Computer History Museum

Gordon Moore and Arthur Rock
Oral History Panel

Moderated by:
John Hollar
with
Douglas Fairbairn

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John Hollar: In the late 1950s, no one was quite sure if venture capital would work as a financing model, or that if it could be profitable. And then by the early 1970s, it was established. The model was clearer than it was in that 15 year period. And your involvement in it, particularly, was really key. So from the perspective of someone who helped lead that change, what do you think the main factors were that contributed to that change in financing over time?

Arthur Rock: Well, the success of Davis & Rock certainly got institutions interested in investing in that form. And then the change in the ERISA law was a big thing.

Hollar: Can you also talk about the difference in the role that you played as an investor who was very involved in the companies that you invested in, especially in those years?

Rock: Well, I got very involved in a couple of the investments we made. And as a result, we didn't even invest all of the money in Davis & Rock. The two most important companies were Scientific Data Systems and Teledyne. And both of those were located in Los Angeles. And I was chairman of one and on the board of the other one. And I spend a lot of time in Los Angeles with those companies. And I hope I contributed to their growth.

Hollar: Were you hesitant at all to invest in companies that were developing in Los Angeles, as opposed to, here, in Northern California?

Rock: No, as long as I could get there in a day.

Hollar: You've said that you really believe in the model of investing in the person, as contrasted with other philosophies?

Rock: Absolutely.

Hollar: Talk a little bit about Teledyne. And then we'll talk about Scientific Data Systems and why that worked for you in your mind as investing in people.

Rock: The company was founded by Henry Singleton and George Kozmetsky. And Henry was clearly the leader there. And both those gentlemen came from Litton Industries, where they ran the electronics businesses of Litton. Litton was also a conglomerate. And their reputation was very high.

And Henry, of course, was the inventor of the of the inertial guidance systems. His conception of what he wanted to do was to build a huge company by acquiring companies, mostly in the electronics businesses.

And that appealed to me and his real passion about doing that. And I spent a lot of time with both of them and we finally decided to invest in his new company.

And they went on to buy about 125 companies. And they did much better than General Electrical or, even, Warren Buffett did in acquiring companies. The timing was different and the scale was different, but not at the time. At the time, Teledyne was a bigger company.

Hollar: Did you have any particular memories of your experience with Fairchild that led you to want to be more involved? I know you said in other places that Fairchild was run in the east. They didn't really have any desire to have anybody from the outside involved at all. And so that was different for you. Did you take anything away from your Fairchild experience that shaped this period?

Rock: Well, the management at Fairchild didn't want anything to do with us. I was involved with-- you wanna take that call?

Hollar: I do. This is Katie. She may have an answer for us. Hey, there. OK. All right. OK. All right. Thank you. OK. Thank you. Bye. He's running very late. He'll be here in half an hour.

Rock: OK.

Hollar: This will allow us to do this part of it, though. If that's all right with you.

Rock: That's fine.

Hollar: OK. Thank you. Let's start again. We were talking about your experience at Fairchild and how it influenced this other period.

Rock: It was clear that Fairchild-- the management at Fairchild was in Syosset, Long Island. And they didn't want to have anything to do with either the investing type or, actually, with the management of Fairchild Semiconductor [to join or start other companies].

Finally, when John Carter, who was then President, passed away, the Fairchild Camera and Instrument was making 110% of the profits of the whole company. And nobody there wanted to recognize that. And that's the reason for people spinning off from Fairchild Semiconductor.

But to get to your point, Syosset didn't want to have anything to do with me. Several of the Fairchild-- or Fairchildren, as they were called-- became very friendly with me. And I spent a lot of time with them and got to know them and respected them and helped to make some of the decisions. I don't think they were very important ones. So I got to know them. It was interesting, what they were doing.

Doug Fairbairn: One of the early spinouts from Fairchild was Amelco, which became-- Can you say something about that? I know--

Rock: No. That's not true. Amelco was a company long before it became a semiconductor company. And it was acquired by Teledyne. And Teledyne ran it for quite a while-- or, in fact, ran it forever. And when Jean Hoerni and Jay Last decided that they wanted to leave Fairchild, I then introduced them to Teledyne. And they then formed the semiconductor division of Amelco.

Fairbairn: So you obviously arranged that marriage--

Rock: Yes.

Fairbairn: --if you will. And that was in like 1961. That was fairly early on in Fairchild's existence.

Rock: It had to be the late '60s.

Fairbairn: So that was part of your-- then knew you. You had a relationship with-- they were some of the founders of Fairchild, in the first place.

Rock: Correct. They were part of the--

Fairbairn: And so, you had a relationship with them. And so, when it came time for them to leave-- or they wanted to leave-- then, you were a natural person for them to--

Rock: I believe that's right.

Hollar: --to team up with. And so it became part of Teledyne and, basically, went on as a successful operation within Teledyne. Is that correct?

Rock: Correct.

Hollar: And then the founding of SDS was different from many of the others we've talked about and a very different business approach. Can you talk about that?

Rock: Scientific Data Systems was run by Max Palevsky. He ran a very successful division of Packard Bell, which was, essentially, in the television business. And the television business went downhill pretty fast. And they didn't have the capital to put into the computer division. And so the computer division closed up, even though it was successful. So some of the founders of that division, along with Max, decided that they would, if we could finance them, start a new company.

Hollar: How had you met Max Palevsky?

Rock: Someone introduced me.

Fairbairn: And I understand that you were not eager to invest in a computer company at the time, but something about Max Palevsky convinced you that--

Rock: I think that's wrong.

Fairbairn: --he could be successful.

Rock: I had no reason not to want to invest in computer companies that I can remember. I don't think so.

Hollar: I want to talk a bit about some of the changes in the model during this period from the '50s to the '70s, Arthur. First of all, is the source of funds and how that changed. If you take Fairchild as an example where the parent company invested in Fairchild Semiconductor. And then you look at the model that you were developing, which was individuals. How did that change occur? Why did you think that was the right model?

Rock: Because I could get the money.

Hollar: And what was it about the willingness of people to invest in these ventures, at that point, that was different? Or was it different at all?

Rock: I don't think the investors in Davis & Rock had any other vehicle to do that. They were primarily very wealthy people who had money to invest and no one had ever approached them about doing this

before-- at least people who they had faith in. And I had done this-- I was successful with Fairchild and I had done it with a lot of other startups while I was in New York and the investment banking business.

Davis & Rock, I think, was the first venture capital firm to start with limited partners who weren't affiliated with the venture. It was Draper, Gaither and Anderson or whatever it was here. But that was their money, I believe. I'm not even sure of that.

Fairbairn: Can we go back to even before, You mentioned you had funded some other companies. I'm curious as to-- and this is more from your own sort of personal story-- when and how did you decide that electronics was an area worthy of investment? And what were some of the first companies that-- through Hayden Stone or whatever-- you orchestrated investments into. Just tell me about how your understanding and belief in investing in young electronics companies evolved.

Rock: I wish I could remember the names of them. I can't. A lot of them were very successful and it just led me to believe that there were great opportunities there. But I can't remember the names of many of them.

Fairbairn: Did you have any personal background in electronics?

Rock: No. None whatsoever.

Fairbairn: So, you were just observing what was going on in that community.

Rock: Correct. Correct. But one of the companies that we did invest in was General Transistor. And that's what, of course, led me to believe that there was something out here with the Shockley Group. That was a successful company making-- and the first publicly held semiconductor company. And I was instrumental in getting them public. But they were making germanium transistors. And the sole purpose of those, at the time, was for hearing aids.

But in the course of the due diligence, it appeared to me that this was going to be used for a lot more things than hearing aids. And when I learned about what Shockley was doing with silicon transistors, it just rang a bell.

Fairbairn: And what was the source of original financing for General Transistor? Were you involved in that stage or in the only later stage?

Rock: The original financing was very small. The whole operation was a very small operation. I think we raised half a million dollars for them, or $1 million. I can't remember, but It was relatively small.

Fairbairn: And was this through Hayden Stone?

Rock: Yes.

Fairbairn: Were you aware of other venture kind of activity going on? The only one I'm specifically thinking of is Georges Doriot and American Research and Development.

Rock: Georges Doriot and American Research. And there was Lawrence Rockefeller and Associates. And the Phips family. And there's one other big family.

Fairbairn: Whitney?

Rock: Pardon?

Fairbairn: Whitney?

Rock: Yes, Whitney.

Fairbairn: And did the four or five of you talk with one another?

Rock: No.

Fairbairn: Were you just aware of what was going on?

Rock: We just knew what was going on.

Fairbairn: So you never shared deals or ideas?

Rock: Never had an opportunity. But those were families. They had no outside investors. And they were pretty limited to the New York area. I talked to them about Fairchild and they just weren't interested in a west coast company.

Fairbairn: And I understand American Research was formed partly to finance new enterprises in the Boston area.

Rock: Boston area. Correct.

Fairbairn: They also had a sort of regional focus.

Rock: Correct.

Fairbairn: They were not necessarily interested in a nationwide effort.

Rock: Correct.

Fairbairn: So when did you sort of make a decision or become aware that maybe there was as much or more money to be made on the west coast versus the east coast and what was--

Rock: Well, after I started coming out here with Fairchild. And then I looked around, saw other opportunities and all the money was on the east coast and all the brains were on the west coast. And it didn't take much for me to put two and two together.

Fairbairn: So one of the things that we're interested in, as part of this new center, is to understand the cultural or other aspects that have helped fuel the growth of Silicon Valley, specifically, and curious, in particular, as opposed to what's happened on the east coast. Can you, having invest in both areas-- especially in the very early days-- do you have any strongly held opinions with regard to that, or is it just sort of the way it happened in you particular cases?

Rock: Well, yeah. First of all, most of the entrepreneurs, at that time on the west coast, were former east coasters. And it took some gumption for them to come out here, in the first place. So there was that aspect-- these people were willing to move and take a chance and look for better things.

But in addition, Fred Terman, who was provost at Stanford, had the idea of letting his postdoc people take a day a week and consult. And that was not done on the east coast-- MIT, and Harvard, and Princeton, and all the schools would not approve of that. And they also had a lot of land. And he convinced Stanford to take some of that land and allow companies to build on their land-- those companies that were started by Stanford people. And I think that was the big booster.

Fairbairn: So did you see Stanford, then, as being sort of a likely major source of new ideas and entrepreneurs? Was that sort of a focus of yours in the '60s?

Rock: No, it just happened that-- I didn't focus on Stanford-- but it just happened that most of them had some Stanford connection. Certainly Hewlett and Packard, and Varian, and those kind of companies.

Fairbairn: So you formed Davis & Rock as this new way of financing venture firms. What was your observation during the '60s-- that formed in the early '60s. 61 or so, is that right?

Rock: Pardon me?

Fairbairn: Davis & Rock was formed in

Rock: Yes, '61. 1961.

Fairbairn: And at that time you were the first to use this kind of financing model with limited partners and so forth.

Rock: Well, I'm not sure what Draper-- I'm not sure I was the first.

Fairbairn: Well, one of the first.

Rock: Yeah, I certainly was one of the first.

Fairbairn: What was your observation about how-- did people come to see you and ask you how you were doing it? Did you see others getting the idea and taking it?

Rock: No, it took quite a while for others to get interested. But we had no trouble because we were the only ones, and people came to see us and talk to us.

Fairbairn: So you didn't have to go looking for deals?

Rock: Not particularly. We had a lot of time too-- that was part of our success was we had enough time to due diligence on these companies and talk to the founders and make sure that there wasn't a lot of empty noise there.

Fairbairn: So as John said, you had felt that the people themselves were the most valuable asset, if you will. Is there some particular element of that-- personality, drive, smart, all be above? What was the key to you, that you looked for, that you said this person is somebody I could--

Rock: Well, in addition to being smart and knowing what they're doing, intellectual honesty. The idea that they wouldn't kid themselves or kid anybody else. And that took me and Tommy Davis a considerable time talking to these people and figuring out whether they had the fire in the belly and wouldn't get led astray and wouldn't try to lead us astray.

Hollar: And a related part of that, Arthur, was your decision to often become the chairman and then to take a really active role.

Rock: Correct.

Hollar: When did you decide-- what was the investment where you said, this is the one I'm going to do. I now know this is important for me.

Rock: Well, I would say Teledyne and Scientific Data Systems.

Hollar: And was that another part of your new model?

Rock: It wasn't when we set Davis & Rock up. But it became apparent that if we wanted to make the most out of our investment that I'd have to get involved.

Hollar: What were the most important things, for you, acting as chairman? What were the things you knew you really had to focus on.

Rock: To make sure that they kept their eye on the ball and didn't go off on all kinds of directions and that they had good accounting advice-- I think that was extremely important-- and that they hired good people. I got to interview most of the people they hired.

Hollar: And was your recruitment of the board equally important during that phase?

Rock: Not as important.

Hollar: Not as important. How did you go about deciding how you wanted to put these initial boards together?

Rock: In those days, all the large investors wanted to be on the board. So other investors could command a seat at the board. And then we got some people who were familiar with the industry.

Hollar: I know you had a particularly-- it seems from all the history that's been written-- you had a particularly good relationship at Intel as a real activist chairman. Was that true with other companies, too?

Rock: Yes.

Hollar: So did all the management teams that you worked with welcome your involvement?

Rock: Well, I haven't heard anyone who didn't. I don't know whether they welcomed me or not. But they certainly called me when they had problems or invited me to participate in the discussions.

Hollar: Were there are others who were emulating that model, too, as you started to get into it?

Rock: There are two theories that go on, at that time, in the venture business and-- what's the name of the head of Sequoia-- the founder of Sequoia?

Fairbairn: Valentine?

Rock: Yeah, Don Valentine and I have had many discussions about our different philosophy. He's an engineer. I wasn't. So I didn't really have basic knowledge of what the engineering required here was. So he took the idea that if there are good products and their ideas are good and the management isn't, we'll straight out the management. And I did not like that idea. I liked the idea that if there are good managers, we'll find products. So there are two basic differences. And they worked out for both of us.

Fairbairn: Both successful.

Hollar: How did you make your way in this very new technical field without having a technical background?

Rock: Gingerly. I had just had faith in people that we hired or invested in. And it turned out, most of the time, it was pretty good-- but not always.

Fairbairn: As you can tell, John and I have sort of different focuses here. I'm particularly interested in the evolution of the venture industry, from, basically, family money and individuals putting money into companies and doing it in a hands off kind of fashion, to the limited partner model and bringing in smart money and people that know how to start companies and know what it takes to make them run. And it seems that that process sort of evolved and transformed from the '50s into the '60s.

And you were clearly a leader in two elements of that and putting together limited partners and taking an active guiding role in the companies, which seems to be sort of the fundamental way that venture capitalists approach today-- 40, 50 years later. And so I'm curious as to-- when you started, you were the first or among the first-- when did you start seeing sort of competitive firms, if you will? And were there particular ones that you found yourself going after similar deals or combining to work together on deals or whatever? When did you sort of move from--

Rock: Well, it all changed with the ERISA law in 1974. That was the big breakthrough for all these other venture capitalists to get institutional money-- pension funds and endowments. Legally, they could not invest in these kind of ventures. There was a Prudent Man Rule and it was only with our success that people became aware of what was possible and lobbied to get the laws changed.

Fairbairn: So the latter part of the '60s, did you find others coming to pick your brain about how to do this and what to do?

Rock: Oh, yeah. Sure.

Fairbairn: But none of them in particular?

Rock: No.

Fairbairn: So Valentine started in '70, '71, '72?

Rock: I don't remember.

Fairbairn: He set up shop separate from yours and you became aware of his activity down the road, someplace. Did you have a relationship with Sequoia?

Rock: I never did a deal with them.

Hollar: When the ERISA laws changed, Arthur, did you want to become part of that?

Rock: No. That's '74 and Intel deal went in late '68 and I was so involved there and a couple other things that we never really went after any institutional money. I kind of lost interest in this whole field when it went from hardware to software.

Hollar: How did the institutional money change the way you saw venture capital operating?

Rock: The venture capitalists, then, went out to all these institutions and raised a lot of money. And I just wasn't about to do that. I had enough money myself that whatever I wanted to do, I could do. But they raised all this money and, pretty soon, they were spending half their time raising money. And then they were looking to invest this moneys. And they didn't have time. And as a result, they kept on begging each other to let them in on their deals. We're talking about the '70s, now?

Hollar: Yes.

Rock: A lot of them were not successful, just for that reason. There's just too much money. But there still is, so I don't know what the answer to that is.

Hollar: I hadn't really thought about that until you said it, but before ERISA, was your model raising money deal by deal to--

Rock: No.

Hollar: You were still using a fund model, but--

Rock: Correct.

Fairbairn: From individuals in your network--

Rock: I'm sorry. I can't hear you.

Fairbairn: From individuals within your network of people--

Rock: Right.

Fairbairn: -- that's where you raised the funds? So you mentioned something about what happened at Stanford and Fred Terman and so forth, and that's certainly a critical piece of laying the seeds of what's happened in Silicon Valley. Are there any other cultural aspects or are there any other differences, having worked on the east coast versus the west coast, that you would say helped fuel the entrepreneurial activity in Silicon Valley in the west coast?

Rock: Well, the other thing was options. The culture on the east coast was that only two or three of the executives would ever get options. And part of the problem with Fairchild Semiconductor is that Syosset said no to Fairchild's wanting to give options.

And when we formed Intel-- you'll have ask Gordon about this-- but to the best of my recollection is one day Gordon and Bob Noyce and I were sitting around discussing this problem, after Intel was formed. And what do we do about our employees? And to make sure they stay. And one of us, and perhaps it was me, suggested well, why don't we just give all our employees options?

They're working at below market price and above market hours. And shouldn't they share in some of the fruits, if there are any? And everybody agreed that would be a good idea. And then, the question was, well when. And somehow or other, we came to the conclusion, at that time, that if anybody had been there a year would get options.

And I think that was the first time that was ever done. We had done a little bit of that at Scientific Data Systems. But I don't think we went to all the employees. I think we only did engineers at Scientific Data Systems. I'm not sure of that, but that's my recollection.

Fairbairn: So that's one of the key cultural differences between the west coast and the east coast?

Rock: Absolutely.

Fairbairn: And the other comment that you had made was that they had a more insular kind of outlook. That is, they weren't really interested or feel compelled to look outside their own backyard, if you will. Whether it be New York--

Rock: Yes, that's correct.

Fairbairn: -- or Boston or whatever. One of the sort of major boomlets, if you will, in the 1960s was the minicomputer business. The number--

Rock: I'm sorry. I can't hear. I'll put my other hearing aid in.

Fairbairn: Sorry. I should know better. My son also wears hearing aids and so--

Rock: Yeah, but these don't work so well.

Fairbairn: I need to-- oh.

Rock: See if this works any better.

Fairbairn: So I was curious about the period of the 1960s. And one of the major booms was in the minicomputer business. And many of those were started in the Boston area.

Rock: Well, one. I think o--

Fairbairn: Data General and--

Rock: Yeah

Fairbairn: So I thought there were others, as well.

Rock: Well, there may have been.

Fairbairn: [INAUDIBLE] others.

Rock: Well, you're right. That's correct.

Fairbairn: Other than Scientific Data Systems, were you involved in the startup of any other computer companies, especially during that period?

Rock: Not in that period.

Fairbairn: I was just curious--

Rock: I was very sensitive to conflicts. And I felt that if I invested in any other computer company, that might present a conflict. That's not true today, as you probably know.

Fairbairn: So at that time, your model was pick areas that were quite different, that were not in conflict. You had enough money to invest in the companies that you were interested in funding. And that was your model of success.

Rock: Right.

Fairbairn: Each one you did long periods of due diligence and got to know the entrepreneurs and invested in them and their capabilities.

Rock: Correct.

Fairbairn: Fair summary of your approach?

Rock: I think so.

Hollar: Do you see anyone doing that same sort of investing, today?

Rock: Well, the angel investors are doing that.

Hollar: I suppose the difference would be that no single angel investor could put enough money in to really get an enterprise up and running, perhaps the way that you and a small group of your hand picked investors--

Rock: Right.

Hollar: -- could do that.

Fairbairn: The challenge, today, for angels is that they put money in early on and then VC's come in later with the big money and often do a cram down or other non-friendly funding that makes it difficult for the angels to continue to participate.

Rock: Right.

Fairbairn: Having sort of lived through the last 30 years of venture investing from both entrepreneur and angel investor, do you see sort of the culture of the venture community changing in that regard? It's more cutthroat are more last money in is the guy who wins kind of philosophy.

Rock: They have a real problem in that they have to produce results for institutional investors. And they're looking at it day by day. I didn't have that problem.

Hollar: Do you think that influences the direction these businesses go in?

Rock: What happens is that they have to sell them off [or have a public offering]. They have to get liquid. And they always have to look where their exit is. I never even thought about exits.

Fairbairn: But in the end, your companies found exits, either by acquisitions or--

Rock: Well, they needed money and more money than I had.

Fairbairn: So they went public or were acquired?

Rock: Correct.

Fairbairn: But your interest was in building--

Rock: Building companies.

Fairbairn: -- the strongest possible company.

<Panel session begins with both Gordon Moore and Arthur Rock>

Hollar: So we'll begin with this part of the interview, then, which is I understand from Arthur, Gordon, that you two have never actually given an interview together at the same time before.

Gordon Moore: That's right, yeah.

Hollar: Well, that's terrific. We're so happy to have you both, here. This is a historic moment to have you both sit down and talk about the beginning of Intel.

We're starting a special project. It's a long term project-- probably going to go on for at least a decade-- about how some of the most important companies in the history of computing were founded and built. It's different from other kinds of history that people have been doing because we're really focusing on company building. So we're trying something new, which is to sit down with a founder and the first investor and talk about how that moment happened, how you came together, and then the early days of the company.

The story, obviously of Intel, and even the way you came together has been told many times, but we hope that one of the unique things we'll contribute to history is having you both talk about it, together. And so the focus of this interview really is what led you to come together, how you made the early decisions to form Intel the way you did, and then the critical early years of the company-- not covering a huge amount of time. Probably 1968 to, say, '72. That's the background. Any questions before we get started?

Moore: No, I don't think so.

Hollar: Thank you. Let me start. Gordon, if I could start with you, I want to ask you, specifically, about the circumstances that gave rise to the idea that you and Bob Noyce would leave Fairchild and form your own company.

Moore: It was a complicated combination of factors that made it happen. Fairchild was going through a top management change looking on the outside for a new CEO. Bob was the logical internal candidate and they were clearly passing him over. So he was interested in another opportunity.

When I heard he was going to leave, I said, OK, I'll come along, too. And I told him earlier that I saw the first opportunity I'd seen in years that I would consider big enough to start a new company with semiconductor memory. With that idea and with the push we had from Fairchild management, we decided to start all over again.

Hollar: Was it an intimidating idea to think that the two of you would leave Fairchild, which was--

Moore: Not especially. We belonged to the culture of the Valley that failure is something that, if it happens to occur, you can start all over again. There's no stigma attached to being a failure. And we had had enough success at Fairchild. We were reasonably confident we knew what we were doing.

Hollar: What was it about the semiconductor memory opportunity that you felt was worth all this?

Moore: It was the one use of integrated circuits where it looked like you could make something complex that we used in large volume. The trouble the industry was running into was anything that got complex tend to become unique. And there wasn't enough of them to spread all the design effort across. But memory was a universal function in all digital systems. And it looked like one could actually make a standard product and develop a fair business on it.

The successful semiconductor companies at the time were dependent on large factories in Southeast Asia with low cost assembly. The assembly and test was getting so it exceeded the cost of the silicon in the relatively simple circuits. We wanted to switch the leverage back the other way-- make complex circuits where processing the silicon became the most important part again.

Hollar: Now, Arthur, you mentioned earlier that, because in part of your prehistory with Fairchild, that, along the years that Gordon and Bob and others were at Fairchild, you were staying in touch, to some extent.

Rock: That's correct.

Hollar: I wasn't aware of that. That was a new--

Rock: Yeah. I became fairly friendly with Jean Hoerni and Jay Last, in particular.

Hollar: What was the nature of your conversation with them during those years before this?

Rock: It was a friendship. We went hiking together and climbing and skiing. It wasn't about the company. But they knew that I was there and, I guess, thought highly enough of me to continue the friendship.

Hollar: And then were you aware that Gordon and Bob were having these thoughts?

Rock: Not until Bob called me.

Hollar: Do you remember that conversation?

Rock: I do, indeed.

Hollar: Can you talk about it?

Rock: It wasn't much of a conversation. Bob called me and said they wanted to do and I said I'm in. And that was that.

Moore: It had to have been the easiest financing of a startup I think that has occurred in Silicon Valley.

Hollar: So talk about how that happened, Arthur. From that moment when you talked to Bob, what were the next steps?

Rock: I asked them how much money do you need? 2.5 million dollars. How much are you willing to invest? 250,000. And then we talked about what percent of the company should go to the investors and figured that out. It was done within 10 or 15 minutes.

Hollar: Were you surprised, Gordon, at how short an amount of time it took to raise the money for Intel?

Moore: Not especially. I knew Arthur was someone who could make a decision in a hurry. And he did.

Hollar: How quickly did things move after this initial conversation?

Rock: This was in the days before emails-- we had telephones-- before the days of--

Hollar: Fax machines?

Rock: -- electronic communication. So it took me about a day and a half to call the people I thought would be interested and get yeses.

Hollar: Were you attracted to Arthur, specifically, Gordon, as the person to do this?

Moore: Well, we knew him. We knew what he had done in the past. So it was certainly the one place we would think of going. And it worked out fine.

Hollar: Did you, Arthur, at that point, have a concept of what would make a great entrepreneur? Did you understand what it was about Bob and Gordon that really had a chance to make this go?

Rock: Well, they made Fairchild Semiconductor go, so it didn't take a great leap of faith to think they could do it again and not make whatever mistakes they made at Fairchild.

Hollar: Were you talking to Gordon and Bob about the specific opportunity that they saw?

Rock: No.

Hollar: Did that come later?

Rock: In the 15 minute or whatever conversation, they told me what they wanted to do. And I said, gee, that sounds great.

Hollar: There was a famous one page proposal, wasn't there-- that was drafted to explain what the nature--

Rock: It was three pages double spaced. Some of the investors wanted to have something in their files. So I wrote this three page double spaced memo. It didn't say anything.

Moore: I didn't realize you had written it. I thought Bob did.

Rock: No, I did. I think Bob would have been more specific.

Moore: Probably. It is rather nebulous what we were gonna do.

Hollar: So what were the first steps then, Gordon, that you and Bob took to start the business?

Moore: Hiring. At that time, we had to get to a critical mass to do the things that were necessary to get a product out. So we were incorporated on July 18th. And our goal was to be to about 100 employees by the end of the year. And we started right away.

I told Andy Grove, I was going to leave. He said, I want to come along. That was a recruiting there. And we tried to select young, high potential people from various places in the industry hoping they could grow with their jobs.

Hollar: Did you have your eye on specific people?

Moore: Not really. We developed it as we went along.

Fairbairn: So I'm curious. Arthur wrote this three page business plan, if you will. Did you and Bob write an equivalent one for your own purposes? Or is there a business plan that the founders created?

Moore: No, the only business plan was the one Arthur wrote.

Fairbairn: Did you have a specific product in mind?

Moore: Well, semiconductor memory. And we went after that with three different technological approaches. I refer to it now as our Goldilocks Strategy.

One was too easy. It was a variation on the theme of the technology that was being used to make simple circuits. And well, we got product out. In fact, our first product was-- the people who had been making the logic circuits could copy it pretty rapidly. So we didn't have an advantage. One was too hard in that we didn't have the technology well enough developed. We would probably have gone broke if that had been our only approach.

But one of them, by fortune and accident, was just difficult enough. When we were focusing on it, we could get by the two or three rather serious problems that had to be solved. But we ended up, then, with a monopoly of about seven years before anybody else got over on the silicon gate MOS transistor structure that we were using.

So it really worked out beautifully. Luck plays a significant role in these things. It was just a very lucky choice.

Fairbairn: What was that Goldilocks product-- the middle one?

Moore: Well, it was a technology-- the silicon gate MOS. Individual transistors had been made. But nobody had tried to make a production technology out of it before. We drove in that direction.

Hollar: Were there things that had happened, Gordon, at Fairchild that you knew you wanted to do differently?

Moore: Well, the thing that bothered me at Fairchild was as the manufacturing end became more competent, it became increasingly difficult to get things out of the laboratory into the production. The

production people wanted to re-engineer everything. In fact, we had spin-offs that had spin-offs with technology before we got the production people to look at it seriously. So that was something that had developed over a period of time and was increasingly frustrating.

Hollar: What was the buzz in the industry in the valley, at that point, if you will, about the start up of Intel?

Rock: Well, when people heard about it, everybody wanted to invest. As a matter of fact, someone called Gordon's wife.

Moore: Oh, yeah. She had more than one call.

Rock: Oh, really?

Moore: One very persistent admiral who wanted to invest.

Rock: And the money-- it had all been allocated. And that was the buzz. Why can't I get into it? We just couldn't accommodate everybody who wanted to.

Hollar: How did Betty handle the calls from the admiral?

Moore: I don't remember the details. **Moore:** She convinced him she wasn't the way to get an investment in the company, anyhow.

Hollar: Was it clear what the roles of the very first people-- you, Bob, Andy, others-- were going to be at the very, very beginning, Gordon?

Moore: It was clear, at the time. Bob and I were going to share management of the thing. He would be the CEO.

He naturally focused more on the external things. I naturally focused more on the internal things. At the time, we thought Andy would eventually be something like a head of R & D, but he got sidetracked along the way, someplace, and discovered big organizations were a lot of fun.

And I say he got over hisPh.D. And it took a management bent fairly early. But then the individuals we hired were, generally, for a specific task that we had to have done.

Hollar: What were the conversations like, at that point, Arthur, as everything was getting started? You had a very close relationship to Bob and Gordon in the beginning, didn't you-- as chairman? This was one of your very involved chairman--

Rock: Right.

Hollar: --roles. What were the initial conversations like that you were having?

Rock: Well, just what their needs were. I remember, distinctly, Andy didn't like the person who headed up sales-- marketing.

Moore: That was a real conflict.

Rock: Finally, Andy had his way. I don't remember, specifically, who wanted to keep him and who didn't feel he should be kept between Gordon and Bob.

Moore: That was a complicated deal. Andy and he didn't get along. But he and I went fishing together on my boat several times. So Bob very much appreciated-- while I was off on vacation, fired the marketing guy. It's about the most aggressive action I ever saw Bob take. So it really worked out well for me because I would have been in a tough spot having to do that if I were still there-- or if were there at the time.

Rock: But in any event, you asked about how I was involved or not involved. We then hired-- who was it we hired? For marketing-- head of marketing. Ed Gelbach.

He came up and interviewed with me. Bob and Gordon wanted to get an outside viewpoint and not make another mistake. So he came up and interviewed with me. He passed my muster, if you will. They hired a lawyer and he came up and interviewed with me. They just passed these things by me.

Hollar: I read, in John Wilson's book, that you would even sit-in on weekly staff meetings from time to time at Intel.

Rock: Yes.

Hollar: How was that process of working together as the early group?

Moore: Well, we just had meetings to view what was going on and see what else had to be done. I'm sure they were very technical, in the beginning.

Rock: My job was to ask questions. At least that's the way I saw my job.

Moore: You always asked good question, too.

Rock: Why you do this or wouldn't it be better to do it that way.

Hollar: Did he ask tough questions?

Moore: He asked good questions. That's been a long time ago. I can't tell you what any of them were.

Hollar: I read a comment from Andy that said, if you're into the company early, you understand the business at a special level. You understand it through your skin, which he contrasted with coming into the company later.

Moore: A start-up is a marvelous time to get the big picture. Things are simple enough at the beginning that somebody can see the whole operation. Before that, Andy had only had a technical job. In fact, I hired him right out of graduate school into the laboratory at Fairchild.

And he did a marvelous job with the physics of the devices we were doing. Clearly had a tremendous amount of talent. But he had never looked at the rest of the business. He hadn't got involved directly in product development. Certainly, not in marketing. Not the finance.

Starting with a small company, he could see all of those things. And in particular, he got entranced by the idea of manufacturing, where you had to do the same thing day after day to make a uniform product, something R & D people never appreciate. So I think that's what he was talking about. And for most of the people coming in at a significantly senior position, it gave him a chance to look across the whole company as it developed.

Now, that's a multi-faceted problem. You also see all the warts and wrinkles there are. Andy considered the start-up time as the most trying period in his life. He was afraid we were going to go bankrupt every week, I believe. I'm on the opposite side of the fence. To me it was as smooth a start-up as I could imagine. And Andy and I worked close together, so we sure saw it through different eyes.

Hollar: As you worked on the Goldilocks product strategy, what were the most important steps you had to take to begin to get it to scale, Gordon?

Moore: We had to get something that worked and made a product that a customer would buy. We took relatively simple products in the beginning. As I mentioned earlier, the two simple technologies-- the one that gave us our first product. And a month later, we had our first product with the silicon gate MOS. And that was the one that stuck.

But that was not a product sufficiently broad-based that we could really develop the company on it. But it was a start. Got our production line running. Got our technology shaken down. Then we went on to other things. The same with 1103 came fairly shortly after that, which was big enough to really let us get going.

Hollar: How did you pick your early customers?

Moore: Anybody who had wanted memory and who had the money in their pocket. Semiconductor memory was a new idea. It was not completely new. IBM had been using a type of it in their big computers. But it took a while to get people to believe that semiconductor memory was really going to be cheaper and more useful than core memories.

Hollar: That was a part of the business you were very familiar with, Arthur, because of your prior experience. How did you feel about that?

Rock: How did I feel about?

Hollar: The competitive market for--

Rock: Well, as I told you earlier it seemed as if there were going to be more computers, there would be more memory and electronic memories would not do it. There weren't enough people in Singapore or Hong Kong or-- I guess it was Hong Kong.

Hollar: How quickly did you have to start about the business of raising more capital?

Rock: I would guess the next round was around 1972.

Moore: I think it was a little earlier than that.

Rock: It could have been. We did a convertible debenture somewhere around there.

Fairbairn: Was that fund just general growth or was there a factory investment or some--

Moore: It was scaling up.

Rock: Just scaling.

Hollar: So the first 2 and 1/2 million dollars that you raised took you a pretty long way, it seems to me.

Rock: It took us to where we had a product-- something we could show.

Hollar: When did it become clear to you that your strategy was right and you seemed to be on the right track?

Moore: I never had any doubt. Really, we appreciated the fact that memory was important. The stuff we were making, people were actually buying. The technology was working, at least after a fashion. And it had a lot of improvement that it could still undergo. We were getting the traction we needed.

We started out saying that, in order to survive, we had to get to something like $25 million revenue in 5 years. We actually got to 63. We exceeded our initial goal of survival. That, clearly, let us think we were on a good path.

Hollar: I know Silicon Valley wasn't called "Silicon Valley" at that time, but how important do you think it was that you started the company here?

Moore: That's a hard question to answer. It was certainly significant in that a good portion of the talent we brought in came locally. It's a lot easier to recruit if the people are local. But we've hired people out of Texas Instruments. Other semiconductor companies had to move in just to get different views of the world and, also, not to raid the local companies too badly.

Hollar: And conversely, how important was it to the Valley, even at that early stage, that Intel was being built here?

Moore: Well, we were small. As a small company with 100 or 200 employees, you don't have a big impact on the Valley. At that time, Silicon Valley was a pretty big deal, already. Even though it wasn't called that.

Fairchild had become a company of something like $150 million annual sales, 30,000 employees worldwide. That may be understating it. Fairly significant. We were a little pipsqueak by comparison and one of about 20 companies starting up in roughly similar areas.

Hollar: We talked a bit about the compensation structure with Arthur, earlier, but I'd like to hear the two of you talk about the very pivotal decision to offer options to everyone within Intel. Can you talk a bit about what led to that and how you made that decision?

Moore: What led to it is this was the way we could hire the people we wanted. And it was a egalitarian kind of approach, I think. Something different than we had at Fairchild, certainly. How we arrived at the decision, I don't know. I'm sure we decided on or decided it was something we could afford to do. Arthur may have some recollection--

Rock: I said earlier, I could see if your memory is what I told them earlier. And that is that you and Bob and I were sitting around just chewing the fat, saying how hard it is to get new employees and that we couldn't afford the wages that some other companies were paying. The people-- we expected them to work harder than they did elsewhere. That's an understatement, I guess.

And one of us, and I think it was me, but that's not important, said why don't-- the option thing was-- on the east coast three or four top executives would get options and that was it. And at Scientific Data Systems, we gave options to a greater number of people than that. And that was the first time that was done. And I think it was to engineers only. But I'm not sure of that.

And then Bob and Gordon and I were sitting around and came up with the idea of offering options to everyone. And then the question came up, well, when would you give these options. And somehow or other, we came up with the idea of after an employee had been there a year. And that seemed to work. Do you have any different--

Moore: No, I don't have any real recollection of that.

Hollar: Was there a discussion at the board about this?

Rock: Obviously, when you're giving away stock, you have to get board approval. But there was some discussion. It didn't amount to anything, I can't imagine.

Hollar: And then what was the effect within the company on the employees?

Moore: Well, they made us a success. I don't know how much we can ascribe to that, specifically, but we did hire the people we needed. And things progressed reasonably well.

Hollar: Was there a first great leap forward? You mentioned, Gordon, how quickly you got to over $60 million in revenue. Was there a point at which suddenly it became clear this was really working from a revenue perspective?

Moore: It's a little hard to say that there was a particular point. Obviously, the product that really got us across the threshold was the 1103. We were able to make that in-- in those days you couldn't sell a semiconductor product if you were the only supplier. You had to have a second source-- for two reasons.

The one people stated was so if one source went down they'd still have a supply. And the unspoken one, that was why you get price competition. So we had to set up a second source for the 1103.

We partnered with MIL in Canada, and transferred the technology to them to set up their semiconductor operation to make 1103's. And they actually became better at it than we were. We were operating on 2 inch wafers. Their yields were above ours. We were sharing customers.

Then, we switched to 3 inch wafers. And that technology, we didn't have to transfer to them. And they knew how to run the 2 inch process very well. But they didn't know how to make the changes. And they kind of collapsed.

So they were the ideal second source. They were there when we were getting the customers committed. And then they couldn't deliver when the volume demands came along. Now that was not a planned strategy. But serendipity can really help in this business.

Hollar: There are many other things we could talk about in the early days, but I want to skip forward to one final section, which was the decision to pivot from memories to microprocessors. And just talk a bit, if you could, Gordon, about what led to that-- what the process was internally for making that decision. Arthur, I'd love to get your recollections about all that, too.

Moore: This happened significantly later than the startup, of course. We were making microprocessors and a couple of different kinds of memories. And in the DRAM business, in particular-- dynamic random-access memory-- the Japanese had become very strong competitors.

And our market share, which had been very high in the 1103 days, had dropped precipitously. We kind of stubbed our toe on one of the generations of memories and were not really competitive for a while. And the Japanese started selling a higher quality product. And all of a sudden, the memory business was getting less and less attractive.

We did the development for the next generation at a very nice 1 megabit DRAM, which would have gotten us back in the leadership position. And we looked at what it would take to get us there. We would have had to devote two fab areas to it. Fabs, in those days, were $300 or $400 million.

And here, all the participants in the memory business were losing money, selling them, essentially, below total cost. And we looked at the possibility of making a several hundred million dollar investment for a business that didn't have any profitability. And it wasn't very attractive.

And that's when that famous discussion between Andy me, presumably, occurred, where he said, if you were coming in to run this company from the outside, what would you do. And I presumably answered, get out of the memory business. But to me the return just didn't justify making the required investment.

We probably developed one more generation than we should have. We had a good product, but we never put it into production. But fortunately, we had the microprocessor to fall back on. That was a business that was developing quite rapidly, at the time.

Now, we didn't get out of all the memories. We got out of DRAM's. But we stayed in the EPROM business-- the erasable programmable read only memory-- which was really a golden goose for us. It was a product that the outside world didn't recognize how important it was.

But it was a major generator of profits for us. And that continued until the Japanese finally got into the EPROM business and the price fell 90% in nine months. And even the semiconductor industry can't follow costs down that fast. So that got us pretty well out of the EPROM business, also.

But in the meantime, we developed a very nice microprocessor business. And the fact that we got out of the memory business freed up a lot of development capability that then got applied in the direction of microprocessor-like products. And it was really fortuitous, again, that we were able to focus on the right technology for that.

The memory and the microprocessor technologies were tending to separate. And they've separated more since then. So we were very happy to have the extra resources.

Hollar: Arthur, what was your recollection about all that?

Rock: Nothing to add to what Gordon said, but I got to tell you, it was probably the greatest decision any management has ever made-- to layoff a third of employees and close plants and go just into the computer business. I don't know of any other management that has ever made a decision of that magnitude which cost them that much and turned out to be the right decision. I just am in awe of that decision almost every day I think about it.

Fairbairn: Was there a lot of debate or was it--

Rock: No, it was obvious.

Fairbairn: It was obvious what you need to do?

Rock: There's nothing else to do. But still, to do it. To lay off a third of your employees-- Jesus.

Hollar: You talked earlier, when we were talking one on one, about intellectual honesty and finding a management team that would know when they were kidding themselves and when they weren't. Is that the kind of example you--

Rock: Exactly. Exactly. And that was strictly Gordon and Andy.

Hollar: I want to skip back one step before we finish up and ask you about when was it clear that it was time to take Intel public? And how'd you make that decision?

Rock: When it appeared that that would be the cheapest source of money.

Hollar: How much financing had you gone through-- how many rounds up to that point?

Rock: I think there were-- do you remember if IBM came in while we were still--

Moore: No, that was much later.

Rock: No, I think there was only the one round.

Moore: I think there were two.

Rock: There could be.

Moore: Fayez [Sarofim] did one. And remember we were going to go public and he said he could do as well.

Rock: That's right. That's right. There were two rounds. I'd forgotten.

Moore: We got close enough that we did a seven for four stock split to get the price down where we wanted it.

Hollar: Well, this has been great. Thank you very, very much. I really appreciate both of you taking the time to do this.

END OF INTERIEW