

Bill Regitz 1999 Interview

intelalumni



MEMORY LANE

Bill Regitz 1999 interview by Rachel Stewart at Intel in Oregon.

Good morning, this is Rachel Stewart. We're conducting an interview this morning with Bill Regitz at the Intel Oregon site. Good morning, Bill.

REGITZ: Good morning, Rachel.

STEWART: I'd like to start by asking you some questions about your background, where were you born and raised?

REGITZ: I was born and raised in a little coal-mining town in Pennsylvania called Locust Dale, Pennsylvania. My father was a coal miner

STEWART: Did you come from a large family, small family?

REGITZ: Oh, it was a large family, my mother and father had six children. I was number four in line relatively poor family

STEWART: Any particular early interests while you were growing up?

REGITZ: Early interests growing up, I remember I wanted to be a policeman, an airplane pilot in the Air Force. My brother went into the Marines I think at one time I wanted to be in the Marines

STEWART: Any early jobs?

REGITZ: There were many early jobs. We were relatively poor, and so, if I wanted anything, I had to work for it. I delivered newspapers, cut grass and cleaned the local garage every Saturday. My brother and I made wooden objects that we sold around the town.

STEWART: Toys, or?

REGITZ: No, it was a fence that we made to go around a Christmas platform where you set up a train and stuff with a little village underneath the Christmas tree. We also made broom holders, and those kinds of things...

STEWART: Let's talk about schooling, high school You attended high school there in Pennsylvania?

REGITZ: Yeah, I did attend high school in Pennsylvania I actually went the first three grades in the town I was born in, Locust Dale Then they consolidated the school system and I went to a town called Centralia, not too far away, for grades three through eight For high school, nine



through twelve, I went to another town a little further away from home, called Arists.

STEWART: Did you have any particular favorite courses or teachers that you had in high school?

REGITZ: My mother and father never graduate from high school, and their goal was to have all their kids graduate from high school with an emphasis on the academic courses I always enjoyed math and the science, and I spent a lot of time in the wood and metal shop.

STEWART: Coming from a poor town were you able to go to college?



REGITZ: My father died when I was 15 and my mother didn't have very much money I didn't think there was going to be an opportunity to go to college. My last job in high school was cooking burgers and washing dishes at the Boulevard Drive-in. I worked the summer after high school graduation at the Boulevard Drive-in and then went to live with my sister in New Jersey I got a job in a plastic factory, working graveyard and later went to work at a GM roller bearing plant My job there was running a press stamping the numbers on the bearings They went through a downturn in early '58 and I was laid off I was out of work for not quite a year; maybe nine months, just couldn't find work Then my brother, who was a carpenter, got me a job as a construction laborer building a high school I was out in the middle of a field one day digging a ditch, thinking this isn't the way it's going to be for me the rest of my life There was a school called the DeVry Technical Institute that had sent me some information in the mail. I made an appointment with the salesman who asked me if I liked math & science These were my best classes in high school This helped me make up my mind at that time to go to DeVry My mother said she would pay for the tuition, but I had to pay for my living quarters and food So, I went to DeVry Technical School in Chicago, but about halfway through school my Mother ran out of money Fortunately, my Aunt Margie paid the tuition for the remaining time at DeVry.

STEWART: Any particular teachers or things that stand out from your experience there?

REGITZ: There wasn't any particular teacher that stands out, either in high school or in college. I always had good grades in high school and the teachers were definitely encouraging me to go on to college. I couldn't see a way that that would happen, because I didn't see where the money would come from. So, I didn't set college as one of my goals When the opportunities came up to go to DeVry for just two years, with my Mother paying the tuition and me working to pay for food and housing, it seemed like the right thing to do.

When I was going to DeVry, clearly the number one places to go to work were Sandia Corporation and Bell Telephone Labs. These were the companies where all the top students went to work The other company I considered was in the Northwest, Boeing, because it sounded like a great place to live.

Another thing I remember while going to school was that all my classes were associated with vacuum tubes except that I had one class in the last six weeks of school on transistors. So, it was kind of funny, I knew I didn't want to go to work for a company that developed military products with vacuum tubes. I wanted to work for a company developing commercial products. I ended up

going to Bell Labs. I didn't get a job offer from Sandia for whatever reason, and I turned one down from Boeing, because the second-best place to go to work was at Bell Labs.

STEWART: Where was that located?

REGITZ: I went to work in Murray Hill, New Jersey. Shortly after I started, they moved me down to a place called Holmdel, New Jersey. Going to work for Bell Labs was a very good decision because all the engineers that I worked with came out of great schools with very good grades in the 3.5, 3.9, 4.0 region. They also were able to get their master's degree with time off, while still collecting their paychecks. That always seemed like a good deal to me. They convinced me to go get my bachelor's degree at night, and about a year later; I went back to school to get my degree at Monmouth College in West Long Branch, New Jersey. I chose this College because it was not too far from Holmdel and my home. It would take me about six or seven years to graduate. My goal at that time was to become a member of the technical staff of Bell Labs and get a paid year off to get my master's degree. I got married when I was in the technical school and ended up with four children shortly thereafter. It took a lot of work and diligence to support my family, work and go to school.

STEWART: What were some of the things that you worked on at Bell Labs?

REGITZ: I was assigned to the memory development team. I've always worked in memory. I worked on the ESS101 time division switching system. It was the first all transistor Electronic Switching Systems where you would have multiple people on the same line with private lines. The department I worked in developed the temporary memories using a technology called Ferrite Sheet Memory. This technology uses a sheet of ferrite about an inch square with a 16x16 array of holes that effectively forms 256 cores per sheet. One of the four wires needed to access each core was plated onto the Ferrite Sheet. They would stack these sheets up to form 1k or 2kx8 bit memory modules. This is very small compared to DRAM semiconductor chips today. My initial assignment was as a technician assigned to the Engineer developing the sense amplifier. Its function was to detect if a one or zero was stored in the selected location in memory. I ended up getting three or four patents from Bell Labs in the technology of linear amplification and voltage regulation.

STEWART: How long did you stay at Bell Labs?

REGITZ: I made a very quick transition through the technician ranks to Associate Member of the Technical Staff, AMTS. It's a cut below the Member of Technical Staff, MTS. One could be pigeonholed at the AMTS level without getting the master's degree. They were very degree oriented. One could see that if you didn't have the degree, the job assignments would be very limited. As a result, I set my goal to be an MTS after graduation from Monmouth College. My grade point average of 3.5 was enough, and with the patents to my name, I was sure I would get offered the position. I can still remember the day when Johnny Johansson called me into his office. He was my department manager, about three levels of management above me. He informed me that I had not been accepted into the MTS program. I was shocked and remember my words were not too nice as I got up and slammed the door as I left. I made my mind up I was going to leave Bell Labs, complete the final semester at Monmouth College and go to IBM. I wanted to continue working in memory, because I had good background and a number of patents to my credit.

I remember setting up my interviews through school. Jobs were in relatively good supply and I interviewed with Ford Motor Company, Honeywell, DEC, Data General and last but not least two days at IBM. I wanted to be well prepared by the time I got there. I got offers from all interviews including the one I wanted from IBM. I decided that if I went to IBM, I would again be around all the Ph.D. people in an environment similar to Bell Labs. I decided to go to work at Honeywell in core memory design because it was commercial and in the computer industry.

About six months after I started at Honeywell, a man named Bill Jordan was pursuing Honeywell to set up a semiconductor memory design development group. One day in a very large department meeting, he got his wish and funding of one additional person, me. We looked at each other and were surprised because neither one of us knew anything about it. I didn't know him, and he didn't know me very well. It was just the two of us. He explained to me that there were two basic semiconductor technologies, bipolar & MOS. He asked me which one I wanted to focus on. He told me that he has been messing around with bipolar because he worked with TI on the development of integrated drivers for core memories, I said to him, "Why don't you continue with bipolar and I will focus on MOS". So that's the way we divided up the workload. A number of months later, I developed a proposal to develop a 512-bit MOS memory chip. We got the project approved and funded by Honeywell to support the development of the product at five or six different semiconductor companies. I was the program manager. We took the proposal out to companies like AMS, Motorola, Fairchild, Motorola, AMI, TI and a little start up named Intel. I went to work at Honeywell in '67, and Intel was formed in '68, so it was shortly after Intel was formed, we talked to them about developing this 512-bit semiconductor memory. We ended up selecting Intel as one of the four or five suppliers of that chip. That's how I first started working with Intel; Bob Graham, Bob O'Hare, Les Vadasz and Joel Karp were the primary people that I dealt with as a customer. During this time, I made many trips from the East Coast to the West Coast visiting Intel and the other suppliers. Intel was the driving force to modify the proposal to a 1k-bit chip instead of a 512. They said the density was not aggressive enough.

STEWART: What product was this?

REGITZ: It was the 1102. It was a three-transistor cell approach to memory. Work that I had done and had applied for patents at Honeywell was the basis for the chip. Unbeknownst to me at the time, Intel was also developing another three-transistor cell memory product called the 1103 and both of them moved along in parallel. I was seeing data from only one of the two development programs. Intel made the decision sometime in early '71 to drop the 1102 and go into production with the 1103. I was disappointed but our larger goal was to set an industry standard, not develop a custom part for the sole use of Honeywell. We truly understood the power of buying standard parts and the economic impact on pricing. It was our belief that this would be the best way to convert the industry from core to semiconductor memory. I also set a goal early on in the development program to go to work for Intel. To me it was a matter of timing when that would work out.

STEWART: Why did you want to come to Intel?

REGITZ: Well, there were two things, One, I'd met with Bob Noyce, Gordon Moore, Andy Grove, Les Vadasz and Joel Karp due to the many reviews we held during the development phase. They all had excellent reputations and I had a great deal of respect for them. One of the things that really surprised me when I went to work for Honeywell, I would look around and see

only a small number of great engineers. At Bell Labs I worked with a large number of great engineers. Honeywell was the opposite of Bell Labs. I could see that Intel was lined up with a lot of great people, plus I enjoyed the working relationships. We had many, many technical discussions about what was right and wrong. I've always enjoyed those interchanges. I wasn't always right, and they weren't always right. From that activity, I had made up my mind that it was where I wanted to work. At Bell Labs, my goal was to get my degree, and as I said, become a member of the technical staff, which when I got my degree and did not get the technical staff position, I went to Honeywell. When I went to Honeywell, I continued my education, getting my master's degree at night, and I had only one year to go. I went to register at Northeastern in the Boston area, but all the classes I needed were full. They wouldn't even let me even sit-in on the classes. I remember driving away from there being really depressed that night, thinking I'm never going to make my goal. I made up my mind on the way home that's enough of school and I quit. I decided I'd get involved in the town - I'd join the Jaycees.

One of my other goals was to give a paper at the Solid-State Circuit Conference in Philadelphia. It was held every year and it was a key place to give technical papers. I knew I needed to improve my public speaking skills. The Jaycees gave me that opportunity. I started the Junior Miss Pageant event in Franklin, Massachusetts, then took on the VP position and the following year became President. I ended up leading the effort to convince the town to hire a recreational director. The Jaycees instituted a fair number of programs in Franklin and I got the practice I needed. I submitted my paper for the Solid-State Circuit Conference and got it accepted. It was a joint paper by Joel Karp and me given at the Solid-State Circuit Conference in 1970.

Right around that time Intel decided to make me an offer. My boss, Bill Jordan, met me at the Solid-State Circuit Conference. It was his job to talk me out of going to Intel. In the end, I talked him into joining me at Intel. When we left the conference, we agreed to put a business plan together to convince Intel to go into the memory systems business. We co-authored the plan and FAXED it to Bob Noyce. I remember lying in bed that night wondering whether he had received it. Lo and behold about 10:00 that night, I got a call from Bob Noyce saying he'd gotten the business plan and we talked about it. There were a series of meetings, but things kept getting bogged down. Intel wanted me to lead the DRAM development efforts and do whatever was necessary to get the 1103 into high volume production. On the other side, Jordan and I wanted to take on the 1103 efforts to development and sell memory system products. Anyway, it bogged down and I decided to go ahead and take the job DRAM position. About two weeks later, Jordan followed me to Intel to set up the first Intel, Memory System Division. And so that's how we ended up at Intel.

STEWART: Now we're up to describing your early positions at Intel.

REGITZ: My early positions at Intel; I came in as DRAM Department Manager. The department was made up of people like John Reed, Joel Karp, Dennis Logwood, Gene Greenwood, and Paul Metrovich. In today's terms the responsibilities not only included the design activities, but also included Test Engineering, Product Engineering, Technical Marketing support and any technical task that needed to be done to get Dynamic memories into high volume production.

STEWART: Did you produce the 1103? Were there any other products out of that group?

REGITZ: Well, it took a lot of time and energy to get the 1103 to production. The first job was to characterize the 1103, to define the specification to achieve high yields and define the correlation

factors to be able to test the parts in production on our homemade tester at room temperature. This effort was repeated to define a higher voltage and hence a higher speed part known as the 1103-1. It was a very sensitive part with respect to timing sequence and power supply noise. Sometimes, I wondered whether the damned thing really functioned. I visited many customers to help them work out system bugs and added test routines to Intel's production test to improve the overall system margins. Honeywell, Burroughs, DEC and ICL. I don't remember how many different customers I visited during the time, but it took up a significant portion of my time. At this same time Joel Karp was working on a 4k version of the dynamic memory and I took on designing an 1103A version, which was an upgrade version of the 1103. It was the only chip that I've really designed personally and put into production. So that was the initial job assignment coming into the company.

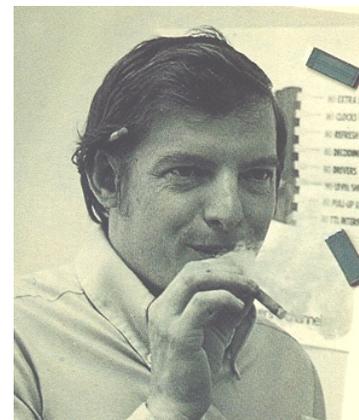
STEWART: What projects followed that one?

REGITZ: Those first two or three years the bulk of my time was spent on getting the 1103 up and running in production and in the customer application. It was a significant task. The 4k-DRAM that was being developed by Joel Karp was using the 1102 cell and was not going very well. At the same time other companies were developing 4k Drams using a single transistor cell. As a result, Intel decided to bring in Mike Geilhoufe supported by Sunlin Chou to development a 4k one-transistor product. My career took a little bit of change. My choices were either to be a project manager of a 4k part for use in Intel's Memory System's IBM add-on memory products or move over to manufacturing set up and run the newly formed Product Engineering group. In those days an engineer, going to manufacturing was really a bummer. So, I chose to lead the development effort to define and develop the 2105 4K DRAM. The inputs to the 2105 needed to be ECL compatible and as a result we filed a couple more patents. This was the last patent I received at Intel.

Intel was not able to convince someone else to fill the PE manager position. The work I led to get the 1103 into production impressed a lot of folks and I felt very good of my accomplishments and very much enjoyed the customer trips. In addition, it was clear to me that I was missing a lot of knowledge about semiconductor physics that Ph. D. Sunlin Chou clearly had. This data, coupled with Keith Thompson persistence, eventually convinced me to take the PE position.

STEWART: What kind of changes did you bring into the project engineering group?

REGITZ: Using my system training from Bell Labs and Honeywell, my first accomplishments at Intel was characterizing the 1103 and solving many customer problems which enabling the 1103 to achieve high volume production. That was followed by the development of the 1103A. I understood product engineering responsibilities, which were to own and resolve all the production and customer application issues since there was no real product engineering group and no technical marketing group, as we know it today. As a result, the PE's responsibilities were limited and not clearly defined. As I got into it, I could see that the broad PE responsibilities were preventing the design engineer's focus on the new stuff because the old stuff was very important and meant revenue for Intel. In product engineering the thing I accomplished was to formally establish



product engineering's responsibilities. This role of defining group responsibilities was kind of a foreign to me at the time. I wanted the product engineer to take on total responsibility for the product sometime during the development phase, about the time production builds began. I wanted the PE responsibility to include making design changes, spec changes, etc. to accommodate/resolve production and customer issues. The other responsibilities were to make sure they were responsible for yields, test flow, sort and final test programs and product cost. As a result, the PE became kind of a generalist in many tasks versus the engineer being highly skilled in design tasks. I worked hard with the design engineering and manufacturing managers to get those roles and responsibilities established. Once that was done, we were able to hire the appropriate people and take ownership of the activity.

STEWART: After your time with the product-engineering group, where did you go? What did you do after that?

REGITZ: After two to three years as PE manager, Intel was ready to break the sort & test-manufacturing group up into smaller groups. There was only one sort & test group, planning group and product engineering group supporting all Intel's products. These products included DRAM's, Static RAM's, EPROM's and Microprocessors. It was a very complicated product line. The manufacturing floor included sort and test. They were located on top of the second floor of Santa Clara II. What Intel decided to do was to establish three groups, DRAMs, EPROMs, and Microprocessors. George Schneer, Larry Regis, and myself were the chosen three manufacturing managers working for Gene Flath. I ended up as the manufacturing manager for DRAM's. I kept concentrating on DRAMs. We each were responsible for planning, PE, Test engineering, sort, test, Burn-in, mark & pack. We divided up the people, equipment and space. This was my first chance of being a manufacturing manager.

During these early years a couple other things happened. A good buddy who worked for me at Honeywell, Hank Bodio, came to work at Intel. Almost my entire design team from Honeywell had come to Intel and joined the Memory Systems Division, working for Bill Jordan. Another fellow that was working at Honeywell was Dave House. I recommended Dave to Ed Gelbach as a person to fill the Technical Marketing position he had established. Eventually House took the job. About a year after I took the DRAM manufacturing position, House went to working for Vadasz or Davidow, I can't remember anymore who was heading up Intel's Microprocessor activities. This left a Technical Marketing Manager position open in Jack Carsten's marketing organization. Jack asked me to fill this position. Just like I had a vision of what a manufacturing engineer was, I had a poor vision of what a marketing person was. I told him that they were the people who opened the doors for engineers. As I looked at it, I didn't want to be a marketing engineer I was enjoying what I was doing and I was successful, making good money, and being promoted. But, he was persistent like Keith Thompson and continued to pursue me. I thought about it and said, "Look, I've been in engineering, I've been in product engineering, I've been in manufacturing, well marketing is certainly going to round out my career with Intel". I took the job working for Jack as Technical Marketing Manager for all Intel products minus Microprocessors. I helped create a bunch of ads and tech notes while working for Jack. Jack's operating style was tough, but he definitely knew his stuff. About nine months into the assignment, Intel decided to form divisions.

STEWART: Can we go back a little bit? Which ads did you do?

REGITZ: I knew you were going to ask me that. We created whole bunch of ads for the introduction of 2k or 4k static RAM ads, and EPROM ads, and Telecom ads. I can still remember one with a racing car. I remember another one we did on EPROM, which was to show future price projects.

So, continuing on... After 9 or 10 months as Technical Marketing Manager, Intel formed divisions, and I was out of a job. I agreed with Jack and others that my marketing background wasn't as strong as the people who were selected to the marketing manager positions. I had to find a job or in today's terms I was redeployed. After exploring all the options, I accepted a position from my good buddy, Bill Jordan, over in Memory Systems. The assignment was as Design Engineering Manager working for Thor Lund. The division was having a lot of issues in manufacturing; so believe it or not, I proposed they form a product engineering organization. It was accepted and they asked me to head it up. As a result, I give myself credit for starting the systems product engineering organization underneath Jordan and Dave Pratt, who was the manufacturing manager. Again, this effort formed the basis and defined the roles and responsibilities of the system product engineering at Intel

A couple years later, they made the decision to move the memory systems operation (MSO) to Phoenix. I helped search for a temporary building on the north side where the Deer Valley plant was completed. I helped get the building ready for occupancy and helped organize the move. When the group moved, I stayed behind. I had no desire at all to go to Phoenix. So I was out of a job again, redeployed again, but we didn't called it redeployment in those days.

STEWART: They weren't as clever; you were just out of a job.

REGITZ: I was out of a job. I wasn't worried about my job at Intel. I never worried, it was just a matter of going and looking for a new one, which I did. I went to work for Phil Kaufman. However, the real job was actually working for Gene Flath who was running the Bubble Memories Division. The assignment was to define a series of system products to be designed, built and marketed by our Memory System Divisions This was somewhere in the 1977 timeframe, six or seven years after I started at Intel. I selected my office in the little bubble factory and proposed two products, the SBC254 which was the first SBC module that used four bubble memories and a "Plug-a-Bubble" Memory Module, using only one bubble memory module This product could be used in computers for industrial applications just like a floppy disk is used today to record data on today.

STEWART: So, what did you do next?

REGITZ: During this timeframe, the Memory Systems Division was really struggling. Bill Jordan left the company to do his own thing, and Bill McCalmont replaced him but left shortly after he arrived. The division was broken up and Tor Lund became one of two Memory System Operation GMs. The operation continued to struggle. I had always looked up to Gene Flath and as a result considered him my mentor. I shared with him my proposal/vision for the Memory System Operation that Tor was running. He suggested I take my plan to Grove. So I presented my plan to Grove on how to integrate the bubble system products into Tor's group and focus the division on only developing DRAM and Bubble Memory System products. The proposal was similar to the plan Jordan and I proposed back in 1970 before we joined Intel. I remember Grove calling me on my 40th birthday (he didn't know that) and offering me the job as General Manager of Memory Systems Operations, MSO. Of course, I accepted the job on the phone. I remember that after my first presentation to all the exempts

and non-exempts in MSO a couple of months after I took over, they all clapped, that made me feel good. We grew MSO's revenue 3x and took profits from negative to greater than 20%.

I was working for Ron Whittier at that time, who ran the Memory Products Division. He was located in Aloha Oregon and I worked in Sunnyvale California. Intel made the decision to get out of the memory component business as Japan Inc came online. As a result, Intel reorganized and combined MSO into another system division whose home had been in Deer Valley. I was purchasing more memory from NEC and others than most computers companies. This fact, coupled with the fact that the customer base was very different than those using our microprocessor and other system products, it was difficult to get any real attention from the Intel's Sale Force. So, I thought, why are we doing this? As a result, I drove the decision to shut down/sell off the product line. So now I helped create the original business plans, revived it, grew it into a profitable business, and then made the decision to shut it down. This task was a very emotional for me. I remember in 1982 being in the Sunnyvale High School auditorium telling 450 MSO employees that we were shutting down the operation and they would have to find a new job. This was in the middle of a bad depression in the Valley.

STEWART: Memory Systems was very close knit.

REGITZ: We were very close knit because we were the only group that occupied Sunnyvale I and II. As a matter of fact, twice a year we had outings at a Sunnyvale park, and they continue to have reunions. There's one this coming July.

STEWART: My first job at Intel, I've been with Intel 20 years in July, but my first job at Intel was as a temporary, and I worked for the technical writers in 1978.

REGITZ: In Memory Systems?

STEWART: In Memory Systems, I worked there for nine months I really wanted a permanent job but there didn't seem to be one, so I quit and then Intel brought me back to a job in Santa Clara. There was a big difference between the Santa Clara and the Sunnyvale work atmosphere.

REGITZ: Well, that's interesting. Shutting down Memory Systems was a very difficult and complex task. It was my baby! I hired a whole bunch of people who went on to different careers at Intel. I see a lot of people from the old MSO group in Oregon, Arizona, Folsom, and Santa Clara. I look back at it as a very difficult time. However, because we worked very hard at finding most people jobs, I received a lot of positive feedback from old MSO employees. They appreciated the effort and the outcome. I appreciated the positive feedback. Making that transition was very, very emotional for all MSO employees. To continue with that part of my career, I ended up selling a large percent of the Memory System business to a small start-up called Zitel. As a condition of sale, I became a member of the Board of Directors of Zitel and I've been there since In '97/'98, as a Zitel director, I influenced/drove the decision to scale back and sell off the product line The company that picked it up, just finally shut it down for good It's ended

STEWART: Where did you go after that?

REGITZ: What did I do after that? As before, I wasn't worried about getting a job assignment. I wanted to take my first sabbatical and then find a job. However, as I was getting

ready to go on sabbatical, there were two or three opportunities that came up. So I decided it might be a better if I made up my mind now versus taking my first sabbatical and then deciding. I decided to help Ted Jenkins out as manager of T4. This was back to the components world in a job very similar to my first manufacturing job years earlier. T4 was a piece of the original sort and test organization that was housed in Santa Clara II. T4 was however located in Santa Clara III at the time. Unfortunately, Ted had to wait twelve weeks until I got back from sabbatical.

Upon return from my sabbatical, I ask Ted, "Are you ready for me to start? I'm ready to go talk to people". He said, "Oh, I haven't done anything yet!" So about two or three weeks later, he finally got around to announcing my new job. As I found out later, the guy that was in the position prior to me wasn't very well like I remember my first meeting with John Rheinhardt, the production manager who is a big, burly, loud fellow about a foot taller than me and weighing maybe 50 pounds more, big guy. John walked into my office, "I want to let you know, I'm out of here as soon as I get a job, and I'm gone!" Then I talked to Joe Louie, who was the Product Engineering Manager who worked in my old product engineering organization and he wasn't too happy that he didn't get the job. So, I had two senior staff members that wanted to be someplace other than T4. At this time, Intel was just beginning to ramp the 8086/186, was introducing the 286 and the ethernet controller and the economy had recovered. I had just shut down MSO and T4 was busting at the seams and struggling. We couldn't deliver enough 8086's and production was not ready to take on the 286 and the Ethernet controller. We started to grow the equipment base, went to a 24x7 work force. We grew out of space in Santa Clara III and expanded into Santa Clara IV We didn't know where else to put the equipment, so we reopened Mountain View, Intel's first location and where I began my career. We installed big expensive Teradyne test machines along with lots of inventory in the building. One morning, John says, "Well, we had to cover the equipment up down in Mountain View with plastic last night". The roof was leaking on these expensive 1.5 million-dollar machines and all the wafers we had waiting to be sorted.

I don't remember how many J941s, probers and test handlers we had purchased. I think in the first six months on the job, I purchased more equipment than the sales of MSO the prior year, about 20 million bucks or something like that. It was an awful amount of money that we spent, and grew the organization's headcount about 4x, to well over 1,000 people. However, we did deliver a fair amount of product

About a year later, I developed plans to split T4 into two pieces. One piece was moved to Folsom California as T4 and became part of PCD. The other piece stayed in Santa Clara IV reporting into Microprocessor and became T12. I went to Folsom with Ted Jenkins.

STEWART: What kinds of things did you do in Folsom?

REGITZ: I did basically two jobs in Folsom. The first was General Manager of the ethernet product line; Data Communication Operation and I also managed the Design Center in Israel. We introduced the 80588 Ethernet controller and a number of other supporting products into the marketplace. We probably grew the business 3-4 times, but not quite to Intel's and my expectations. Ron Grindstaff was running T4 at the time, Ted Jenkins moved over to run EPOMS and Paul Otellini was running PCD. Paul moved me over to run T4 in the 1988 timeframe and asked Ron to help out the new GM of DCO. This put me back into a manufacturing organization, T4.

STEWART: And how long were you there, in Folsom?

REGITZ: Probably nine to ten years. I started in March of '71 in Mountain View and I moved to Folsom in '85...

Continuing on with what I did in Folsom. In the 1986/'87, timeframe, Intel made the decision to transfer the sustaining product engineering responsibilities from the divisional test organizations to the high-volume test plants. In addition, the decision was made to move the Product Engineers out of the test organizations back to the divisions. This structure positioned the high-volume test plants to better support/resolve current issues and the divisions to focus on new products



By the time I became the T4 manager in 1989, the product ramps were so steep that the test plants would add testers and people during the ramp and then transferred the equipment to test as the product transferred to the high-volume production plant. It was close to impossible and expensive to install enough manufacturing capacity to handle the ramp. This two-stage start-up methodology was not very productive. I and some other test folks, with Craig Barrett's pushing/backing, established a plan to do direct start up in the high-volume manufacturing plants. JP Masbou was brought in to manage the project. As a result of this direct start-up strategy, we were able to significantly reduce the size of the Tx divisional test plants and focus their energy on new product development.

A couple of reorganization occurred in this time frame. First, Paul Otellini took on a new assignment working directly for Andy Grove. They move me under Conrad Wiederhold and later under Mike Fister. About a year later another reorg occurred and Albert Yu formed an Engineering Service Operation in MPG, headed up by Jamie Van Deven. This change allowed us to team up with T12 in Santa Clara and fostered better synergy with T12. All these changes improved our efficiency. As a result, we decided to reengineer our process to be effective for development versus production, significantly reduce headcount and equipment and retrain the workforce. The T4 staff did an excellent job in executing all planned actions. These actions resulted in two to three reductions in headcount, a staffing level driven by divisional headcount/projects, better focused organization and a sizeable savings to help improve Intel's bottom line. Finally, we changed the name of the organization from T4 to better reflect its new mission to Folsom Validation Center, FVC.

The final challenge for me came as plan 1996 was coming together. As usual with Intel around plan time, some additional organizational changes were made. ESO was reorganized and the pieces moved back into the MPG divisions they supported. My organization, FVC, was moved under John Coulter in MD6. At this time, FVC served 4 customers/masters, PCD, EUCD, Folsom Design Center and all Validation Centers as a central engineering resource. These diverse businesses had different sets of priorities, economics and reported into different Intel Groups. After my first 1/1 with John Coulter, I knew this structure was not going to work. When I came home that night and told my wife of my intentions, she said, "You will be out of a job." I agreed, but it was the right thing to do. So again, I drove the decision to break up the organization up by transferring the people and equipment into the appropriate divisions. As

usual, the FVC staff did an excellent job of developing the plans, dividing up the people and equipment, and executing the plans superbly.

REGITZ: I wanted something different to do I looked around and talked to a whole bunch of people I went to Oregon to talk with BC Ooi who was running Systems Manufacturing and he had a couple of opportunities He was building a system manufacturing plant in Dupont and there was this new OPSD's program called GI. It was Sony's first attempt at entering at the PC business. OPSD was designing the PC, System Manufacturing was building the PC for them and the volumes were quite high. BC wanted me to be a project leader to ensure that Materials and SM would not limit the product ramp and that we achieved Intel and Sony's quality expectations. I thought the project would be a good entrance back to the system side of the business and then move on up to Dupont into system manufacturing management. The GI project was a pretty good challenge You know, putting those little PC boxes together doesn't look like it ought to be that complicated, but try to get 20 some screws in the right holes without missing any and getting all the connections right. It was actually a pretty good challenge I came in with very clear goals. The development team that was set up between the marketing group, the design group, the materials and manufacturing groups, had their goals well understood. They had good agreements on what the quality and reliability goals were going to be, and they had agreement and approval to produce 1,000 PCs beforehand to prove out the quality levels, the design, the materials and the manufacturing process. Barb Jones and I were the manufacture coordinators. She and I led the manufacturing energy to bring this box into production. My background in quality, reliability, engineering and manufacturing, helped significantly in cementing the things that needed to happen to get the detailed qual plan defined, the supporting data reports in place, the material qualified, and I influenced how the production processes was designed. We ramped the product on schedule and in actual fact we hit manufacturing indicators, quality, and reliability goals we had committed to Intel management and Sony.

It was, however, time to move on. BC said, "Well, I have this other job I'd like you to do." This second Oregon assignment was similar; it was to ensure materials and system manufacturing would not limit the start-up of Slot 1 ramp and that we achieved the manufactures indicators and quality goals. This project was Intel's fist microprocessor product using the cartridge form factor. The project was a coordination job between boards, systems, materials and manufacturing groups, to get the Slot 1 up in production. Barb Jones went on and did something else. I took this one on by myself. The challenge was to get all those material pieces solidly qualified, connector qualified, the manufacturing processes certified and the product qualified. I did that for about a year, and again we hit the ramp and the quality goals.

STEWART: What to do next?

REGITZ: This little outfit called Mobile Modules was beginning to make a module called Baranof. It is a 2x3 printed circuit card using all surface mount devices and was one of the two form factors used to deliver the microprocessor to the Lap Top marketplace. BC Ooi wanted me to help out by improving the material quality, product quality level and manufacturing readiness to ensure that materials and systems manufacturing would not limit the product ramp and all quality goals were consistently met. My first two Oregon assignments were as an individual contributor as a Program Manager. Now I was being asked to manage people again. I didn't want to take on the manager role again, but I did with Jeff

Citta as co-manager of Mobile Module Manufacturing. The last year has been a very good year for us. We've ramped the Pentium II into production in '98. We went from almost 0 production in the beginning of the year to about two million modules a quarter in Q4. There were really big challenges to get the manufacturing lines in place and get the material qualified, process certified meeting all manufacturing and quality indicators. We were successful and definitely added money to our bottom line and EB in '98.

STEWART: Well, thank you

REGITZ: Yeah, I liked it, too

STEWART: How would you compare life at Intel today to what it was like in the early days, when you first joined?

REGITZ: Everybody asks me that question When I first came to Intel, there was a conference room about 9X20 with desks lined up in a row, one after another. I don't remember how many desks there were, but mine was right in the middle of one big office, because we were out of space in Mountain View at the time. My second office at Intel was a 12x12 office, private office with walls and doors in Santa Clara I. I actually never got into open office space until I moved to Folsom, which was 1985. In Sunnyvale, we had walled offices. I kept thinking about taking the walls down and going to open office, but it was too much money. My office was big in Sunnyvale. I shortened it and added a conference room at one end. Today I am again crunched into a little 6x9 office. We are in compressed space, so spacewise I think; it's just like it was in the beginning, it hasn't changed.

STEWART: We're out of space again.

REGITZ: We're out of space again. Other changes, besides from the space standpoint. We did a lot of communicating with Penang, in the product engineering, product planning etc. worlds. You'd come in the morning and there would be this pile of TWX paper, right? This little 8" stuff off of the Teletype, it would be laying there, and somebody would come in and sort through all that mess, break them all down and distribute them. About 2:00 we would see the TWX support people typing all of our return messages. We'd answer their questions as best we could for that day. Today, you're sitting at your desk talking to somebody in Penang or Israel and within seconds you can send them a report. You can really see the power of the computers we've developed. Another thing... we grown into a very large organization, and it takes a lot of committees to get stuff approved and ratified. Actually, I'm working in a small building, HT, which separates you from the "big company."

STEWART: It's like a small company day to day.

REGITZ: It's like a small company and a big company.

STEWART: Of all your positions, which would you consider to be your most rewarding and challenging?

REGITZ: They're all different and in their own ways were all rewarding and challenging. I look back over my career and I'm happy with what I have accomplished and impact on Intel and the memory industry. Certainly the 1103 work that I did got the most recognition in Intel's history books, in the Intel museum, and the technical magazines. I have a number of patents in my life here at Intel, Honeywell and Bell Labs. In each one of the jobs, I'd learn something

and try to carry the key learning's forward. For example, going over and setting up the product-engineering group I can see my impact. I sit in many meetings today and say, "Well, you know where that methodology came from." I started that back some time ago. Whether anybody recognizes me for doing that or not is another thing. Even though I shut down the Memory Systems Division, it was a very rewarding experience, especially to hear the positive comments today from those whose lives were affected. One of the things that Intel does very well is to startup and shut down business. As it turned out, by shutting down MSO I helped establish a BKM. Mobile Modules, which was just established a couple of years ago is planning to shut down. Today Intel has put in place a support structure to help managers do what is right to support our customers and help the staff continue on as productive Intel employees. They've put a lot of activities in place to support change I actually feel pretty good about it.

STEWART: To what or whom would you attribute your success at Intel?

REGITZ: To what or to whom?

STEWART: Yourself, someone else, something?

REGITZ: I do my best when I have a job where we have reached agreement on objectives and goals and then are given the freedom to get the job done. I saw this skill in Noyce and Moore many years ago. They allowed their people to get the job done as the saw fit. This style did not mean that they never spoke to you again There was always a good review system in place to ensure your plans and results were properly reviewed and there was ample time to receive their input and advice on how to improve your plans Sometimes the advice was conflicting. They held you accountable to sort out and decide on the best action plan.

When I look back, at the quality of the work, how people have grown, and the process we established and the material and product qualities we delivered, it is very rewarding. I get my highest levels of satisfaction by making sure we can deliver high quality to our customers. This is one thing I've always looked for in a job. I had some foolish thoughts of what a salesman and marketing person did, like open doors for engineers and take them to lunch. After one grows, you find out that's not quite true. I never wanted to get a Ph.D. degree because I always viewed those people as working in the back room on things that never actually got delivered to customers. Yes, the thing that turns me on the most is being able to deliver products to customers. So, I've had many opportunities to do this at Intel.

STEWART: Are there any Intel employees that have left a particular memorable impression on you?

REGITZ: Definitely Robert Noyce. I had many dinners with him and knew him fairly well. He and Gordon are really down to earth individuals. Gordon probably doesn't remember, but I have shared this story with a number of employees. I was coming back on a plane and as it turned out, Gordon was on the same plane. As we were talking, he asks, "Do you need a ride home?" "Yeah, I need a ride home." I did not have two cars in those days. So he gave me a ride Here's the Chairman of the Board giving me a ride, going out of his way to take me home It's hard turning him down Bob and Gordon were always a good role model and set a very good example of how things should get done I was in many meetings with Andy Grove. I was always amazed with his ability to ask the right question and tried to emulate this skill. Lately, a number of people have given me feedback that this is one of my strengths!

Gene Flath, I liked Gene, I considered him my best boss. He helped me a lot and was always encouraging. I still remember him saying, "Go ahead and talk to Grove about your ideas." Other individuals that I trusted for advice were Ron Whittier and Jerry Parker. These are some of the people that come to mind.

To think back in a little bit different direction, how many people I've hired that has done well at Intel. Tom Dunlap, we hired him as a Product Engineer. He was going to go to work for National if we did not pay for his tuition to get his legal degree. I eventually had to speak to Grove to get his OK to pay for Tom's tuition.

STEWART: Wow.

REGITZ: We also hired Dennis Carter, as a Marketing Manager in Memory Systems. Bill Holt... I was reading the other day he just became a V.P. Bill Holt we hired as a product engineer. I hired a lot of folks who have done very well at Intel.

STEWART: I have one more question about the future. What do you think the future holds for Intel in the semiconductor industry?

REGITZ: When I came, Intel wasn't even a public company. It has grown to be clearly the number one semiconductor supplier, with a large lead. I think that the current road map is extremely strong. Intel will continue to be number one. Intel has always had a golden egg. Its golden egg in the beginning was the 1103, followed by EPROM, followed by the microprocessor, and that one's been around for a long time. Now maybe its golden egg is manufacturing capacity and capability. It wasn't our strength a number of years ago, but certainly Parker and Barrett have really changed that. As long as Intel can continue to recognize that it needs to change, which it does very rapidly, shut things down and start new things up, I think it will continue to be successful. I've been here 28 years now, about to take my fourth sabbatical, and am still counting on that stock to double in the next several years. It doesn't look like it's crumbling to me. It looks like it's getting stronger.

STEWART: Thank you.

REGITZ: You're welcome.