Oral History of Lionel Kattner

Interviewed by:
Craig Addison

Recorded: November 20, 2007
Napa, California

CHM Reference number: X4434.2008

Craig Addison: Could you start off by talking briefly about your background and your education?

Lionel Kattner: Sure, I received a degree in chemistry and math and almost total physics too, three of them, at Southwestern University in Texas and upon graduation I had a couple of offers, one from the FBI for their laboratory work and another one was Hanford Atomic Products Operation up in the State of Washington…at that time everything was atomic. Nuclear wasn't used that much so it was called the Hanford Atomic Products Operation and that was for the production of plutonium primarily from the Uranium 238. And so at the time that seemed to be a much more exciting industry so I chose to go up there and worked in the research labs mostly, in the actual chemical operations of separating Plutonium from Uranium, and spent a little over four years there.

At that time I wanted to transfer down to Los Alamos but since the Korean War was still not totally complete I was still subject to the draft and I had to resign at one place first before I could go to another place. I was afraid I might be picked up quickly and be drafted so I opted to go to the Navy. Went to Officer's School and was immediately assigned to the Atomic Weapons Operations in the Navy and went to Sandia Base for about six months and did some studies there. Then from that point on I was considered a Nuclear Officer in charge of all the nuclear components of the atomic weapons in my group.

I got out of the Navy in 1958…I had applied to Lawrence Radiation Labs down here in Livermore, California. I never did hear from them right away so I then saw an ad that Texas Instruments was hiring and they wanted some chemists so I decided I'd go up there and work for a while and then all of a sudden my offer came through. It went through all the Navy channels before I got it and it took several months but I had an offer from Livermore to go to work there. But after I got started at Texas Instruments I kind of got caught up into the semiconductor business and didn't know a thing about it when I went there. I solved some of the problems they were having on one of their production lines and then immediately was promoted to the product engineer of that product…that was one of the IBM [mesa type] germanium products and I spent a little bit of time up in New York at their plant.

And then came back to Dallas at TI and then at one point a friend of mine there said, "You ought to consider going out to Fairchild. Would you be interested?" I said, "Yeah." I didn't know much about Fairchild at that time. Jay Last came down. He was doing some interviewing down there to hire some TI-ers I guess to go back out to Fairchild. I met him in Dallas and very quickly I got an offer to come out to California to interview and that was [with] Bob Noyce, and a lot more time with Jay, and then was offered a position to go into the microelectronics group which Jay Last was heading up at that time. I think the only other person that had been hired in there was a person by the name of Jim Nall. So he and I shared an office. So I did go to Fairchild and it was a very much unknown situation there. Very few people had done much work in microelectronics but my job was to essentially follow some of the thoughts that Jay had about isolating individual components in silicon wafers.

The long and the short of that is is that worked out but then there were several people who were exiting Fairchild and I also felt kind of like, well, Jay [Last] had left at that point too and he said he was waiting for me to call him. He didn't want to be trying to hire away from Fairchild but I never did do that.

It turns out that several of us in the lab were…I was a little bit disenchanted because I wasn't sure what was going to happen next and Mark Weissenstern was one of the people I worked with. He talked to me. He said, "Would you be interested in starting a company?" I said, "Well, yeah, I have thought about it." I didn't know the other people in the lab that well since I hadn't been at Fairchild that long. He got us all four together. It was David James, Dave Allison, he and then myself and we met after hours one day and started talking about it and everybody had the same feelings that there didn't seem to be a lot of direction at Fairchild. So after a short time we decided that we would try to seek some financing but then we knew that most of the West Coast venture capitalists and banks and so forth were pretty much tied in with Fairchild or some of the Fairchild people and we thought we'd better go back east somewhere and seek something there. Dave Allison…his brother was in New York and knew some banking [people]. I'm not sure if he's a broker but worked in that area and suggested we contact Merrill Lynch and said a Mr. Smith was the fellow most likely to talk to.

So we wrote a letter and sent it to Smith. At that time it was Merrill Lynch, Fenner and Smith. Never did hear much and then finally I think Dave called back there and found out that Smith was deceased so the letter was kind of sitting there and they offered to send it over to Lehman Brothers if that was OK with us. We said sure because Lehman was doing a lot of financing then with Litton Industries and a lot of other companies down south in California.

So after a little bit… actually we were talking about leaving Fairchild in like March of 1961 and that was right after the micrologic elements had been pretty much completed and going into production. I think then in May of that year, somewhere around April to May after the letter got over to Lehman, we got a call from Warren Hellman and he wanted all of us to come up there and meet with them but we knew that all four of us couldn't go so it was decided that Dave James and myself would go up to New York. And so we flew up to New York, met with the Lehman Brothers, even the chairman of Lehman, one of the older Lehman Brothers, and at the end of the conversation they asked us did we have any kind of a business plan? Of course, Dave James and myself looked at each other and wondered what in the hell does he mean by business plan? At that day and time there wasn't that kind of mindset so we just said we really didn't have one but we could put one together if you just tell us what you want to know. Warren Hellman was kind of put in charge of that, of dealing with us and he was one of the younger members of Lehman Brothers [the company]. He sent us a little outline of the kind of information they wanted and it was basically nothing more than just a financial [plan]…how much money did we need, how we were going to spend it and this sort of thing. How long would it last?

So we put together a plan for about a year and that consisted mostly of the kind of equipment we thought we'd have to have and how much spending would be on that and approximately how many people we felt we would end up with during that first year.

We sent that back and then in late July/August we got another call from Warren Hellman at Lehman and he said, "OK, we think we want to do this deal. We'll put something together and we'll work out the financial arrangements." So what they did is they put together some five percent subordinated debentures in the financing and then there was some common stock and preferred stock for the investors, and some of the investors were White Weld, Goldman Sachs, Lazard Freres and other investors. Anyway, there were several other banking firms, including even Bob Hope's Investment Group [which] put some money in it.

So then we each got some common stock as founders and from that point on I think we gave notice to Fairchild in August. All four of us let it be known that we were going to leave and, of course, we exited pretty quickly. They didn't want us around any more so we just left that day.

Addison: What was your next step after leaving?

Kattner: Then we found an office and looked around where we might find a building somewhere. Most of the places in Mountain View and that area were very expensive plus there really wasn't anything suitable for us. So in looking around we found a building that was under construction in Sunnyvale and there was a company named Perry Real Estate. They were putting it together and they just had the shell up and so we hit that one pretty quick and we could just do what we wanted to do as far as making changes within the building. It was approximately an 18,000 square foot building. It might have been a little bit more than that but that was about what it was. So we had been given an office at Perry Real Estate for us to work out of during the time they were completing the building and so all four of us were in that office and immediately we contacted Orville Baker at Fairchild and Jack Yelverton. Mostly Orville Baker right away because Dave Allison felt like he was one of the better circuit designers. They [both] had a pretty good working relationship at Fairchild. We took him on right away and then we knew we were going to have some sort of administrative person do the hiring and personnel and just handling the general accounting and general administrative work, so we contacted Jack Yelverton and he agreed to join this company as well.

Addison: Going back to when Jay Last hired you from TI, you said you didn't know much about semiconductors so what was it that he saw in you that he wanted to hire you?

Kattner: I really don't know. I guess because at that time I told him what my background was…in the nuclear business and we did a lot of very intricate, touchy type work…and I guess the other person that Jay had talked to down at TI told him what work I had been doing. I solved quite a few of their technical problems on the line and I guess that's one of the things [Jay] was looking for. He knew that they were going to have to have somebody with a chemical background, at least [for] doing some of the things that were going to have to be done with the micrologic elements.

Addison: During your time at TI, was there any discussion about the so-called integrated circuit as the next technology breakthrough?

Kattner: Very little. At that time the only thing I'd heard of was Jack Kilby but he was in a different group and he was working on what they called at the time a solid circuit. It wasn't long after that that it was announced that he had an idea at least how to make one…I think at the beginning he actually used germanium and used mesa-type devices and had it all wired, but the devices were separated by a length of germanium metal. Finally he did some in silicon the same way but they were all mesas and he just used the distance between elements for the isolations. There was not any type of electrical isolation with the devices. So that was pretty much all that I knew about at the time.

Addison: When you joined Fairchild, how different was Fairchild to TI?

Kattner: Oh, totally different. TI was mostly, in my opinion, more of a brute force type technology. Very few people there that I came across knew much at all about semiconductors and most of it was, at least where I was involved, came out of IBM and also Western Electric, the Bell Labs type facility. And you had a few people there that had worked up at Bell Labs and obviously there were some people there that knew enough to get the company going in that area. But mostly it was IBM that provided a lot of technology for [TI]. But then they had the money and they had the typical brute force approach, as I called it, because a lot of people I came across didn't know much about transistors either.

That was one of the things that attracted me to Fairchild…the fact that the majority of the group were PhD's and had been in the business for some time too and worked with [William] Shockley and I was aware that Shockley had come out of Bell Labs as well.

Addison: And in terms of people management, I think you also said TI wasn't a terribly good place to work.

Kattner: No, not to me at least. You were pretty much left alone but then when the pressure was on to get something done it was like you work around the clock to get it done. Although the main person I reported to was Bob Trent [and] he was really a very nice gentleman there, but he was more soft-spoken than most of them were. You were pretty much left on your own. You either swam or sank.

Addison: So in your view TI was way behind in transistors compared to Fairchild?

Kattner: Oh yeah, very definitely, and there really wasn't anybody that I came into contact with that I could learn too much from about semiconductor technology, actually. I felt like Fairchild was small and a good opportunity to work directly with some of the founders there.

Addison: Can you talk about how you worked with or met the other co-founders of Signetics. Did you work on the same team at Fairchild?

Kattner: We were all in the R&D lab. It was a very small, close-knit sort of group in there. For example David James was working mostly with epitaxy and thin film type devices but he did a lot of research with some of the semiconductors…the diffusion characteristics as far as some of the problems that even Fairchild was having at the time. That was his area. I didn't come into contact with him too much in the beginning. Later on I did.

Dave Allison…I never did talk to him much at all until later on either. Everybody was just kind of working on their own individual projects. Mine was strictly in the microelectronics area so our group was starting and everybody else that was there [was] pretty much entrenched in their own work.

Mark Weissenstern…he was a EE and he was working on quite a bit of packaging at the time…doing some quality control as I remember in Fairchild, and he was a more outgoing, talkative person so he and I got to know each other fairly well. That's how that started.

Addison: Do you recall where they came from before Fairchild?

Kattner: After a bit, then I knew. David James had his PhD from Bristol University in London, England. He got his undergraduate at Manchester in England and he had it in physics so he was pretty much entrenched in that area. Mark Weissenstern had an MS EE from MIT and so he spent most of his time on the electrical engineering side. Dave Allison, I believe he got his Masters at Stanford. I think he went to Columbia first. I think I covered everybody pretty much there besides myself.

Addison: Did you become taken with the IC work [going on at Fairchild] and think that it had a great future or was it like Jay Last said in the other interview, just a research curiosity?

Kattner: My feeling was it was pretty much a serious thing because I got completely excited about it. Since I was in the same office with Jim Nall who had done some work on the military and the things they were doing were totally different than what was being planned at Fairchild. I knew ahead of time what I was going to be doing. Jay had talked to me enough about it and some of the problems he was thinking we were going to come up with that we would have to solve, so my feeling was that this had to be, even though I didn't know that much about the semiconductor business, I just felt like this had to be the future because of the old method of using vacuum tubes and so forth. You just instinctively knew that something had to change but at the time whether we were going to be successful or not, nobody really knew. It was just one of those things again where you just keep hitting at it and in my opinion I felt like it had to be done one way or another. Somehow we were going to figure it out. There was plenty of technical backing at Fairchild, I felt, to get the job done.

Addison: Before you said you were generally disillusioned with Fairchild and that's why you left. Was it because Fairchild wasn't focusing enough on the IC?

Kattner: Basically that was it, and mainly because Jay [Last] left Fairchild. I knew a lot of things were going on at that time and I distinctly remember Gordon Moore telling myself and I think Isy [Haas]…I can't remember if he told us both at the same time but he told me, "Don't waste your time on trying to do this." The approach actually worked finally. But he said, "Technically we are not there and we don't have the facilities available for you and that's going to require somebody else with more knowledge." I remember that discussion.

Addison: If you hadn't have left Fairchild, what would you have ended up doing there?

Kattner: That I don't know and that's one of the reasons I was prompted to leave because after we got the family of Micrologic elements pretty much completed and in pre-production, I was still in the R&D lab and the production work was going on over to the main manufacturing facility. I really didn't know who I was reporting to. I guess I was still reporting to Gordon Moore but I never did have any discussions with

him. I was doing mostly just clean up work on the Micrologic elements and working with Bob Norman and some of the others of his group there and continued on with that work. So I wasn't sure what was going to happen and whether I was going to eventually move over to the manufacturing side or not. There wasn't any plan to try to make any more devices like that. Micrologic was not considered a viable product line at the time, although they were moving ahead because they had some orders for the elements.

Addison: The other guys were also disillusioned I would imagine. Was that for the same reason as you?

Kattner: I think the same reasons, yes. Dave Allison, he never talked a lot. But I knew that Dave James was not too enthusiastic about what was happening at that time. It just seemed like the planar transistor, all that work had been completed and had been in production and now here the Micrologic elements were moving over to production and at that time there really wasn't any clear picture of what was going to happen next in R&D. I didn't feel like there was that much future there with the Micrologic side of it. I think Dave James felt more like me because…since he was working with Jean Hoerni and he was gone then too, where do we go from here? And when those [Fairchild] founders left, pretty much disillusionment took place in the R&D labs and Gordon Moore never really took any kind of direction. He was probably pretty much confused too since a lot of his people were gone now. So that's basically why we all felt the same way.

Addison: How did the idea to form a company come about, was that just over a lunch one time?

Kattner: Yeah, just over evening drinks. I don't think we went to the Wagon Wheel but we did get together after work and started talking about it. I was the only one that had a house that was readily available so we met at my place, all four of us because we could sit down and relax there. We just made our plans.

Addison: Was the plan specifically to start a company to make ICs?

Kattner: Yes, because everybody, even Dave Allison felt the same way…that this was going to be [the future]. The more we talked, the more all of us just convinced each other that this was the future.

Addison: Were there many semiconductor start-ups at that time?

Kattner: I can't remember which other companies were start-ups. GME was one, General Micro Electronics and Siliconix, I believe, but they all came about the same time. There was one other one that started out but…they were going more for MOS but we were strictly going to go the integrated circuit route.

One thing I did forget to mention was the fact that at that time…since we had not heard from Lehman Brothers in a while, through a friend of mine that still worked at TI but he was a rep out in California…we had talked a little bit and he said, "Gee, I think Mark Shepard," who was running TI at the time, "would be interested in talking to you guys." I said, "Fine. Contact him." We didn't know where we were going to get

our money. Mainly we were committed to leave [Fairchild] and when you are at that stage, you just can't go back in your thoughts. We were not going to give up on Lehman either. We were going to keep hitting at it until we found something.

Mark Shepard right away said yes and he flew out and visited with us one evening and he just said, "I can do this deal for you." So we felt pretty comfortable until about three or four days later when he contacted us and said, "Can't do it because the lawyers for TI said they'd probably be sued out of business by Fairchild." So he had to decline and then it was just a matter of days after that that Lehman Brothers came through.

Addison: So the discussion with Mark Shepard was that TI would fund you as a subsidiary, not that you would come to work for TI.

Kattner: No, no, we would have our own company and they would finance us and he would leave it out in California. That was a promise at least because he knew that Fairchild had already announced the Micrologic elements and they [TI] had not been able to develop processes yet. They did not have the planar technology which is what was really going to be required and the fact that he knew that, he [Shepard] wanted to get in on it immediately. That would have probably been a good deal but it just didn't work out. I don't know which [deal] we would have taken at the time. We had some misgivings about getting involved with TI, anything with TI, but if it was going to be totally separate, then that would be something we'd consider.

Addison: Did you know Mark Shepard personally?

Kattner: Before that? No. I'd seen him around [at TI]. He'd always come around to yell at people. It was kind of a big joke around TI that he was more talk and noise. The threats weren't that serious but you kind of got the idea that you'd better get busy. So he was that kind of a person. I never had any personal contact with him, no.

Addison: You told me before that TI's interest in funding you indicated that TI was way behind Fairchild in ICs?

Kattner: Exactly and he said so. He said, "We don't have the capability yet. That's why I want to do it."

Addison: So Lehman Brothers came to the rescue. Had they funded any other semiconductor start-ups?

Kattner: No, not that I am aware of. We were the first ones but the reason they hadn't contacted us was because they were doing some background checks on each of us. I don't know how they did but they found out through their own methods and sources were we legitimate and so forth. After they were satisfied we were probably capable of doing what we said we were going to do, then they came forth with their offer.

Addison: How much money did you need?

Kattner: The first year we said we would need about a million dollars. Nowadays, that's chicken feed by comparison. But then we knew pretty much what the equipment costs were going to be and approximately the people that we'd need to hire and bring in. When we hired more of the technical people, one of the first things we told Lehman, too, was that we wanted to offer stock options and I think we were probably one of the first, particularly in the IC business, to offer stock options to people and that's one of the reasons we were able to hire some fairly decent people to start with. Orville Baker and Jack Yelverton both got stock options.

Addison: Was that only for the management? It wasn't to every employee.

Kattner: Not to every employee, no. It was more management and some technical individuals that were hired.

Addison: So Lehman put up the $1 million.

Kattner: They arranged the $1 million. I think there was another one. J. Barth out of San Francisco that was a smaller investor…there were a few private people in there.

Addison: You talked about Orville Baker and Jack Yelverton. Any other key people that you brought in?

Kattner: Not at that time because that's all we had to get the company started, Actually, the facility was ready for us in late September [1961], but the first order of business was I spent most of my time on the building. We did not have a building manager or anything like that but we knew what we'd have to have so we had to cut up the foundation a little bit to get some proper drain lines in there for some of the chemicals, the acids and so forth. We made those modifications and soon we hired one guy, another individual that took over the building functions finally. I was kind of relieved off of that.

Addison: In terms of responsibilities and titles for the founders, how did that come about?

Kattner: To start with we all decided Dave James…he had the PhD, and he was a fairly smooth British accent, fairly good, smooth talking individual. We decided he would become president. There wasn't anybody else in there that was really interested. He wasn't either but somebody had to be president of the company and the rest of us became vice presidents. The way that broke down, David James was president but he was in charge of more of the physics side, epitaxy and thin film areas. I took manufacturing because that's what I had been doing, basically that pre-production work. Dave Allison was device development and some process too. Mark Weissenstern was going to take care of the packaging areas and decide what methods we were going to use as well as quality control. Orville Baker was circuit design and he and Dave Allison, that combination, was superb in making devices. In other words, circuit design and then the device development. And my area also included, besides setting up all the furnaces and getting the parts set up, all the assembly lines and the equipment to go along with it. I

took care of most of that with some help from Weissenstern, too, because of quality control. Some of the equipment in that area had to be sort of common. And the photolithographic area, the photomasking, that was my area.

Addison: Talking about setting up the equipment manufacturing, did you buy a lot of that stuff off-the-shelf or develop any of it in-house?

Kattner: The furnaces came from Electroglas which was fairly prominent in the industry at that time so we just stuck with what was readily available. I think Dave Allison, since he had worked with some of the Electroglas people before, he established the specs that we wanted on the furnaces and he made some changes on them because the ones at Fairchild were very old.

The photomasking area, I had talked to a company called Electromask down in the Los Angeles area and went down and checked and I was very impressed with some of the step-and-repeat camera work that had to be done and it seemed like what they had designed and built was going to work fine and they guaranteed the tolerances and everything that we needed. That was taken on pure faith…I gave them a different set of specifications than what they had but I was just sort of convinced they could do it. But if they didn't, then we would have been up a creek. That fortunately worked out. The other part of the equipment in there was a coordinate graph which was built in Switzerland but I don't think we had to wait for it to come from Switzerland. They had some in stock here in the U.S. And then the alignment equipment for masking…I was already familiar with some of the outside machine shops and from my days up in Hanford, we call them instrument makers because up there a lot of the equipment had to be handmade and they were just super machinists, if you want to call them that, but they were very precise instrument type makers I felt.

So the alignment equipment…we did use the same kind of microscopes that had been used before but the aligning jigs were totally different, a little more precise.

Assembly equipment. The microscopes out there were going to be about the same. We didn't have to have any real alignment jigs or anything because they worked on a individual die as far as attaching wires so we used the same type of glass pipette that was in the industry for feeding the wires through, but that equipment still had to be built to feed the gold wires to attach to the devices. It did have a jig there, too, to do some alignment. So we set that up and I think the first line was maybe four stations. I think we had about the same number of stations in photomask. We didn't really use all of it at first.

In the lab area where we had the diffusion furnaces and all the chemical washes and so forth, etching, we set those sinks up and put in all the polyethylene tubing and so forth to feed all the hydrofluoric acid and some of the more dangerous chemicals and solvents through. Everything came together just fine…we never had any major hitches as far as getting production going.

I might just mention…Dave Allison and Orville Baker spent most of their time trying to decide on a device, a circuit. So once a lab was set up, then Dave Allison went to work…to do the triple diffusion where you diffuse a collector into the wafer. He was doing mostly experiments on trying to accomplish that and did it right away. Some of our first elements were done the same way we did them at Fairchild, just electrical

isolation, but they were more the first product that we were planning to build. I can get into that in a little bit.

Addison: What was the first product?

Kattner: We called them the "pre-FEBs" and they were pre-fabricated elements…this was our approach right away at Signetics…to build little modules so we could do customized circuits. We felt like a lot of companies would want to have their own circuit designs so we came up with small modules of the integrated devices that could be building blocks to do many different things and they could be put together then but still [be] little individual chips. Similar to the same old approach that had been done before, even at Fairchild in the beginning, of putting different components on substrates and then wiring them together. We just called them pre-FEBs. Some of those were done with all the processes that we were fully aware of. In the meantime…we all knew we had to do the triple diffusion approach. Then also at the same time we knew that the DTL circuit approach was the only way to go in the marketplace, although it was going to require some real stringent process controls to get the devices that would work properly in a DTL circuit. So that was Orville Baker's contribution primarily and, of course, Dave Allison agreed with him, both being circuit engineers, electrical engineers. And so ultimately we knew we were going to do that but custom circuits was our first approach. That didn't really ever materialize. We sampled a lot out and we had some orders but it didn't excite a lot of people so we did make our first full gate device in late December of the first year. We moved in that plant in late September and we had the first gate in late December. It was shown in IEEE in March of '62. That was a triple diffused device. That being a DTL circuit, we got a lot of feedback on that, a lot of interest. From that point on we knew the pre-FEB idea was not a good decision. It did do what we wanted to do. It helped us finalize our processes and so forth and that worked to our advantage as well. We weren't making large circuits within a chip so to sort of debug all the processes…it wasn't a bad approach. We just didn't get a product out of it.

Addison: So how did things like yield go…you had some yield problems in the beginning I guess?

Kattner: Yield to begin with…I felt we had better control than we did at Fairchild because Fairchild yields were extremely low as well. We just had to keep fine-tuning the process, do more cleaning up of the processes and so forth, particularly in the clean rooms of masking and so forth. That's where you almost always generated most of the device failures. Here again, I didn't get to do all I wanted to do in the clean lab area…I actually wanted to do a complete clean room, total clean room approach in that area but we just didn't have the money nor the time to do that. But I did incorporate the hoods and so forth to do the masking in the best way I could to get as clean a process as possible and to get some of the better filters. But even then we couldn't afford the ones we were using up at Hanford either.

Addison: At that time was any device maker using a full clean room?

Kattner: No.

Addison: The technology existed?

Kattner: It existed but it was very expensive to set up and most people hadn't been exposed to it that I knew of in the semiconductor industry. IBM probably did back East and GE and some of the other eastern companies, but I never ran across it anywhere.

Addison: What you could do in the clean room on your budget, did that have a major impact?

Kattner: Yes, definitely because we had to have humidity control in there and air conditioning and proper filtration but to do the approach that ultimately came into being, it was just a very expensive way to go and just wasn't in the budget. The other problem was we had time constraints. We knew we needed to get into production as quick as possible so we just did the best we could.

Addison: How did the products go on the market, follow-up products and so forth? Can you talk about the progression?

Kattner: Somewhat. Bear in mind most of my time was spent in the manufacturing and process areas and so forth. Most of the marketing then was actually done by Orville Baker through some of his contacts in the industry but he could talk to the potential customers because all they were interested in was the circuits. That was his expertise so he spent a lot of time doing that for us until we hired some of the marketing and sales staff. He actually was doing some of the sales work just by talking to customers. [Joe] Van Poppelen came in a little bit later out of Motorola but we did have a fellow by the name of Tinglef and he was our outside sales person as well.

Most of the product in that area…you are talking about marketing…we knew it was mostly going to be a military type customer base. As far as industrial and consumer products, that was much further down the road but once we could convince the military that these were reliable products…we talked to Autonetics and several of the larger military companies and, of course NASA. We got involved in selling products to NASA as well. We became quickly known as the only company that was totally committed to making integrated circuits. At that time still most people called them microelectronic devices or solid circuits or micrologic circuits and it seemed to me that when we started right away, the idea of the word "integrated" we used it exclusively. So to some extent I think we promoted the integrated circuit name in the industry…one of the first ones to do that.

Addison: So you called your products "integrated circuits."

Kattner: Yes, from the very start. It's kind of interesting how the name Signetics came up. Basically we first came up with the name of Dynalog Corporation, God awful name. How that came up I have no idea. It was just another one of those terms that was being used a lot at the time and then I found out, because of the work I was involved with, that Foxboro Company had a product called Dynalog. That was one of their chart recorders. We talked to our attorneys and our attorneys at the time, we hired Brobeck, Flager and Harrison in San Francisco, and our primary attorney was Whit Budge out of that firm…I called him up and he said, "No, you've got to change the name. It's just not going to work so come up with something else." One day I came in our little office there on Maude Avenue where there was Perry Real Estate and we were all trying to come up with another name over several days. I just happened to see a book on Orville's desk. He and Allison were using something about signals and circuits and I forgot the title of the

book now but it was on that order. Each of us had written down a bunch of names on a blackboard there. Each person came up with one. Suddenly it just popped into my head -- Sig -- and then autonetics was a common used name. There was a lot of "netics" out there at the time too. So I just said Signetics, put it on the board and that's how it happened.

Addison: Did you take a vote?

Kattner: Everybody said, "Yeah, that's the best one." We filed under that name and that's what it became.

Addison: What was it about Signetics that made it different from other companies?

Kattner: That's a good question. I think the idea that we came up with…the DTL approach for integrated circuits. That was an industry standard as far as circuit engineers. They were very familiar with it and they could design easily with that approach. However, it did require a lot more precise control and the electrical characteristics that circuits had were going to be a lot more stringent than what had been done before in the industry.

It was well received by nearly everyone we talked to when we finally got the product out and I think the fact that we were one of the first ones in the industry exclusively devoted to DTL. DCTL, which Fairchild was working on, was not a well received circuit design…and then the fact that we had our triple diffused approach, we were able to do a lot more things than you could with other circuit designs.

Then we did get some contracts from some of the military organizations. I remember Fort Monmouth gave us one to do some planar epitaxy work, circuits, and I can't tell you exactly why they were interested in that but that was one of the more research affiliations within the military. That, of course, went to David James and that was one of his areas that he took control of then. And out of that came some of the next work that was done that even improved more…using dielectric isolation of the thin film resistors and capacitors on the circuits, whereas before there was a lot of leakage. When you do the junction type, you still had some junction characteristics that interfered and you couldn't get as precise control of resistor values and capacitor values. That was one that Dave James and Dave Allison worked on together but mostly it was Dave James because of his expertise in that area.

So once those things came to [fruition]…and we did get a patent on that approach…the company actually went forward. Before we had completed our first year, we had our complete line of DTL circuits out in production. I don't think that had ever been accomplished before as fast. But then our money was running out too so we were faced with some real tough issues at the time. We knew we were going to run out of money by then and we'd already had meetings and talked about it before. I think the DTL circuit design, as well as encompassing the dielectric isolation of the passive element components, was one thing that gave us a huge advantage in the field.

Addison: Before we move on to other issues like finances, was there anything else that kept you up at night in terms of manufacturing problems or yield problems?

Kattner: Yeah, one of the other things we came upon was what we called "purple plague" and it turns out that that existed not only with us but some other companies as well. We heard that through the grapevine so we didn't think anything we were doing in-house was causing it necessarily. So my approach was "OK, guys, in manufacturing we've got to clean this place up." I felt it was not necessarily so much what we were doing as far as cleanliness but I just felt that anytime you clean up processes, it's got to be an advantage even in yields and everything else. But what was happening on the "purple plague" was that devices started failing, circuits did and when you open up the elements, you open them up after being encapsulated and you look in there and can see that all the aluminum interconnects were just dissolving away. What was left was sort of a purplish color and so I knew right away there was something going on that either we weren't washing or cleaning the chemicals off properly or there was something wrong with chemicals. So right away I decided, let's change our chemical brands and sources and do a better job of flushing the devices off before we encapsulate them. Lo and behold, it just sort of disappeared. We never did know specifically what it was but just doing many of those things at the same time, it solved the problem. Once it went away, I decided OK, let's stick with what we've got and keep rolling because we didn't have time to go find out exactly what it was, but we knew this worked.

Addison: Other companies found out about the solution?

Kattner: I guess they found out the hard way too. They never did say anything. I know that some of the acids we were using…sodium hydroxide was used and combinations of that or different etches of caustics to dissolve away the aluminum pattern. To me that had to be one of the first sources you look at as a potential problem so changing the brands and so forth, and different vendors, it became a non-problem then.

Addison: You talked about running out of money and I assume that's because you weren't selling as many devices as you'd hoped.

Kattner: We knew when we set up that we would not have enough money because we knew it was going to take at least a year to get the product out there and then you have to have more money too, probably two or three times as much to keep going this next year because then you've got to hire a lot of production people and a lot more support staff. So ahead of time, I guess within six months…Lehman Brothers talked to us and a lot of ideas were tossed around about bringing in some other investors and they wanted to know what we wanted in that way. We had talked to a company by the name of IMM Industries and [the owner] was very excited about becoming an investor but then something happened in his company where he couldn't raise enough funds to invest in [another] company. Most of the discussions had gone around just getting a corporate partner because nobody wanted to be president of the company particularly. We were all basically technical people and running a company was just not anything that we remotely thought we wanted to do at that time or could do.

As a matter of fact, I did come up with a name, too. We were going to hire a general manager to run the company and I did come up with the name of Cecil Dodson who was at TI and he was what I considered a very strong leader and a very nice guy to work with. He was well liked but then he ended up going to Ireland to run the TI facility over there so he was out of the picture then. Lehman was going to help contact him but we never got that far. So we knew we had to have somebody in there that could provide proper management in the company and the rest of us had too much on our plate to be worrying about it.

So that's how the idea of the corporate partner came into play. However, Lehman did say, "We can raise more money when that time comes but then you are going to have to have somebody to run the company, like a manager, if none of you are going to do it." So that's how this corporate partner came up.

Addison: So the motivation there was not necessarily the money from the corporate partner but the expertise in running a company.

Kattner: Exactly and what they could bring to the company as far as the management area as well as the marketing and just a name in the industry would help us out.

Addison: So Lehman Brothers hadn't lost faith in you?

Kattner: No, no, not at all because Warren Hellman said, "We'll get you the money if you really want to go that way but you are going to have to decide who is going to become full-time president." David James didn't want to do it and none of the rest of us wanted to do it. Probably Jack Yelverton would have been the only candidate but he never had any experience at that either, except in an administrative area at Fairchild. So it kind of came down to the fact, OK, let's get some corporate investor come in and help us out.

Addison: Again, did Lehman Brothers understand that this business had long development times and then you've got to get market acceptance? They all knew that?

Kattner: Yeah, because they had plenty of experience with Litton and some of the other companies and so they knew what some of the timeframes were and everybody understood that $1 million would last us a year. The reason that came up to $1 million was if we weren't successful in building what we said we'd do, then it was only a $1 million loss to them. But once we had the product out there and it was done and it was successful and well received, it was just "let's keep going."

Addison: Can you talk about the search for the corporate partner? Obviously it ended up as Corning, but the steps involved.

Kattner: IMM Industries was still in the chase. I think there were two or three other companies that Lehman had mentioned that might be interested but it turns out that it wouldn't be a good match at all. And then they did come up with Corning, that Corning was definitely interested in putting some money in. Of course, all of us knew that Corning was a very prominent company and well financed so that was when we became more focused [in] trying to work with Corning.

Addison: Why was Corning interested?

Kattner: Corning had an electronics facility down in Raleigh, North Carolina, and they had a gentleman there, Malcolm Hunt, who was running the electronics division. He was one of their vice presidents. How Corning got into it was making diodes and capacitors and things of that nature and using glass

encapsulation since they were in the glass business and that kind of made sense. But Mal Hunt was one person who was focused on the electronics side. I can't remember why Lehman talked to them specifically but they did have some working relationship with Lehman before [with] some of their financing requirements. And Mal Hunt just got very excited about getting involved in the integrated circuit area and semiconductors since they were already doing some passive elements mostly for the semiconductor business, so that's how it sort of got their interest.

Addison: Can you talk about the type of deal that was structured?

Kattner: Initially it was talked about, "Do we want to go with a company like Corning?" That was when we had major personnel involved and making that decision was the four founders [plus] Orville Baker and Jack Yelverton. And then Joe Van Poppelen was well on board then at marketing. I think that was really the main group. We would always meet together and we talked about the Corning deal. Of course, there were two of us that were negative on Corning so that's kind of the way discussions came down. Warren Hellman from Lehman Brothers stayed pretty close, and he was always involved in a lot of those meetings as well. Warren was our primary contact at Lehman. He was pretty much working with our group all the time. We had a continuous dialog going with him all the way through.

My feeling was, and Joe Van Poppelen for the same reason…I just didn't think they [Corning] would be a good fit but everybody else was feeling the pressure of "we've got to do something to keep this going." I can still remember Warren Hellman saying, "Don't worry. We can get you more money but the more money you get the more it's going to cost." To me Corning was just too much of an eastern, staid type company and I could just see in my mind that they would not understand the western free-for-all type approach to running a business. Like Fairchild and all the rest of them, they are just all sort of mavericks as far as business goes. And Van Poppelen felt the same way, so when the vote came there were two dissenters and the rest voted for it, so that's the way it went.

The [Corning] deal was they wanted 51 percent of the company or else they wouldn't come in and then I knew right away that this was going to go further and further south as far as every time they put money in, they'd want more. But we did go with Corning and everybody was as cordial as we could be but I think they always knew that I was the one that voted against them and Van Poppelen as well.

Addison: What did this mean to the founders in terms of financial stakes in the company?

Kattner: Just dilution and percent of ownership. We still had the same amount of stock and so forth, but it just meant that now every time you get more financing you are going to be more diluted in terms of the value of the stock. And, of course, we knew that, too. Individual investors would have been better maybe and if we had had a good strong general manager, as they were called then, we would have probably gone that approach. I wasn't opposed to the corporate investor and the help that could be gained from them but if it had been a western or different company, I probably would have felt better about it. But conservative, eastern companies, I just didn't like it.

Addison: So presumably Corning appointed a new president or CEO?

Kattner: No, not right away because David James decided he did not want to be the president any more. He had too many other things on his plate. Actually, Malcolm Hunt talked to me about becoming general manager and I just told him, "No, I couldn't do it." I said, "First of all I hadn't had any experience at it." I was very excited about doing it but I had no idea how to run a company, other than what we were doing as far as [managing] R&D technical people. So I just told him no. Finally Joe Van Poppelen became the general manager because he was more of a sales/marketing type person and a lot of companies have those as leaders in the company anyway, so that seemed to be the answer at that time.

Addison: And everybody supported that?

Kattner: Yeah. I had no problems with it.

Addison: We've kind of skipped over how Van Poppelen came into the company. Can you talk about where he came from?

Kattner: In the beginning, when we first started, after we got the building set up and we got the product actually completed and knew that we had a saleable product, then we knew we had to get a strong marketing person to come in. There was a company in San Francisco that we had been put in touch with, a recruiting company, and we hired them to look for a fairly strong marketing person that was in the industry. They had to be from the semiconductor industry. They knew that Joe Van Poppelen wanted to leave Motorola and he was head of some of their marketing down there so they put us in touch and we all decided, yeah, let's go with this person.

Addison: Going back to Corning, when did your intuition start coming true in your mind in terms of things not going well?

Kattner: After that next round of financing…the first round of financing with Corning, everything was going along fairly smoothly. Our product line was completed and was out and in marketing…was ramping up and, of course, under Joe Van Poppelen, he hired a fellow by the name of Tinglef He was the outside sales force mostly and then there was another individual called Berg, his last name, and that comprised the marketing and sales force and they all came out of the semiconductor industry so we felt pretty good in that approach.

As far as with Corning, the next year everything went along fairly smoothly. Malcolm Hunt was flying out to California consistently and talking to us and giving us his support and he was totally behind us 100 percent which helped. I felt more comfortable with them.

But then in '63 to '64…actually let me back up a bit. Before that we were actually doing very well in sales and we became well known as the company to get your integrated circuits from. We knew that Fairchild was not doing as well as they had hoped. TI had finally come out with a planar product and so they were just beginning to come into the picture too. But it was in '63 the DoD [Department of Defense] came out and emphasized that integrated circuits were the way to go and from that point on the military at least was pretty much sold on the idea. There's a long lag time between a military organization getting

interested and then you've got to go through all your quality control, your MIL specs and all of this stuff, so that's a very lengthy process to go through. We were still sampling quite a bit through some of the aerospace groups. NASA did have strict requirements but they were moving very rapidly too so they were one of our better customers at the time.

But then I think it was in that same timeframe in '63 we knew we were running out of money and space primarily. The money we knew we were going to be OK on. We had looked for property to expand into previously and I had met with some individual that had some property in Sunnyvale and we were out looking around through a realtor and determined that there was a plot of land that was available because the person that inherited it had to pay the taxes and so he was going to have to sell the property to pay his taxes on the inheritance. So we did find a plot of land and then with Corning's help we designed a new facility. We knew it was something we had to do. We actually got some plans together on the building and we did sign an option on the property.

But then about that time, around 1964, when we were making our most strong move in the industry, Fairchild came out and had copied our product exactly and had successfully done what we were doing. They cut the prices down to practically nothing. Bob Noyce admitted later, "We were bound to put you out of business." That's when Corning got a little squeamish about the whole thing. They knew it was going to take a lot more money to get through the problem that Fairchild was giving us. I don't think they felt we were really strong enough yet.

We were going to have to get another round of financing to get the building built and to overcome what Fairchild was trying to do to us. We had to lay off a lot of people we had hired. We had quite a few that I had picked up down at TI and elsewhere and we had to let some of the key people go. They were in the production/manufacturing area and some of the other support people. We just got to the bare bone to get through. It was kind of a touch and go period then.

Then the next round of financing was where it just got very touch and go. That was where Corning was really getting antsy about the future of their investment and they wanted to get control of over 80 percent of the company. All of the rest of us there didn't want that and, of course, by that time they were so well entrenched that Lehman had sort of let loose from [our] company, even though they were still part investor. But as far as making decisions, that was going to have to be between us and Corning. It came to one point where the deal that Corning offered was totally unacceptable. I think we all came to the same conclusion that just let it go down the tubes then because it's not worth keeping it going. I think Dave Allison at this time, he was really getting a little afraid about what his future was going to be so it was decided that Dave Allison and myself would go back and meet with Corning. We didn't have any legal representation because Whit Budge, our regular corporate attorney couldn't help because that would be a conflict of interest. So we went back there just on our own and sat down in a big Corning Glassware conference room in New York and had some of their top people there and financial people, and Mal Hunt was present. And we had our meeting and that's when they wanted to basically just take control and dilute the stock down to nothing value wise, and it had to be based on some value, and so they were trying to say it's only worth a nickel a share and we were just in the process of getting a new appraisal done and we both felt it was certainly worth more than a nickel a share. But they were holding pretty fast and I just said, "Forget it then." I started getting up from the table and we left and Mal Hunt was really running scared then. He called us up at the hotel and said, "Let's have dinner." He had talked to the main people back in Corning about the deal and that this was going to go down the tubes if they didn't do

something and so the president of the company at the time, he told his people to “come back down and make a deal. I don’t care. Whatever deal you can make.” We found out later that’s what he said.

We called a meeting for the next day. We were already ticketed to go back to California and so we had another round, another two days of it, but we finally got it up to, I think, to a valuation of 50 cents a share and that was about as far as we felt we could go. We talked back and forth with the rest of them back in Sunnyvale and everybody said, “OK, let’s go ahead and do it.”

Within a month the appraisers had finished their evaluation and prior to that time it was already all the way up to almost $4.00 a share as an official appraisal. That then put a bad taste in everybody’s mouth but from that point on all the founders became disillusioned and Corning. For some reason Van Poppelen and Corning were not seeing eye-to-eye either [over] his running of the company and they sort of blamed all of us for what Fairchild had done.

So they started moving some people into the company. I guess our excitement just diminished at that time but the company did keep going. We did get more financing. In 1964, I think it was just after that that it was on its feet again and very profitable and then expanded into New Mexico and up into Utah and overseas. Ireland was another location. At that time I think David James was one of the first ones that left. He just totally got to the point that he didn’t want to have anything to do with it any more. I don’t know exactly the dates but it was around 1966…when I left. Mark Weissenstern was actually one of the first ones out. He locked horns with the Corning people quite a bit so they just offered to buy him out so he left and that was pretty much the end of the company as far as our contribution went.

Jim Riley was one of the people they brought in to become president of the company. He really wasn’t that bad a person. It was just that he still didn’t understand…he grew up in the Corning philosophy of how you run a business. He didn’t survive either. I’m trying to think of some of the other names that are in there. Don Liddie, of course, came in and worked for me for a while. Then he was sort of put in charge of the new facility in the manufacturing area. [Chuck] Harwood was another Corning implant after Riley. That’s kind of the end of my interest in the company. I stayed on as a director of the company until I resigned and left the company.

Addison: When was that?

Kattner: That was around 1966/67. Jay [Last] and I have maintained contact with each other. He and I talked. He knew I wanted to leave too, so he came up with some ideas for myself but that’s another story.

Addison: Signetics was never a public company while you were there?

Kattner: Not until many years later in the ‘70s. Then they finally went public. Corning owned such a lion’s share of the company that when they did put out the public offering, there were a lot of people who owned the stock at that time, I didn’t know any of them. They filed a lawsuit against what Corning was trying to do. They were still diluting it further to put it out on the market and go public.

Addison: When you resigned, you didn't have any stock?

Kattner: We still had the same number of shares.

Addison: So when it went public you still held the shares?

Kattner: Yes. All of us had offered some of our shares to Corning because there was a deal set up to where they had to buy your stock at the official appraised value and there were some incidents there too where they still wanted to refuse to buy it. They said, "It's dropped in price since that evaluation," but the way the deal was arranged, once an appraisal was done, that remained in effect until there was another appraisal and if anybody didn't like that appraisal, they could pay for another appraisal, either Corning or us, or see to it. But since Corning was in charge pretty much, they were going to have to do the appraisal if it was demanded. So they did buy some of [our] stock at the appraised price as people bailed out.

Addison: So looking back, I know you didn't go into it as a money making venture, but was it a financially rewarding experience?

Kattner: I think so. Yes.

Addison: You skipped over the Fairchild competition. You said they copied you. Did they actually get hold of one of your devices and pull it apart?

Kattner: They knew our products were out there and what we were building. They had come to the same conclusion that DTL was the only way to go but at the same time they had not done the triple diffusion so once they got the triple diffusion process down…everybody was talking about the Signetics product line and they knew they had to do something, so why not just copy it and try to run them out of the business at the same time since they've already done all the dirty work? Basically that's what we all felt so I'm sure they made some of their own improvements. The actual layouts might have been a little different but in terms of the device characteristics and the devices themselves, it was our product line.

Addison: Was there any way to protect that with patents?

Kattner: No. The only thing we had a patent on was that dielectric isolation that Dave James and Allison had worked. We always knew we had a little bit of a bargaining chip there with Fairchild but it was not that strong a bargaining chip with them. Even though they were copying that, we had copied some of their processes in the earliest days so it became kind of a draw in the industry. TI, Fairchild and vice versa and then with us.

Addison: The pricing issue. Did Fairchild do that deliberately to hammer Signetics or was it to get volume? I've heard two versions of that.

Kattner: It was mostly to put us out of business and that was because we were…as I said earlier, the DCTL approach was not being accepted that well and our products were so they knew they had to do the same approach. So if you are doing it, why not just at the same time [cut prices]. They were doing very well. Their planar transistor business [was] making lots of money and so why don't we just start out and cut the prices. I think initially they cut it in half. And, of course, that hurt.

Addison: Do you recall what the prices were?

Kattner: We started out at like, I think, $125 for a gate element but it came down and of course volume pricing would bring it down even further. But then as our yields got better…I really don't recall what some of our prices got down to but I know we were way down to maybe a tenth of that. Fairchild probably put that kind of price on them…maybe at $10 a circuit. It was pretty much that drastic as far as what happened.

Addison: So you were losing money on every device at that price, as was Fairchild.

Kattner: Yes.

Addison: With volume could you make that up or the market still wasn't developed?

Kattner: The volume wasn't quite there yet, although it was coming along real well. We just couldn't do it. Financially we had nothing else to offer. Fairchild had the transistor business to support it and then once we got over some of that hurdle with more money then, of course, we were able to hire more people again. Our processes were always improving. We lost a lot of money at the time but then it finally all ironed out because we came out with some more products, too, at the same time. Other things helped us, too. We were doing a lot of linear circuit work with the epitaxy and so that gave us some support there too.

Addison: We haven't talked about that. Was that a pretty small part of the business?

Kattner: It was small to start with, yes, but there was a lot of interest in some of the linear circuits. But that was also part of the Fort Monmouth group that wanted the linear circuits and that was where the epitaxy came into the picture more because of some of the device characteristics that you could control with the epitaxy.

Addison: Are you saying that the Fort Monmouth contract put you in the linear business?

Kattner: Yes. It helped us get into that business, right.

Addison: Was that ever a commercial success?

Kattner: Eventually yes. After we got over the Fairchild debacle that became part of the product line as well. Eventually the company was back in the black again making money.

Addison: Was linear ever a commercial market then?

Kattner: Commercially speaking, no I think still mostly the military requirements. In some of the areas of industrial, commercial type market we knew we could sell some of our circuits. In other words, some of the circuits that wouldn't pass the military specs, we knew we could sell in the industrial and commercial area where the specs weren't quite as stringent…but those became sort of the bread and butter then. They could be made at less cost.

Addison: Was there a linear guru in Signetics, a particular individual who really was responsible?

Kattner: Here again I think through Van Poppelen's organization and working with Orville Baker…he worked very closely with marketing. He had a staff of engineers as well, so we did have a linear expertise and circuit expertise. But, again, it was mostly the DTL that was our main effort. But later on, of course, that did come into play.

Addison: Just backing up…you said that Bob Noyce admitted as much that Fairchild was lowering IC prices to put you out of business. Did he ever tell you that face-to-face?

Kattner: Not to me but Jay Last told me. We knew absolutely that's what they were trying to do as soon as they came out and announced their product line which was ours. They cut the price way down. We knew what they were up to because they never sued us when we left [Fairchild] They never said a word. They probably never thought we were going to make it so they just didn't bother us until we did make it and then that's when they came after us.

END OF INTERVIEW

