Oral History of Julius Blank

Interviewed by:
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Craig Addison: Thank you very much, Julius, for coming along. Could we just start off with you talking about your first job, what you were doing?

Julius Blank: Well, actually, the first job I ever had was when I got out of high school, I worked at a factory. And this was in 1940. And I was going to college at night at that time. I remember 1940, the economic conditions improved from miserable to bad. The unemployment rate was still about 12 or 14 percent. I was working in a factory making a handsome sum of 40 cents an hour and going to school at night. Then I went and got a number of different jobs in offices, and then I decided I was going to learn how to be a machinist, so I went to a trade school at night to learn how to run a lathe and a milling machine and all the shop equipment at the same time I was taking courses at college.

Addison: And how long did you stay in that job?

Blank: Well, I stayed there until I got called up to, you know, called up into the Army in 1943. And the first thing there was they put me through infantry basic training, and then I went to a college program. I don't know whether you remember, but in those days, they had what they called an Army Specialized Training program. They would take a lot of young students, put them in the Army and then send them to college because they needed trained officers. And the Navy had a similar program. Well, around April of '44, they disbanded the program because they could see that they needed more canon fodder, so most of us got transferred to infantry units and got shipped overseas and joined the festivities over there. And when I came out, I went and finished my schooling under the GI Bill. Now, the first [job] I had out of college was working for the Babcock and Wilcox Company in Barberton, Ohio, making large central station steam boilers for the power industry. The second job I had was working for Goodyear Aircraft, which is a subsidiary of Goodyear Tire and Rubber. And I was in an R&D division there. We had all sorts of programs from, you know, from aircraft propulsion to submarine work to parachutes to air ship fabrics--you name it. And then my wife said she didn't like the windows in Ohio anymore, so she wanted to get back to New York. And first we found an apartment, then I looked for a job. I decided at that time I wanted to learn some more about manufacturing, so I got a job at the Western Electric Company in Carney, New Jersey. And there I went and was assigned to manufacturing engineering for what they called a No. 4 toll crossbar switching equipment, which probably doesn't mean anything these days, but that was the first automatic dialing equipment system that you could use for long distance calls without any operator intervention. And then they had me troubleshooting in a plating room, which was also part of that, a totally different thing, but I found myself being called in to help with the plating room people. So I learned a little about metal finishing, acids, chemicals and all that kind of business. And then I received an invitation to join Shockley and his laboratory out here in 1956.

Addison: So, how did he find out about you or find out where you were?

Blank: Well, one of the fellows that was working on the same floor as I…we worked together on a number of projects, was called on by Shockley to help him start his organization out here as a kind of managing director with the responsibility of providing engineering assistance to this group of PhDs that he had because he knew that none of them knew anything about manufacturing or equipment or anything of that sort, and he felt he needed a strong engineering group. So he gave -- the fellow's name was Dean Knapic -- he gave him the instructions to go ahead and bring some engineers out with him. And the upshot of it was he chose me and Gene Kleiner, who was also working on the same floor. And we both

got interviewed by Bill Shockley at the restaurant at the Newark airport when Shockley was coming in between flights. And so we went and moved out to the West Coast. I came out in April of '56, and Gene came out two months later because he was teaching a course at Brooklyn Poly, and he had to finish his commitment.

Addison: Okay. So you knew Gene pretty well?

Blank: Oh, yeah. We were in the same car pool together.

Addison: And you also knew Dean Knapic pretty well?

Blank: Oh, yeah. All of us were car pooling for three years, so we knew one another and we'd been working on some joint projects. In those days, the issue of connections was a very important one for the Bell system as it was for other people, such as IBM, because they had a lot of components that needed to be wired up. And we were working on a project sort of jointly with them to do wrapping without soldering because the solder introduced issues that they would just as soon avoid. Anyway, that's how I became acquainted with the tyranny of the interconnects, which was everybody's problem at that time, [and] it remains a major problem even to this day.

Addison: What was your motivation for wanting to join Shockley? Was it to move to the West Coast or was it better money?

Blank: Well, a combination. They moved to the West Coast and he was starting in a new, a whole new field. And I had a little inkling of what that was about because one major piece of equipment in the switching system that we were building was a card translator which had as its main focus an array of germanium photo transistors, which were used to help route the paths to set up calls from anywhere in the United States to anywhere else. And it was one of the key elements in finding which circuits were open, and as soon as they determined that, they would just tie them up.

Addison: And that first meeting with Shockley, what were your first impressions of him?

Blank: Well, I had heard from people that we knew at Bell that he was, you know, a very brilliant theoretical physicist, and he was a temperamental one and somewhat difficult to deal with, but other than that, I knew nothing. He seemed very sharp and interested in the new field of solid state physics, which I knew almost nothing.

Addison: All right. So you've moved out to the West Coast, and what were you doing the first few months at Shockley Labs?

Blank: Well, one of the first programs he had us working on was to build a crystal grower. And when I heard that, I said, "Now, what is a crystal grower?" And pretty soon, I learned that that was the technique that they used to pull single crystal silicon out of a molten crucible. And he had some designs of his own

on what he thought could be used to grow a crystal and eliminate the contamination due to oxygen that was coming from the quartz. Well, this turned out to be a rather elaborate project and then we decided we were going to build a conventional crystal grower. And so, we thought about buying one, but the delivery was so long, and I took a look at it and decided we could probably design and build one faster than they could get shipped from the East Coast. So that's what we did.

Addison: And I've read stories about the first [crystal grower] -- was that the one that reached through the ceiling?

Blank: That was the fancy one that never really worked. He was trying to get it to do too many things and we didn't have…it was very early in the game, and we didn't know enough about it to know that it wasn't going to work. We just tried it and it didn't -- and it had other problems, which turned out to be a major. So eventually they abandoned it, and we stuck with the more conventional Czochralski crystal growing.

Addison: But you designed that yourself?

Blank: We designed that. We had a couple of designers there, and we just did it.

Addison: And in terms of equipment and materials, how did you go about doing that? You made your own pieces?

Blank: Well, we had to make everything because nothing was available. We were using furnaces that were basically laboratory type furnaces for diffusion. And, you know, these were clearly too small. The controls were primitive even by those standards, and they weren't meant to be used continuously. They were meant for intermittent laboratory use. Well, this is fine, except that a diffusion cycle takes anywhere from a dozen [hours] to, you know, overnight sometimes. So that's really continuous duty. And you really have to have a sturdy, robust furnace with very good controls to make sure that over a long period of time nothing changes. I couldn't get anybody to build one for me. I went around personally to a number of manufacturers trying to get them to do it. And they just [said] the market's not big enough. Well, they were right. At that time it wasn't. But we were sort of forced into doing this. We made our furnaces for a long time.

Addison: Besides the crystal grower, were there any other particular projects you were involved with?

Blank: Well, we were building our own evaporators for evaporating metals. And again, we were buying laboratory bell jars and putting in our own fixtures and designing them to make them usable. And, you know, basically a laboratory bell jar was a base plate with a vacuum pump on it and a hunk of glass cover over it, too. But eventually, you had to design something a little more robust that could handle service literally around the clock.

Addison: What about the team there? Was it kind of a well-oiled team, did you all work together very well?

Blank: I know what you mean. Among the group of people that we were working with…the eight of us, got along very well. We knew what we needed and we knew who to go to to get any kind of help that was required. I mean, if you didn't know, you at least took a stab at it to make sure that the job got done.

Addison: And did Shockley micromanage or look over your shoulder a lot?

Blank: Well, I guess it started to get dicey just after he got the Nobel Prize. We had a big celebration, and shortly thereafter, he began to travel around the world rather extensively as, you know, he was invited to visit all the major labs, universities and private and public around the world. And he would come back with new ideas and new projects, and we never really got to finish the ones that we started with. And this got to be frustrating to the point where we decided among ourselves what we felt was important, and this had to do with the diffusion process. We didn't want anything else; we decided that diffusion was probably the most effective way to build a device. And we decided to focus on that. And while he was there, we would just put it aside, work on some of these new hair brain things that he came up with, and when he left, put them back and worked on the preferred one. Well, you know, this is fun for a while, but after a while, it gets to be a little -- you know, why do we have to do this? So, it just takes a lot of time and…then his dealing with people that he found fault with was a little troublesome, and the way he dealt with them. And so that began the friction, and it led to the point where we decided that we should have a talk with Arnold Beckman and apprise him of this, which is what we did.

Addison: Did you personally get along with him?

Blank: I didn't have a problem with Bill. I think the problem that existed was between himself and the other physicists because my understanding was that he felt some kind of a competition between them, whereas with engineers, we were not competing with one another. I was there to help him, you know, to help him do his job, so we got along fine. I never had any difficulty with him at all.

Addison: And there's always that famous story about the pin and the secretary cutting her hand.

Blank: Well, that was -- I saw it myself. I saw this device. It was one of these push pins with the little plastic head on it. You ever see them? You just stuck them in a bulletin board. Well, apparently, there was a note stuck on there, and if you'll notice, some of them aren't fastened very well, and sometimes the plastic will pop right off. And you don't see it, but there's this little bit of a very rough edge that sticks out. And apparently, one of the secretaries didn't see it, and she cut her finger. And I mean, it wasn't life threatening or anything of that sort, they just…put a Band-Aid on it. That was the end of that. But [Shockley] felt that this was sabotage and somebody was out to get him, and he started a whole program of bringing in the detectives with lie detectors. And that was really off the wall. We didn't take too kindly to that kind of thing at all. It's just a simple, stupid mistake that somebody made and there was nothing sinister about it, at least I didn't see anything.

Addison: Just going back to these new projects that you talked about. Was the four layer diode one of those? He suddenly switched to that?

Blank: Well, the four layer diode was his pet project, and I think that he was focusing on that because he knew that the crossbar systems were the major effort at Western Electric, the Bell system in those days. And what he was trying to do was to build a solid state cross point. I don't know if they exist anymore, but a crossbar switch is a big heavy hunk of machinery that comes in two sizes that I know of: 100 points and 200 points. And Western Electric made these in Chicago actually under license from Ericsson from Sweden. It was their patent. And they were making these by the tens of thousands, and that was the main stay in the equipment, much faster than relays…a little faster than relays. It didn't get into the microseconds, but it was getting close to that. And it made all the difference in the world in the switching system, and [Shockley] wanted to replace the crossbar. And I said, Bill, you know, that's fine and dandy. So you've got a thing like this with 200 points and you shrink it down to something like that with 200 points, and now you've got to interconnect them. So now the problem gets worse because now you've got less space to make all these connections to. In some cases you made life easier, but in other cases you made life more difficult. Well, I don't think he saw the significance of that, but he still persisted with it. And making this thing was a real bear. You had to lap silicon to 6 mills or 5 mills, I've forgotten which, and most of the time, the equipment that we had, you wind up with silicon powder and oil. If the thing got mishandled, you would get a mess. Once in a while, you got lucky, and you had a fragment of a wafer that had some devices on it. So, we sort of felt that, yeah, it was a nice thing, but let's learn how to make the diffused transistors first before we take off on these things.

He had [another] project which drove me nuts. He was trying to build a float zone device for float zoning silicon. Well, germanium is easy. You could do this because germanium melts at 900 [degrees], and you have to bring it up close to that. You could do it almost in anything. But to try to do that with silicon, that gets a little dicey because you have to get close to 1400 [degrees] and that's a little more difficult. We tried a few things, but it just required a major…to this day, I don't think anybody does float zone silicon.

Addison: Could you just run through the events that led up to your departure and the departure of the group from Shockley?

Blank: Well, as I said early, we began a number of discussions with Arnold Beckman. He came to visit, and we had dinner with him on a number…I don't remember exactly. But we had at least two or three visits with him, and we outlined what we felt was the problem, and he agreed with us. He realized that Shockley was not a real manager, and that he ought to get one of his managers from another division to come and take over. And he sort of got an interim manager from the [Beckman] Spinco division, Maurice Hannifin, who really wasn't a solid state transistor man at all. He was just more of a manager. And in the end, he backed out and [Beckman] decided he wasn't going to remove Shockley from his role at the laboratory. And that sort of left us, you know, hanging in mid air. The situation became untenable and we decided that we were going to find other means of pursuing our careers in this industry. And we decided to see if we could either get hired as a group by another company -- it didn't occur to us to start a company in those days, because that just wasn't done in that time and there was no vehicle for doing it. But we did-- Gene Kleiner wrote a letter to his father's broker in Hayden and Stone in New York outlining what we wanted to do, and they presented it to the manager, Bud Coyle, who came out with one of his analysts, Art Rock, to visit us. He interviewed the group, and he decided that they were going to…you know, give it a shot, and we signed an agreement, and that famous dollar bill that you saw was evidence

of that. I guess the rest is history, but that's the way it happened. Actually, [Bob] Noyce didn't agree to come along until the last minute. He felt he had an obligation to stay as the technical adviser in that new sort of floating interim role he had. He decided that wasn't going to work if we bailed out en masse because he didn't have anybody he knew that he could work with. So he decided, probably wisely so, to join the group.

Addison: And how did Shockley take this news?

Blank: I don't know how he took it. He didn't take it very well. He felt betrayed, I don't know. Somebody would have to ask him, but I know he wasn't happy about it. And Beckman read a letter to us where we resigned, and that's been published. He didn't speak it extemporaneously. So, we knew it had to be prepared by lawyers because it was totally different from the way he spoke to us earlier. When he spoke to us earlier, he spoke to us as man to man. This time he was reading a letter.

Addison: And the basic gist of the letter was?

Blank: Well, I guess it's in Leslie Berlin's book [on Bob Noyce], I think they published it there. What we were going to do and what we were doing was not right…he said [there were] consequences of doing this, and this sort of thing. I guess it's a free country. You can do whatever you want as long as you don't steal anything.

Addison: Okay. Well, just turning to Fairchild Semiconductor then, can you talk about the first few weeks, what you were doing?

Blank: Well, the first few weeks were really a panic. We had to get a building, which we didn't have. So, I went searching for that. And we had to order equipment, which we did. And we had to start building equipment, which, you know, we didn't have a place to do it in. But Vic Grinich hired Murray Segal, who was scheduled to come to work for Shockley, but he didn't want to do that. He decided he wanted to work for Vic Grinich. So he joined the group and he and Vic were working in Grinich's garage putting together test equipment and electronic types of things. And everybody was working, planning what we were going to do until we got this building going. And we had to order lab benches and furnaces and crystal growers and RF generators and machine tools to build the stuff with. So we were busy beavers for a while. And then we had to equip the building. Well, it came with offices, which we just put some temporary partitions in so we'd have a place to work. And the back, we had to air condition it and pipe it for gases and water and sewer lines and all the other stuff that it takes to do a fab of that era, which is quite a little different than it is today, but still, the basic elements were all there. They were somewhat primitive…we needed a lot more power than the normal electronic lab needed because we had all these furnaces. On top of that, we had a 25-kilowatt RF generator sitting in a corner, which had to be powered up. Oh, it was fun, but, you know, through it all, we managed to get it going. And I remember the day that we finally got the floor tile laid in the back main room on which we were going to put all our lab equipment. And that night, Noyce and the rest of the guys came out and got barefoot and rolled their pants up and were swabbing the floors. I wish I had a picture of that. That was something to behold. They don't talk about that, but that was quite a sight. And we rolled up our sleeves and got to work. Well, from the time we left Shockley until the time we shipped the first device was about eight or nine months.

Could you imagine building a fab and building equipment and designing a device and shipping it in nine months? You can't even get a building permit in that time these days.

Addison: And what was your specific role within this?

Blank: Well, we decided what had to be done, and then the guy that could do it did it. Gene Kleiner and I shared the task. Some things he knew about, they let him do it. Some of the things I knew. See, I was the only one that had any kind of experience with air conditioning and piping and plumbing and gas work and acids, handling of acids, because I had had that experience before, so a lot of it fell on my shoulders. The machine shop we both handled because we both had to have machine tools. And the equipment design, we set a group together and between the two of us, we managed that. And [with] the rest of the guys…we decided on how they wanted to set up the lab for masks and mask making -- it's not the masks we know of today. These were old…the masks were brass shim stock, which we poked small holes through and covered with black wax…not photoresist. Eventually, we did photoresist a little while later, but the first ones were not done that way. So there were a lot of things that had to be learned. And on top of that, we had to build our own assembly equipment. Couldn't buy any. So we set up equipment to put the die down on a header…then to put the wire on the chip and weld the wire to the post and then cap the device. Now, we bought a welder, but we had to tool it up to make that. And so basically, we had to designer build just about everything.

Addison: In the early days, could you buy off-the-shelf equipment?

Blank: Couldn't buy anything. Had to build it. Eventually, little by little, some of the equipment began to be available, but a lot of it was a little better, but not better enough to go ahead and bet the whole factory on it. So you would buy it in pieces until you became familiar with it. I remember we, Fairchild continued to pull their own crystals for a lot longer than they should have, but they bought silicon from other people. They bought crystals from other people as well. But they held on. You know, once you have a facility going with people that are hired and trained, you're reluctant to go ahead and abandon it, if the only alternative is to just close it down because there's no market for it elsewhere. So they bought equipment, and a lot of it wasn't really built as rugged as it was required to be. They [Fairchild] had a lot of trouble and that probably hastened their exit from that field altogether to buying all the silicon from the outside. That would be my guess because I spoke to one of the maintenance guys, and he said the old equipment works fine, except it didn't have enough capacity. They couldn't make it any bigger without redesigning it. So they bought other machines from other people, and they were giving nothing but trouble. So that probably induced them to go ahead and just put it aside and buy the material.

Addison: Can you talk about the development of the IC from your point of view, how did you see that unfolding at Fairchild?

Blank: Well, we had talked about that at various times and I remember giving Noyce a copy of the first symposium on printed wire and printed circuitry that was done, I think, in 1955 or 56, in which they went over the techniques that were being used in those days for doing that with conventional devices. And most of it was done with printed wiring. We would lay down a pattern of wiring and put the components in the holes and solder them up. And I don't know who came up with the idea or how it was, but maybe you could do the same thing on a piece of silicon. The transistor is one thing, and the resistor you can sort of

do with silicon. And even a capacitor, which you couldn't -- they'd try, but they weren't too good at putting in…the coils, the inductance, so most of it was focused on putting in capacitors and resistors and the condition of the transistors. Now, how you could do that, I guess it came down to isolation and how you interconnect these things. Once you figure that out, then the rest of it is easy, but doing that wasn't obvious in the beginning. And the first circuits, I didn't have much to do with them. I know Jay Last was up to his eyeballs in that. And that was very difficult to do until they finally… made available the epitaxy device, which made life a little easier.

Addison: Was there any kind of announcement that, oh, we've invented this new integrated circuit?

Blank: No. The first one was rather primitive as I recall. It was a flip-flop or something like that. And at that time, the digital devices were just beginning to show up. Most of the [circuits] were analog. The digital circuits were just beginning to come alive. I talked to designers, and many electronic designers, and they told me that, you know, "You threw a curve at us when you showed us transistors. Now we had to learn to deal with that instead of vacuum tubes. And then you throw another curve when you go to digital devices, which are a lot different from analog device." That's all new science. And there weren't very many people coming out of colleges and trade schools those days that knew anything about these. And so, until you build up the first couple of graduating classes, you had to learn this the hard way.

Addison: How did your job change from when you were making transistors and then integrated circuits? Did that change a lot of things for you?

Blank: No. You know, you make a transistor and integrated circuit the same way. I mean, the techniques are the same. There are just more of them, you know, on the chip, and the silicon was getting a little bigger…over the years, learning how to make bigger crystals. But after some time, I began to get involved in building buildings and factories all over the world, because you had to field this expansion. We built new R&D facilities, we built new fabs in Mountain View, and then we had one in San Rafael, and we added one in Portland, and eventually had one in Toronto, but it wasn't a fab, it was just an assembly facility. And then we did Hong Kong because of the assembly action, and then Korea and then I used to travel a lot to Europe because we had this connection with SGS where Fairchild owned a third, Olivetti owned a third, and an Italian telecommunications called Telettra, owned the other third. And so, I was asked by Dick Hodgson to go and help them with their expansion because they were building facilities outside of Milan [Italy]. They were building them in England and Sweden and France and West Germany. So, we were busy for a while. We had a facility in Australia as well and two in Mexico, one in Tijuana and one in Mexico City.

Addison: The first off shore facility was Hong Kong, right?

Blank: Hong Kong, right. That was a big culture shock.

Addison: Could you talk about how you became involved in that project?

Blank: Well, Bob Noyce had a neighbor who was a Pan Am pilot by the name of Loren Simmons, and they were talking one day, and he told him about Hong Kong being a good place to have cheap labor, available labor, and that we ought to take a look at it. And the East Coast people, namely John Carter, were horrified at the thought of doing this in such an unstable area. But, you know, we went and did it any way. He called Charlie Sporck and I in and he said, "Why don't you go take a look at this and see what you think about setting up an assembly thing there?" They had a contact by the name of John Baldwin, a local person who they knew that would help us in our way around Hong Kong. And so in July or August of '62, we flew out to Hong Kong to take a look. And was quite a revelation. But the upshot of it was we decided we would set up a small assembly facility out there and we rented a part of a rubber factory. They were making these rubber sandals…and they had some empty space there. So we rented a back room and eventually set up the initial facility. They had to do simple assembly of devices. And that grew to the point where we built a big building there that eventually had about 6,000 people in it on three shifts.

Addison: So for the first facility…was there any special equipment required or was it just tweezers?

Blank: No, we took the old, ancient equipment from Mountain View. I didn't do this, but I heard that they just put it in crates and shipped it overseas. It came over there rusty, but they just sandblasted it, put a coat of paint on it and put it together; it worked fine.

Addison: So you just physically relocated the assembly that was in Mountain View to Hong Kong?

Blank: Yes. And that time, they devised a simple inexpensive package, which wasn't a metal can. It was an epoxy device, epoxy pellet with three wires sticking out of it, and they put the device in and when they connected it all up, then they just put a glop of epoxy over it and cured it, and that was the end of that. And then they tested them. Fairchild was building its own testers, because you couldn't buy any testers from anybody there.

Addison: So, did you get things up and running pretty quickly in Hong Kong?

Blank: Oh, yeah. It was amazing. We sent a group of people over there to get the thing…to get people trained, and we hired local people. We hired a number of engineers in Hong Kong that were actually Taiwanese that had been educated in Taiwan. There were some pretty good fellows there. We had, working at Fairchild in Mountain View, a number of people who had relatives in Hong Kong. And there were a couple of brothers, Frankie and I forget the other brother's name, he had people living there. We actually went to visit his father there. And there was a fellow, Sam Fok in R&D, who had a lot of relatives there and in many other parts of Asia. So we were fortunate in that when we landed we had somebody we could talk to that spoke the language…that lived there, so we weren't just coming in out of the blue. That was very helpful, and that was a lesson that we learned everywhere. When you go some place, you'd better get some local people to help you.

Addison: Okay. So can you talk about how things expanded from Hong Kong to other parts of Asia, what the strategy was there?

Blank: Well, the next place that we went to right after that, we looked at Taiwan, and I went over there myself. And I wasn't crazy about going down to Kaohsiung, which was where they wanted you to go, because it meant that you had to change planes, and I get nervous about sending equipment to a place where you have to change aircraft. And in fact, I didn't like Taiwan at all for that reason, because at that time there were very few direct flights, and there was always a chance of something getting lost. Maybe it's my own personal bias, but Korea looked a lot better from that standpoint because there were direct flights, at least from Tokyo and from Hong Kong to Korea. And they were genuinely interested in having us work with them. We made our connection through the economic development board in Seoul, and they were very helpful in getting us to visit the universities and people that would provide facilities for us. We actually had some customers there. One of the first customers we had was Lucky Gold Star -- well, actually Gold Star at that time, and then they added the Lucky later. And they were eager and helpful and, you know, there was still talk about the North Koreans being only a few kilometers away, but okay, so the world can be a dangerous place to live in, but what else is new.

Addison: What was the motivation for going to Korea? Was it wages were rising in Hong Kong?

Blank: Wages were coming up in Hong Kong, and it was getting more crowded there, and business was expanding. And they also decided to do all the ICs in Korea.

Addison: Any particular reason why that decision was made?

Blank: Well, the ICs were just beginning to take off and Hong Kong was going to remain as a discrete device place, and they decided they wanted…I believe they decided they wanted a separate place right from the beginning that did nothing but ICs and didn't mix the two. There's a little bit of a cultural difference between working on discretes because the feeling was the discretes were slowly going to going to tail off and the world was going to be more heavily focused on ICs, which I couldn't disagree with at that time.

Addison: Were there any other U.S. device companies going to these places?

Blank: Well, Signetics had a facility there. They built theirs about the same time ours.

Addison: Hong Kong or Korea?

Blank: Korea. I think General Instrument was in Taiwan. I don't know where TI was. I didn't run into them. But we looked in a number of places, and eventually, just before I left, we decided to set up a facility in Singapore.

Addison: I've been told that TI and companies like that went to automation instead of having off shore factories where labor cost was lower; they took the automation strategy.

Blank: Well, everybody went to automation as soon as it became available. We did also. Some people started a little earlier than others.

Addison: When did the automation start to kick in?

Blank: I don't remember exactly, but when the stitch bonders became available. You know, some of the early ones were a little troublesome, and they required a lot of baby-sitting, but as they became more available, people got used to relying on them, and that's when they used them. Now, at that time, I think there was just the beginning of independent assembly houses starting up. And little by little, I guess, people began to use those for overflow work and seasonal changes and things of that sort.

Addison: With the automation, were companies outside developing this product and they came and sold it to you or you were developing automation equipment in-house?

Blank: By that time, by the late '70s, I wasn't too involved in that…but I know that both were happening. We were building our own and buying on the outside. And if you have an old facility building an old product that's sort of working, it's hard to justify retooling it with new automation equipment. That's economics 101. But if you have a new product that's much easier to start that off on the newest line of equipment. And so you're sort of stuck with having old equipment with an old device and translating the new equipment into the newer technologies as it becomes available.

Addison: Earlier, you talked about SGS. What problems did you have to solve there? Harry Sello told me they were making germanium transistors and didn't want to switch to silicon.

Blank: Well, Harry Sello would know because he went over there. He was up to his neck in dealing with those fellows. There was germanium, it was selling, there was a market for it. Then there was a painful struggle to get them to cut over to silicon. But eventually, they sold the equipment…I think it was a Yugoslavian company that bought the old equipment from them finally, and then they committed to doing all silicon.

Addison: What were you specifically sent over there to do?

Blank: I was just helping them get their facilities up and running because I had been used to dealing with different cultures all over the world…but, you know, lots of times they didn't bother to find out if you could do anything there. For example, is there a reliable source of power, water, sewerage, gases, chemicals…really basic elemental things? Not to talk about labor supply and trained technical help. You have to factor all of these things into it, and you neglect one at your peril, because it comes back to bite you. Even some mundane thing, as we mentioned earlier, putting [a factory] in a place where there are no direct flights can be hazardous.

Addison: Could you talk a little bit about how Fairchild changed when Bob Noyce and Gordon Moore left?

Blank: Well, I wasn't there long enough to witness the whole transition, but I had left only a few months after they did. You know, when [Les] Hogan and his crew came in, they sort of swept through the whole area, took over and introduced a style which I wasn't used to. So some of the fellows stayed around long enough until they could get something else lined up and a few of them remained. But there were a plenty of places to go between Jerry Sanders with AMD and National and Intel, and Signetics and lots of other…like equipment houses [which] sprung up at that time. Then a lot of our design people set up their own companies or went to work for other companies. And we had lots of design guys, some of them we brought in from Texas Instruments. We had a whole group of fellows in from that part of the world. And we added more locally. And they had some at R&D that did a lot of work on contact printers.

Addison: Of the time that you were at Fairchild, what was the most enjoyable for you? Was it the early years?

Blank: The early years, building something from nothing.

Addison: How did it change from those early years to later?

Blank: Well, once you have an establishment going, you have to feed the establishment and at the same time make progress ahead in new areas. R&D got very large. They had a lot more people there. I mentioned to Gordon some time, I said, "You know, it seems to me that the bigger the group that you get in R&D, the less that comes out of it." But again, my impression was that they were coming out with new products faster than they could get them designed and built and sold. So you had this backlog. Everything [was] funneled in there and you had a bottle neck in the factory and in marketing. You can't expand the whole system all at once -- or you can, but it's not easy. So if one is more productive than another, it sort of backs up until you've got this little hole on the end, which is with the factory. And if they can't absorb new products, you're just going to have to wait. And I think that's one of the things that caused the decline, because they couldn't get new products through the factory fast enough…every time you introduce a new product in the factory, they have to go through a whole learning cycle --learn how to build it, learn what the quirks are, learn how to test it. Doing reliability work was difficult; with a new product, you really need to take the time to do it. That's something you can't shorten. A thousand hours is six weeks no matter what you do. You know, you can't shorten it. And so, that was one of the limiting factors in there to get new products out up and running, and the marketing people had to learn how to sell it. First they had to learn what the product is and what it's going to do. And the guys who designed it didn't even know that.

Addison: Of the original group of eight [founders] I know four of them left early on, but did you guys stay close throughout?

Blank: Well, you know, we still remained friends. We spoke to each other. We just went our different ways. Jay Last moved to southern California and I see him infrequently because he doesn't come up here all that often. I don't go down there hardly. Gordon [Moore] is now in Hawaii half the time or most of the time. I just bump into him occasionally here. And Gene Kleiner was a neighbor of mine, and he got more involved when he moved Kleiner Perkins to San Francisco. So I began to see less of him because I just didn't go up there that often. But, you know, we still remain…you pick up the phone and talk to anybody…it's as though we never left.

Addison: All right. Maybe just to wrap up, what did you do when you left Fairchild?

Blank: When I left Fairchild, I decided I had enough running around the world building new factories that I had paid a price for health-wise, so I decided I wasn't going to do that any more. I began to get involved in working with new startup companies, small ones, either as an investor or in some cases as a director or advisor. You know, all kinds of fields with different areas other than semiconductors, and in addition to some semiconductor devices. And I went back to school. At one time, I thought I'd like to do something with medical electronics. So I went back to school and took a couple of courses in anatomy and physiology. I figure, well, I should know something about that before I get involved in medical stuff. And I did get involved in one medical device, but it didn't go any place because getting through the maze of FDA approval was more than could be handled unless you had a large organization dealing with it. And then I helped start Xicor in 1978 in which I was the director from the beginning. There was another company I was with that was making food products. So I was the director there for a while. And when the [SEC] restrictions got to be so onerous that it got to be more of a nuisance than a pleasure, I began to disassociate myself with boards. After a while, I figured I had had enough of that. I didn't want the nonsense of dealing with SEC matters that keep changes all the time is something that I'd just as soon leave to somebody else.

Addison: Okay. Well, that's a good time to end. Thank you very much, Julius.

END OF INTERVIEW

