in money and letting you run the business?

Lorenzini: Oh, well, of course, there were many key employees. We did a public offering in 1980, so we brought funding in then, about $8 million, and also that year, or maybe it was '81, we arranged an $8 million loan from the State of Oregon. Because at that point in time, we had outgrown our facility in Menlo Park and wanted to build a larger facility, and decided to go to Oregon to do that because of the low-cost power. Because electric power is one of the large cost items in crystal growing.

Addison: Can you talk a little bit about the competition, or the competitive environment, in those first few years? You said you were cash flow positive and self-funding, is that because there weren't other major competitors?

Lorenzini: No, there were competitors, Wacker was really beginning to come on strong in the '70's, Monsanto was a good competitor. In those years there was not much competition from Japan. I traveled

over to Japan several times and tried to build accounts, and generate sales volume in Japan, but typically Japan wanted to develop their own single crystal business, and they did that and did a good job of it.

Addison: So did you have any significant success in Japan?

Lorenzini: We didn't. We did have success in selling equipment, however. During this period of the 70's, we set up an equipment division as a way of helping to fund the company, and sold crystal growing furnaces, and polishing machines, and eventually wafer transport systems as well. And that was a very profitable business for Siltec. It generally was a 50 percent gross margin-type business, significantly more profitable than a silicon materials business, which was more like a 30 to 35 percent gross margin business.

Addison: The guys these days would kill for that.

Lorenzini: I know.

Addison: So you sold the equipment to Japan…

Lorenzini: Sold equipment not only to Japan, but all over the world, actually. To Philips in Holland, and to Wacker.

Addison: What was your thinking there? I mean really, that's creating competitors.

Lorenzini: It was creating competitors, but on the other hand, it was also funding the business. So I think we could see that the business was big enough, at least at that point in time, it was big enough to take several good companies as suppliers for the industry.

Addison: But a potential silicon supplier buying equipment from a competitor, was that a problem?

Lorenzini: No. Wasn't a problem. It was a little tricky regarding [what] we called the software at that point in time, which was all of the processing steps in, for example, making zero dislocation crystals and getting utmost productivity out of the machines. We made it clear to the buyers that that was not going with the machines, that what they bought was a piece of hardware. And so there was a certain amount of tension, as you can imagine, about that, but that worked, and there was not a problem with that, as there was a clear understanding.

Addison: The device-makers during that period, they pretty much had stopped growing their own crystals, right?

Lorenzini: Fairchild grew their own crystals. Texas Instruments grew their own crystals. IBM had a facility in East Fishkill, New York, where they grew not all of their material, but some amount of it. Motorola's strategy was to make virtually all of their silicon. Whereas others, like Intel, and AMD, and others who were latecomers to the business, decided not to. They decided there was enough of a silicon infrastructure to go ahead and just purchase the outsourced wafer.

Addison: So you were really selling to the startups of the time?

Lorenzini: Right.

Addison: Throughout the period of Siltec, did that stay the same? I mean, Fairchild, TI, IBM, and so on, they eventually got out of it.

Lorenzini: They started getting out of it. And as the silicon industry matured, and prices came down for wafers, they decided to just close down or sell off their facilities.

Addison: Was that sort of a noticeable impact on the market, suddenly, there was a lot more demand?

Lorenzini: Yeah, there was more demand. It happened slowly, it happened over a number of years, but definitely more demand for wafers in the marketplace.

Addison: So what about the wafer sizes? You talked about IBM having its own size, and I think around the time that Siltec was established, or a year after SEMI was established, and I believe that one of the motivations was to standardize wafer sizes. What are your recollections of the debate?

Lorenzini: Well, three inch was the standard for quite a long time. And I mentioned IBM would always go a quarter of an inch more, so their standard was three and a quarter. But the industry virtually standardized on three inch for a number of years, and then went directly to four inch. Four inch was a big runner for lots of years and then there was quite a bit of debate about what the next step should be. And for a while, five and a quarter inch was used by IBM, and that didn't last long, and people went to the six inch. And from there to eight inch, and then now up to 12 inch.

Addison: During those progressions, was SEMI closely involved in getting the industry to focus?

Lorenzini: Yes, SEMI did a very nice job of pulling the industry together and helping to set standards and it helped the industry and the end-customer, and the device-maker, very much.

Addison: So really, when did the standards come into place, from like, 3 inches on?

Lorenzini: I'd say from three inches on, that's my recollection. It really started with the three inch.

Addison: And if you look at the current situation, some people are saying that the next generation, whether it's 450 or 400mm, is going to be not economical to produce, and maybe 300mm is the last. Was there any sort of a debate back then, people saying well, four inches, we're not going to be making wafers any bigger than that?

Lorenzini: Yeah, there was some debate about that, but not much. Generally, the materials people like Siltec, and like Monsanto, and so forth, would try to be one step ahead, and show the industry that yes, you can make four inch and make it on a production basis. So at that point in time, there was quite a bit of innovative work being done by the silicon people.

Addison: So was it a case that the silicon suppliers were the ones pushing the larger wafers, or the customers who said okay, we went bigger wafers?

Lorenzini: It was both. Both wanted it. In a way, the customer, though, was really the driver because the silicon industry folks would get a little bit nervous about the fact that the customer always wanted to go up in diameter. There's lots of capital expense obviously in setting up a crystal growing operation, and you set it up around a certain diameter, typically, and lots of concern that, this installation was going to become obsolete quickly because it's designed to do four inch, and now six inch is being demanded by the customer. So there was a bit of play, tug back and forth between the customer, the device maker, and the silicon wafer maker. But moving upwards, on a quest to go on to larger diameter…generally, it really worked quite smoothly.

Addison: So you were happy with the period between changes, you got enough return from your investment in those machines?

Lorenzini: Yeah.

Addison: Everybody complains about the silicon cycles and surviving those, I guess you've been through, probably what…?

Lorenzini: Too many!

Addison: Too many.

Lorenzini: Yes! The scars are all over me to prove it. One that I remember very well was 1975. 1975 was a large downdraft in the business. And the chip industry in the early '70s was really growing rapidly, there was a tremendous silicon demand, and in 1975 everything dropped off the cliff. I remember very well coming to work one Monday morning and getting a call from the purchasing agent at IBM. IBM was our largest customer at that time, and saying, stop, hold everything, don't ship us another gram of silicon, we have an inventory that's growing rapidly and we just can't use it. And for us, a small company at that time, this was a real hardship. So we really went into a survival mode, and 1975, unfortunately had to let quite a number of people go, probably half the workforce. The management group, we all took 15 percent pay cuts, and just gutted it out. And it was a very, very tough period of time. But, it survived, it came back in 1976, and '77, and so by the late 70s, it was growing again, very nicely.

Addison: How many people did you have with the company at that time?

Lorenzini: I'd say maybe 50 or 75 people, something like that.

Addison: It really happened that suddenly? That call from IBM was like the first real indication?

Lorenzini: Very suddenly, yeah, that was the first real indication that it was serious.

Addison: Did you get other calls from the customers?

Lorenzini: Yes, within several weeks, we got the same sort of call from virtually all of the customers. So it was a very tough period of time. And then again, virtually 10 years later, another very, very dramatic downturn, in ’85. In fact, ’83 to ’84, the industry had leveled off a bit, but ’85, again, was a very bad downdraft. Much the same type of thing happened, just early alerts from the big customers calling, saying stop, halt, we have enough silicon, no more! And during that period of time, we were right in the midst of building a new plant up in Salem, Oregon. So that hit us particularly hard, because we had quite a few ongoing expenses and not a lot of revenue base or profitability as part of it. So that actually led to the decision to sell the business. We brought in a business broker and started to shop the business around. The environment during that period of time was certainly not the best to sell a business; it was still quite low, a lot of pessimism. The industry was really in the tank. But Mitsubishi had an interest in getting into silicon, and decided to come and take a look, and did a significant amount of due diligence, decided that this was a business they wanted to get into, and so we ended up selling the business to Mitsubishi the end of December of 1986.

Addison: Just going back to the reason, the downturn of ’85 was when you decided you wanted to sell the business?

Lorenzini: Right. It looked to us, at that time, that this was not going to be a good business for an entrepreneurial culture and a relatively small independent company to pursue. At that point in time there were a number of very large players. Monsanto had grown quite dramatically; Wacker was, of course, very large. We had a number of Japanese companies that had come into the business. SEH, Shinetsu Handotai, Osaka Titanium was one, was in it then, Komatsu, quite a few. And it was extremely competitive then, margins had been whittled way down. So I think the decision to sell it was the right one. It needed to have the resources of a large, deep pockets owner.

Addison: Who were the U.S. competitors at that time?

Lorenzini: Monsanto was the main competitor.

Addison: But it wasn’t a focused silicon company…it was a large conglomerate, wasn’t it?

Lorenzini: Well, it was a subsidiary, I guess, of the chemical company.

Addison: So you were pretty much the only dedicated, crystal wafer company in the U.S.?

Lorenzini: Right.

Addison: So you looked around for buyers. How did you find Mitsubishi, was it through your broker?

Lorenzini: Yeah, it was through a business broker in Japan that made the contact and helped kind of handhold both sides during the negotiations. It worked out well for, I think, all parties.

Addison: Did you know anybody at Mitsubishi?

Lorenzini: No. But Mitsubishi went on to invest very heavily in the Oregon facility, and after buying Siltec, set up a large, modern, epitaxial wafer plant and expanded the crystal growing and the polishing and slicing plants up there. That worked out to be a very good facility.

Addison: Mitsubishi wasn't in this business in Japan; this was its very first step into this market?

Lorenzini: Right.

Addison: After this, did they start building facilities in Japan?

Lorenzini: They build facilities in Japan after this, and also enlarged the facility up in Oregon.

Addison: We skipped the IPO. You briefly mentioned about the Siltec IPO. There was quite a long period between starting the company and doing the IPO.

Lorenzini: Yes, a few years.

Addison: What was the thinking there?

Lorenzini: No, the thinking there was just to help finance the growth, because the business had gone through tremendous growth in the late '70s. From the downturn that I spoke about in '75, when it finally came back in '76, it started to really grow and accelerate rapidly. I think, I remember our sales volume was something like, in '75, in '74, we were doing about $10 million in sales, in '75 it was basically cut in half, down to $5 million. Then, I think in the following year, in '76 it came back to $10 or $12 million, and then it went $24, $38, $50, and we were on a tremendous roll and growing very rapidly during that time period.

Addison: So the IPO was to fund that growth?

Lorenzini: The IPO was to fund that growth. Exactly.

Addison: What was the IPO environment like then for a materials company?

Lorenzini: We were really one of the very early pioneers…at that time, there were very few companies being brought into the public market. We did it with the high-tech group in San Francisco that had made quite a name for themselves in helping to fund high-tech businesses, and that was Humbrecht & Quist. We also used an investment banker from New York, Kidder Peabody. The two of them did the underwriting, and the stock offering was successful, and we brought in, I think it was $8 million the first go-around.

Addison: Was it a hard sell? Did people say, what is crystal growing, what are wafers?

Lorenzini: No, it was really well received. We did a road show around the country, Boston and New York, Chicago, and Dallas, and I think the public was very interested in the semiconductor industry at that point in time. It was still relatively new, and they felt that this was a good chance to kind of play the

semiconductor card without owning the chip company itself, but spread it around a bit by owning a piece of the company that's in the materials business.

Addison: Are there any sort of memorable moments or anecdotes from the IPO that you recall? Popping of champagne or anything?

Lorenzini: Oh, yeah, we had some big parties. As a matter of fact, I think it was the night before the actual IPO, we did a party up on top of the World Trade Center building, so I remember the top of the World Trade Center building quite well. It's interesting; an IPO at that point in time was just a means of financing the business, and there was really very little hoopla around doing an IPO then.

Addison: And how did the price of the stock go on opening day?

Lorenzini: It went up a bit, I think it was around $18, and moved up a little bit. So it was a successful offering, it went well, the stock was all taken up, and it went very well.

Addison: So after that, then you were beholden to the quarterly reports, and to Wall Street, and so forth.

Lorenzini: Right, there was a bit more reporting to do, but it was nowhere near as complex and regulated as it is now. I mean, we maybe added 2 extra people in our accounting and finance area to take care of reporting, and this was for a $50 million business, so it wasn't an onerous task to do the financial reporting as it is now.

Addison: I guess the stock was hit pretty bad in the '85 downturn?

Lorenzini: Oh yeah, in fact, the early '80s the industry slowed down, and it was really '85 when it really went back down in the tank. One of the disappointments during that period of time was we decided to go into another line of business and we started a division making ceramic packages down in Southern California, in competition with Kyocera. These specifically were what were called CERDIPs, a ceramic dual inline package, and we built the business fairly rapidly. But it was extremely tough going against Kyocera. Very tough competitors. After three and a half years running that business, we elected to sell it and get out of it, and we took some losses as a result of that. But we decided that it was an interesting foray, we learned a lesson; we should stick to our knitting, and do what we knew best, and that was a mistake.

Addison: So that was a disappointment. What about the highlights?

Lorenzini: Well, certainly one personal highlight for me was 1979, being awarded the SEMI award for pioneering work in silicon crystal growth. And I was very proud of that, I remember that evening very well, it was a big gala occasion up in San Francisco, and Chuck Harwood, who was president of Signetics at the time, did the presentation, and [it was] a very nice awards ceremony. I remember that very well.

Addison: Talking about the technology, I guess people look at a wafer, and they think, well, a wafer's a wafer, but over the years, what are some of the technology breakthroughs that might not be evident to people not involved in the industry?

Lorenzini: Oh, oxygen control, oxygen gettering, linearity/flatness of the wafer has all gotten much better. Specifications on a silicon wafer now are very, very tight. Of course the demand now going up to 300 mm requires massive furnaces. They almost look like what you would have seen years ago in a steel mill, where the crystals coming out look like telephone poles; they're huge. So the silicon industry now is, I think, on a bit of a plateau. There's a lot of conjecture now as to whether 300 mm is the end of the line as far as the expansion of wafer diameters. And I guess I feel that it very well could be. There's not a lot of push from the device people, the customers, to expand beyond 300 mm, so I think 300 mm will live on for some period of time, and could be, that's the ultimate.

Addison: So do you think that the Day of the startup in the silicon wafer industry is over? Nobody could come in and start from scratch…?

Lorenzini: Oh, it's well over. It's not an industry now for an entrepreneurial company. It's very deep pockets; very large financial resources are needed to play in that business.

Addison: Maybe we can talk about the period post-selling the company. What did you do afterwards?

Lorenzini: As I mentioned, we sold the business in December of '86, and I again took a break and played a little more golf, and definitely did more sailing, and enjoyed life, and decided what to do next. I basically decided to go into venture capital and angel investing and working with startup businesses. And in that period of time I met a very interesting man who has become my partner and co-founder in a business called SunPower, and that man is Richard Swanson. At the time I met him he was a professor of electrical engineering at Stanford, and had done a lot of work in photovoltaics, which is solar cells, conversion of light to electricity. In fact, I was contacted during that period of time, in early '88 by EPRI, the Electric Power Research Institute, who were funding Swanson's work at Stanford. [EPRI said] if you'd be interested in doing some consulting work for us, we would love to have you write a report as to whether you think that the technology that Swanson is developing is an effort that can be commercialized. So I in fact did that, became very intrigued with Swanson's work, and decided, well, not only is it able to be commercialized, but I will go out and raise some money, and see if we can start a business around it. Of course, when I came back with that information, EPRI were absolutely thrilled. They said you have our total support, and went out and raised some money from a venture firm, AVI, Associated Venture Investors, and started a business that has been going and growing since. The business now is ready to go really into primetime with a large plant in the Philippines, and production coming out of that plant in July or August [2004]. So, it's been quite a long gestation period, and during the early years the company really survived and made their money doing government contract work, and did some interesting projects

Addison: What is the connection between semiconductors and solar power, I mean, what you've learned during your career?

Lorenzini: The connection is that the solar cells, the photovoltaic cells are made on silicon wafers, so that is the tie-in for me. It's fun for me because when I used to do my road-show trips and explain to people what Siltec does and what the silicon industry is like, I would generally finish up…with a photograph of a big housing development showing lots of flat roofs, and I had a little demonstration toy that was a silicon wafer mounted on a plastic box that had a propeller and a little small, electric motor on it. And I'd hold it up to the light bulb and show people, see, this light, impinging on the wafer, can make this propeller go,

and this is solar energy, and a silicon man's dream is all of these rooftops covered with silicon wafers. So, this has been a fun trip for me to help to make that happen.

Addison: Taking that argument a step further, do you think the silicon suppliers today are on the verge of this huge new market where they can supply wafers?

Lorenzini: Very much so, except that the pricing and the method of manufacture of the silicon wafer is going to have to be quite dramatically changed from the way that the wafers were made in the integrated circuit business because the pricing required to make solar energy attractive is very, very low.

Addison: I was just going to ask, have you got any comments about SEMI or your involvement with SEMI.

Lorenzini: I attended the very first organizational meeting for SEMI and it was at Ricky's in Palo Alto, and I remember Phil Gregory and Fred Kulicke were there at the podium, and there was a hodgepodge of people like myself who were in various forms of the, either equipment or materials business providing services and equipment and so forth to the industry. And I can remember Phil Gregory saying, "Well, one of the things that we want to do is have a show, and we don't want to make it overly expensive for the participants, and what I envision is a show where the exhibitors can just drive right up to it with their station wagon, and take a card table, set it up, put their equipment on the card table, and sell their wares." And we all applauded, and said, "Wow, this sounds great!"

Addison: Could you put some of this equipment on a card table at the time?

Lorenzini: Oh yeah. The kind of equipment then, there were like wire bonders and so forth, you could put on a card table.

Addison: You couldn't put a furnace, though…

Lorenzini: No, couldn't put a furnace on it. But some of the actual chip-making stuff, absolutely. And the inspection equipment…of course, microscopes were a big thing at that time.

Addison: So was a trade association specifically mentioned, or it was just, let's do a trade show, and then that led to…?

Lorenzini: No, really the whole idea was a trade association which would sponsor the show; that would be the primary mission of the trade association.

Addison: Did people start talking about names of what the association might be called?

Lorenzini: Yeah, they did. Semiconductor Equipment and Materials Institute, everyone thought that sounded good.

Addison: You said it was at Ricky's?

Lorenzini: Yeah, it was Ricky's, what later became Ricky's Hyatt House, or Ricky's Hyatt. [It] was kind of a standard place where the trade associations [held meetings]. There was another trade association called WEMA, which was the Western Electronic Manufacturer's Association. WEMA used to hold their dinners there. As a matter of fact, back at that time I was a board member of WEMA, and actually chairman of their Northern California chapter. And we used to have our meetings at Ricky's, the WEMA meetings.

Addison: So you were on the board of WEMA, but weren't they the so-called enemy, from what I've read. It was all defense [electronics] people, and the people starting SEMI complained that WEMA was too defense-orientated?

Lorenzini: Yeah, there was a little bit of animosity there, but not much. I think WEMA felt that semiconductor equipment and materials was probably too small a niche for them, that they wanted to be more end-instrumentation, end-use of chips. So their typical customer was more of a Hewlett-Packard, for example, or a Tektronix, companies like that.

Addison: Were you involved in any follow-up meetings with SEMI, after that first one?

Lorenzini: A few of them. At that point in time I was very busy with Siltec, so I didn't have the time to spend a lot of time on the trade association. But I volunteered some time, and actually was asked to be a member of the SEMI Board of Directors, which I served on for I think about 5 years.

Addison: So were you the only silicon guy on the board? Stan [Myers] came on later.

Lorenzini: Stan came on later, right. Yeah, I think I was the only silicon member.

Addison: Actually, we haven't talked about Stan. Was he at Siltec the same time as you, or he came on later?

Lorenzini: No, in fact, I hired Stan in, I think it was in the early 80's, when we were in the midst of building our big Salem facility, and Stan had that assignment, to get that up and going.

Addison:: So he came from Monsanto.

Lorenzini: Monsanto, yes, which was one of our rivals, as you know.

Addison: Are there any recollections where you called him and asked, do you want to work for us, or did a headhunter do it?

Lorenzini: You know, we knew each other, and I think the initial contact was over the phone, because I remember I'd called him, and he said he might be interested in that, and we got together. One thing led to another, and we said yeah, sounds good, let's go.

Addison: What was his title?

Lorenzini: Vice president, I think at that time, vice president, administration.

Addison: So you hired Stan in the early ‘80’s?

Lorenzini: Right.

Addison: And then you sold it to Mitsubishi in ’86, so you were working there together for a few years.

Lorenzini: He was there for a few years, yeah. And then, we made Stan president in ’85 and I went to chairman of the board. This was during the period of time where we decided to sell the business. So [Stan] was very involved in the whole process of finding bidders, and of course, quite involved, as we all were, in the negotiations and helping Mitsubishi with their due diligence.

Addison: So he wasn’t a bit peeved that after joining Siltec, it was then sold?

Lorenzini: No, I don’t think so. He was very supportive, because he knew, like all the rest of us, that to survive and grow in that business, you needed very deep pockets. And Siltec just didn’t have very deep pockets; Siltec was still an entrepreneurial-type organization, and did not have the financial resources to go up against an SEH, or Wacker, or the other big ones.

END OF INTERVIEW

