Oral History of Monte M. Toole

Interviewed by:
Craig Addison

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Craig Addison: Could we start with the story of how you got into the semiconductor industry?

Monte M. Toole: I graduated UCLA in 1960 as an industrial engineer with a degree in Business Administration and decided after considering plastics, nuclear and electronics, [that] electronics had the greatest interest for me and therefore went to discuss with IBM the possibility of going to work for them which resulted in my going to work for them. I did that for a couple of years which, of course, was before the age of the PC and the mainframe computer instead, and learned what there was for me to learn at the time in mainframe computing.

Addison: What was your specific job at IBM?

Toole: At the time my title was systems analyst. However, as things evolved, I decided that IBM was too large and would require that I travel back east and spend a number of years actually in Poughkeepsie preparing for a sales career since IBM, as my training went on, decided to eliminate systems analyst in favor of sales. I, at the time, couldn't consider myself as a salesman so I went to work instead for a company in Hawthorne, California called Continental Device which made semiconductors. This was about the time that planar came to be a reality at Fairchild and this company Continental Device, did not make planar devices. They made anode connected devices. I worked for them initially as a systems analyst. They purchased an IBM computer which permitted the company to sign a contract with North American Aviation on the Atlas program. I then moved from systems analysis to quality control and reliability and after about a year and a half, two years I decided that I wanted to work for another company, a company called Fairchild Semiconductor.

Addison: Just going back to Continental Device, did they go out of business fairly quickly because they didn't adopt the planar process?

Toole: No, actually they sold out to Teledyne Semiconductor and followed the evolution including the conversion to planar through Teledyne.

Addison: How did you get connected with Fairchild?

Toole: I noticed that they were looking for a manager of quality control and since Continental Devices made diodes and Fairchild at the time in Marin County made diodes, it was a natural for me to apply to Marin County. An individual by the name of Fred Bialek at the time was plant manager and I went to work for Fred as a quality control manager.

Addison: At Fairchild did you have any involvement with the IC development because that was starting around that time?

Toole: Hadn't yet started actually. I had a meeting at Mountain View and I arrived early for the meeting, bumped into Bob Noyce, sat down and talked to him. Had a coffee with him in the cafeteria at the time and Bob was then just getting going on MOS structures which in turn led him to ICs. I actually learned something that day from Bob and that was I asked him why Fairchild had recently at that time dropped its prices on standard devices by a factor of 100, dropping $100 devices to $1 which struck me as being very

non-business-like. Bob pointed out that it was very business-like because any potential competitor to those genre of devices would be sworn away from them and as the company that initially introduced devices they [Fairchild] would reduce prices to a point of controlling the market…really to establish whatever price arrangement it wanted.

Addison: Can you talk about your career progression at Fairchild?

Toole: I took on both quality and reliability at Fairchild. We did quite a bit of reliability testing. It was in the days [when] some 80 percent or more of semiconductor device sales were made through the Department of Defense which was a lesson in itself…the technology industry got developed because of the defense needs of the country. In any case, I built the device testing lab and I spent a fair amount of my time becoming involved in both the Department of Defense and NASA. We did a great deal of our work for NASA. We provided the [Fairchild diode] plant with some 30 percent of its revenue and almost 70 percent of its profitability through the lab.

Addison: Were there any non-defense customers at that stage?

Toole: There were. In particular I remember Burroughs and Honeywell both of which I worked with directly, and IBM for that matter.

Addison: What were the yields like in those days?

Toole: Yields were very high, 90-plus percent typically. Very high, but these were for well-established devices. Well-established could mean a year, three years, considering the rapidity of the progress of technology.

Addison: How long did you stay in the diode operation?

Toole: I left diodes in 1968, about 5 to 6 years.

Addison: And why did you decide to leave Fairchild?

Toole: In fairness to Fairchild and anyone else, when I was in my 20s, I had decided that I eventually wanted to be my own businessman, not work for a larger company. On the other hand, I decided to also gain some experience working for other companies before doing that so I could look out for the mistakes that would be made and my experiences at IBM initially and subsequently Fairchild were invaluable in terms of what success I've had as an entrepreneur. So becoming an entrepreneur in '68 was just part of my overall profession planning.

Addison: Before we move on to there, what lessons did you learn at Fairchild that you later applied to your own company?

Toole: Let me start with IBM which taught me something about the value of paternalism. Those people that may have an understanding of IBM's growth are aware of the fact that [Thomas J.] Watson started the company, passed it on to his son and set up a procedure of concern for individual development of its

employees -- almost like a large family that became larger and larger as time progressed. So paternalism was the first thing I learned.

Addison: You are saying that was good or bad?

Toole: That was good. It has its drawbacks but it's something I employed when I developed my company. At Fairchild there was a little bit of that as well. The interest in building a plant in Marin County was not because of the water or manpower, both of which at one point or another became a problem for us, but instead Bob Noyce's parents lived in Marin County for that time, so that's how it started.

Addison: How important was the diode operation to Fairchild?

Toole: It was significant, in particular in relation to profitability. I remember Gordon Moore coming to speak at one time and initiating his talk with, "I want to thank you for your hard work and efforts on our behalf. The success that we take out of every dollar you sell of diodes that we use in developing more advanced devices comes without a direct reward to you."

Addison: Talking about the other devices was the Fairchild planar IC big news or it just happened very slowly?

Toole: A little of both. It happened slowly because working for Fairchild [we knew] the development plans or what was going on in development at Mountain View. But the sudden [news] was the very dramatic drop in price that I mentioned earlier which made the use of the IC very instantly popular.

Addison: What about the equipment you used to manufacture and test the diodes? Was that made in-house or bought from outside?

Toole: Typically it was made inside and not very sophisticated equipment. The object, of course, was to provide the process of making a semiconductor. In other words, the equipment didn't have an end of its own. Its only interest was in supplying semiconductor manufacturing.

Addison: So it was relatively simple equipment?

Toole: Mostly. It had something to do with the cleaning of wafers. At the time, what was common was to put a wafer in mixture of acids, which we called witch's brew, because it smoked. It included nitric acid and sulfuric acid, and a number of other acids that would literally fume a lot and the fume scrubbers going outside would have to be upgraded every couple of weeks because the acids would eat them up. And the acids themselves would be contaminated, so instead of cleaning the wafers often they'd leave a deposit of their own. So one of the other things that we came up with subsequently in the equipment business was a plasma system which uses innervated gases, that is running like nitrous oxide through a RF field to break apart the gases, energize the oxygen and that would combine with the carbons in the residues that were left in the silicon and take it out of the system in the form of water, H_20. It was infinitely cleaner, and also didn't disturb the EPA [Environmental Protection Agency] which then was becoming a factor in production.

Addison: So this plasma system cleaned the wafers and that was designed in-house at Fairchild?

Toole: No, that didn't come from Fairchild. It came out of a company called Tracer Lab.

Addison: Dick Bersin's company?

Toole: Yes. As a matter of fact, when I left Fairchild in '68 to set up my own company, which at that time was a manufacturer's rep company, Dick Bersin had a company called International Plasma [Corporation] and I think in terms of contribution to the industry…my greatest contribution was persuading people to switch over to plasma instead of gases. So I became the first sales outlet for International Plasma [IPC].

Addison: OK, can we talk about why and how you set your own company?

Toole: I mentioned that in my 20s I decided to set my own company up and by this time I had already worked for a large company, IBM, and then with Fairchild we started with 150 employees in diodes. I left and there was almost 1,500. They had begun to manufacture LSI devices.

Addison: So this had been a long-term plan of yours. Why did you choose a manufacturer's rep in particular?

Toole: I had always had a disparaging attitude towards sales people. In terms of work, the title of "sales" was about the lowest form I could think of. I subsequently changed my attitude but at that time I still had that feeling, so going in as a manufacturer's rep was a challenge in itself for me, if nothing more than just the acquisition of the title on my shirt.

Addison: But that wasn't really your skill set. You were QA or a system analyst?

Toole: Correct.

Addison: So how did you adjust to the new role? Did you just hire people to do the selling?

Toole: No. During my stay as quality assurance manager [at Fairchild] I did make [sales] calls often. As an example, with Jerry Sanders at some of the Southern California companies, Autonetics in particular, North American Northrup, etc., and with John Reddy, who was marketing at the time at the diode plant.

Addison: So you went out with the sales guys a lot and learned.

Toole: Yes, learned what it meant to sell semiconductors at least.

Addison: You said you went to the defense companies. I guess reliability was the main concern? They weren't necessarily concerned with the cost.

Toole: Exactly. When I was at Continental Device we had a problem. The alloy device that we made was taking a gold ball in connecting the anode to the chip… wire to a chip through a gold ball [which] at that time was the best conductor. And we'd have to put that in a completed device through a high temperature

furnace for some period of time to age them. If they weren't aged properly, you'd end up with the gold flaking, becoming pulverized, actually falling apart. I'd left Continental Device to start with Fairchild and during that time we had an accident in space with one of the computers. Their initial reaction was that there was just that problem. In other words, the gold had shorted the device. It turned out that was not the problem.

Addison: So there was a lot of pressure from the defense contractors for ultra reliable devices.

Toole: Yes. And my first thought when I left Fairchild was to set up a commercial reliability test lab and make it available to any sales and semiconductor houses but I decided not to and instead went into a general sales situation.

Addison: So let's talk a little bit about this rep firm. What did you call it?

Toole: Monte Toole and Associates.

Addison: How did you decide what companies you wanted to represent?

Toole: I had worked for a company called Apogee Chemical which made silicon tetrachloride which you use for growing epitaxy as well as hydrogen chloride for cleaning devices and silane for growing silicon devices.

Addison: Mike McNeilly [founder of Applied Materials] was at Apogee.

Toole: Yes, exactly. He was my predecessor at Apogee Chemical.

Addison: So you worked for Apogee after Fairchild?

Toole: Correct.

Addison: How long were you there?

Toole: A very short time. I think probably six months. When I left them, I took it with me as their rep. One of the key players there knew Dick Bersin and knew the work he was doing with plasma. He introduced me to Dick and I then picked up IPC as one of my principles.

Addison: Did you know much about these products that you were repping?

Toole: No, I was learning, which was part of the appeal to that field of endeavor. It gave me an opportunity to learn other areas that otherwise I would have no reason to gain experience in.

Addison: You said before you were persuading the industry about the benefits of plasma technology. Was that a difficult task, because I know Steve Irving [of IPC] tells a story that he went out to talk about plasma and people thought he was in the medical industry because that's where it was used.

[Editor's Note: Steve Irving passed away April 9, 2007].

Toole: Sure. Steve, by the way, was one of my first customers with plasma. Typical of Steve, rather than purchase a system, he purchased components and put them together in his fashion.

Addison: When he was at Signetics?

Toole: Yes.

Addison: How did you convince the device makers to buy these plasma cleaning systems?

Toole: Two ways. One, actually running comparative tests between chemical and plasma and secondly, the threat of EPA which then was making noises in the industry about shutting down the industry because of their use of toxics, you know arsenic and boron, a lot of acids…phosphene.

Addison: Besides IPC and Apogee Chemical, were there any other lines that you represented?

Toole: For a short period Emulsitone which made a spin-on dopant, but it didn't take. I think that's it.

Addison: And that was enough to make a living?

Toole: I made a lot of money. I made more money per year the two years that I had IPC as a rep…than I made until the one or two years before I sold my company, GaSonics.

Addison: IPC wasn't set up to sell its own equipment directly?

Toole: They did then. It's typical of manufacturer's rep…one of the problems. If you are successful, they will fire you because they need more money to sell directly, plus it's a branding situation which is what the case was with IPC and, as a matter of fact, Steve [Irving] is one of the people that advised them to get rid of me. He told me this directly. There's nothing personal involved in it. He admitted in retrospect it was probably the wrong advice in terms of overall sales.

Addison: When IPC took the business away, what did you do?

Toole: One of the lines that I picked up was Atomel [which] made a pinhole detector that highlighted defects in oxides using an electrolysis process. Next came GaSonics. I named it. One of the things that I ran into in the field is that companies, including Fairchild, were growing oxides on semiconductors by taking a Pyrex dish, and feeding DI water through it into, I think they call it the Flasher. It's a piece of, at that time, probably eight quarts of Pyrex which broke the water up into its constituents, specifically hydrogen and oxygen, and ran it through a furnace and drew the silicon oxide. The problem with doing it that way is Pyrex itself contains a lot of sodium which is a killer for semiconductors and the whole operation was uncontrollable from a cleanliness point-of-view which didn't matter in the initial stages of semiconductors, but eventually it became abhorrent.

Addison: So this GaSonics equipment solved that problem?

Toole: Yes.

Addison: Who developed this technology originally?

Toole: An individual I had worked with…he came out of Raytheon. Bud Maxwell was his name.

Addison: And he developed that for Raytheon or on his own?

Toole: Kind of on his own. I sold for him and then he asked if I would participate with him in the company so we became partners. I continued to sell; he continued to manufacture. Eventually it turned out that he wasn't ready to start as an independent employee or entrepreneur. He literally vanished. I was in Europe making sales to the European market and when I got back there was a pot of coffee on the burner, the phone with 25 unanswered messages, most of them coming from Hewlett-Packard, saying "when are we getting our equipment?" A few of them coming from others…and Bud Maxwell had literally disappeared. He turned up eventually over at Fairchild…his brother was head of a technology group at Fairchild, so he went to work for his brother. So I bought him out. So that put me in the gas control business. I brought in a guy named Bob Champagne who was with me for 20 years as head of operations.

Addison: So the name of the system was GaSonics, but what did it do exactly?

Toole: We were trying to provide clean oxygen and hydrogen to combine with the silicon to make silicon dioxide.

Addison: So the equipment was for growing silicon oxide on the wafer.

MT: Exactly.

Addison: What was it about this system that Bud Maxwell developed that was more advanced than anything else?

Toole: One of the concerns was that gas flow was typically using rotometers that had terrible repeatability and could not effectively maintain the ratios to combine hydrogen and oxygen to create steam. If we were able to maintain a 2-to-1 ratio of upstream pressure to downstream pressure of the gases, it created sonic velocity of the gas making it very repeatable. This allowed the gas to flow at sonic velocity, therefore the name of the company GaSonics. The steam that was created significantly improved the quality of the oxide growth helping to enable MOS devices. What existed before was the use of flow raters, which were very crude in comparison.

Addison: Did the device makers immediately recognize the benefits of this?

Toole: We managed to get most semiconductor manufacturers to convert to the use of our controllers.

Addison: Was that on the east and west coast?

Toole: Both. When I started to rep, for selfish reasons I decided to take on the work, so one of my first visits was with Siemens in Germany, Philips in Holland, Hitachi in Japan.

Addison: How did you approach the European market? You were looking for a rep to sell for you?

Toole: Actually, I had a rep in England who was covering Europe at the time and I made the rounds with him.

Addison: Did Europe eventually become a big market?

Toole: I'll tell you a little story. I had an office…I guess they call them incubators, a small plant, probably a total of 1,500 feet -- 1,000 feet in manufacturing and 500 feet in offices. I had one of these on Old Middlefield Way in Mountain View [California], and moving from a different space from Mountain View to Old Mountain View. I knew Harry Sello from that time and Harry was Fairchild's patent representative. What he would do is license Fairchild's manufacturing processes to other manufacturers…and he was working with Philips at the time. The purchasing manager from Philips was visiting him and I had talked to Harry about what I was doing and Harry said, "Why don't you have these guys over? You should get them in to see what you are doing." So I said, "Fine, bring them in. I'll make arrangements to bring them to my plant." He said, "Great. I'll tell them that's a good idea. They can learn." So we made a date. They were to arrive at 2:00 or 3:00 in the afternoon…you'd walk in and there would be a reception area which also served as offices and that's the 500 feet…then in back would be the manufacturing space. So I had two or three chairs, put them in the offices and right on time they came in. It turned out to be the purchasing manager from Philips. Philips, of course, is a multibillion dollar company in manufacturing. There was a group of five and I had three chairs. In selling to Philips, as was the case with most larger companies, they needed the feeling of stability. They wanted to know if they placed a larger order with you, you could deliver in a reasonable time, so I'm afraid that first visit didn't come over very well.

But I had an opportunity later to visit them at their plant in Nijmegen and it was very different. Here I am a vendor, a supplier. Came in and they had a breakfast table set up, gorgeous breakfast. Everything you could think of and I was a cigar smoker and after breakfast they put out a huge box of a variety of cigars to choose from and some alcohol. We learned something about selling in Europe. I was very flattered by the treatment that I received from them. So I sold Philips. I sold Siemens their first systems.

Addison: You also talked about Hitachi. Do you have any stories of going to Japan and trying to sell to those guys?

Toole: The first machine I sold to Japan was to Hitachi. But I never made any headway with gas control systems. I did make headway with IPC when I first took that company over, but in the meantime I also developed and patented a product called the HIPOX which was an acronym for "high pressure oxidation."

One of the physics peculiarities in the processing of the semiconductor is that you often need to work at higher temperatures for long periods of time to grow the oxide as thick as you may need to from a resistance, non-conductive layer. When they began to work at 1,200 degrees centigrade as a norm for growing oxide you would have to be in the furnace for 10 to 15 minutes at that temperature and what they found is that the high temperature moved the junctions around too much. Going to high pressure is a

tradeoff…an exact tradeoff of time and temperature and pressure. As you increase the pressure, you could reduce the time to oxide growth or the temperature or both and you work it out on a formula basis. This enabled the customer to reduce their device geometries as the underlying dopants would not spread out as much. Most customers dropped their temperature from 1,200 to 900 degrees centigrade which put them into a completely safe zone in terms of more dopant movement. This also had another benefit of reducing the silicon defects which to some manufacturers made the difference of being able to [increase] yield from their devices to above 90 percent.

So Hitachi was my first customer for this machine in Japan and I learned a lot about their way of doing business at the time. I had a distributor who sold the machine to Hitachi and I received payment for the machine. It turns out that Hitachi didn't pay my distributor until a year after they had the machine. This was, at the time at least, a normal way of doing business. Now, to be fair to Hitachi [although] they didn't pay them for a year, when they paid them, they paid that plus interest which was not an unfair way of doing it.

Addison: There are many stories about the Japanese device makers not wanting to buy from non-Japanese suppliers. Did you face that?

Toole: Not really. One of the things that I'm very proud of is that we had a distributor in Japan by the name of Kisco which was in the chemical industry throughout Asia, but they got into semiconductors and they were selling equipment and scientific measure equipment for a while, including ours. They also began to manufacture a unit for growing a surface on silicon for [display] panels like television or more popular computer panels and there was a small company there that Kisco had organized and run for a while and we bought this company. It took us a year, two years and it was real coup. We were the first American company permitted to buy a Japanese company. The point of that is I started to visit Japan in 1966 for a number of reasons but including as a QA manager for Fairchild. We began to buy diode parts in Japan and between '66 and let's say '86, [so for] 20 years I visited Japan at least two or three times a year. We negotiated the sale of their company to us. When Kisco was selling their company to us I spent over a month in Japan. My son Dave was instrumental in the negotiations. He had joined the company in 1979 and was running our operations at this point.

I might mention, by the way, an interesting wrinkle on HIPOX. I don't know if you are familiar with Bob Graham. Bob and I were friends for one thing. Of course, he's passed away. Bob was in marketing. He was actually head of marketing at Fairchild when I was at Fairchild…a very bright guy. For a while he…worked as a consultant for Applied [Materials] initially under [Mike] McNealy and McNealy had left. [Jim] Morgan came in and brought Graham in as a consultant. Graham decided that one of the things he wanted to do is to give Applied some exposure to different technologies so he set up a group that reps other companies, so when I set up the high pressure system, I took Applied on as my rep. One of the first memories I have is someone came up with a T-shirt with a hippopotamus doing a toe dance in a tutu and that was a joke on the HIPOX.

Addison: Did Bob Graham set up a separate company for this?

Toole: No, it was within Applied. Applied in the meantime had offices, sales and service offices all over the States, Europe and Japan so this gave us access through Applied.

Addison: So that was a very good deal for you then.

Toole: It was. When we broke away from Applied it was completely amicable.

Addison: The relationship with Applied, how long did that last and why did it end?

Toole: It lasted for a little over a year and it ended because I had the sense that Applied was too busy selling its own equipment and, therefore, wasn't doing the job it should or could have done with ours. They kind of agreed. So that was it.

Addison: Let's talk about the progression of GaSonics in the '80s through to the '90s? What were the major milestones?

Toole: It went from a sales level of $2.5 million to a sales level of $125 million.

Addison: Over what period?

Toole: It would have to be the early '80s to probably mid-'90s. When we sold it [to Novellus], I think we were in the 350 or 400 range.

Addison: Going back, you did tell the story of Bud Maxwell disappearing and then you bought him out. So when was the actual beginning of GaSonics?

Toole: 1971.

Addison: The name of the company was GaSonics or that was just the product?

Toole: That was the product. It was Monte Toole and Associates, and I had two companies -- a company called Atomel which made spin-on dopants.

Addison: And when did Atomel start?

Toole: In 1968.

Addison: So when did the name of the GaSonics product become the name of the company?

Toole: I guess in 1971.

Addison: What about funding? You said you didn't take any venture capital but when you parted with Bud Maxwell and went out on your own, was it just from cash flow?

Toole: Cash flow. I always had a good relationship with the bank but I never borrowed until very late in the business towards the sale of the company. Before then I'd always maintained a good credit line but didn't use it. I tend to be a very fiscally conservative individual. Cash flow is life's blood. From a business point-of-view, most companies today get started with venture capital. In my day, it was unusual to get

started with venture capital but not unheard of but I never touched venture capital. Never got any money from venture capital.

Addison: Would you say the company was successful from the beginning? Some companies struggle for a few years.

Toole: We always struggled. The semiconductor industry, in my observation, runs about a four-year cycle from peak-to-peak or trough-to-trough. During the trough period if we weren't getting any orders and I had to support the plant and the individuals in it what I would do is develop new products or hire and train new people in preparation for the next up cycle. We never had a layoff.

Addison: The handoff to your son, Dave [who became CEO], when did that happen?

Toole: In the late 80s we decided to enter the photoresist removal business and had made our way to the number one position. In the early '90s I decided to buy IPC and had Dave integrate the products and people from the two companies. We changed our name to GaSonics International. A couple of years after this I decided it was ripe to take my company public and when I started the company, I had no plan to create a dynasty or a family business of any sort. But I wanted it to survive as an entity but it wasn't as important to my son. My son had I guess not unnatural feelings about creating his own success so he gave notice that he would be leaving the company somewhere after we went public. I persuaded him to stick around for a few years after we went public and then sell the company so that's what we ended up doing. We went public in, I think it was '94.

Addison: What was the primary reason you went public?

Toole: To create liquidity. In other words, I had spent about 25 years building the company to where it was and I had taken no more than I needed in terms of living. I had taken about $25,000 or $30,000 a year out of the company sort of thing. So I felt it was time to realize some of the values incumbent in a successful company.

Addison: Of course, the other advantage of going public was that your employees, if they had stock options, may not go to another company.

Toole: Correct. That was part of the thinking. I ended up giving stock to every employee we had at the time and giving it as a function of how long they had been with the company. It was a gifted stock.

Addison: Was it good timing in '94 to go public?

Toole: Yes, we were very fortunate. It turned out to be good timing.

Addison: If we can go back to the '80s, what would you highlight in terms of product developments or major achievements in that decade?

Toole: HIPOX looked and performed like a locomotive engine -- high pressure oxidation so it's a large vessel, 14 inches in diameter, stainless steel throughout, about nine feet long, so it was an imposing

piece of equipment. What SEMATECH took us to was single wafer so we invented a single wafer HIPOX in that period. It's funny because [Bob] Noyce took over SEMATECH. I don't remember what year that was but we had a single wafer machine at TI which Noyce went to look at. I visited him and we had a pitch on the HIPOX single wafer and he asked me a simple question like, "Where is the wafer?" And I looked at the drawings I had with me and I couldn't find one that showed the wafer so my answer to that was, "It comes from down below" which it did. At the time [that] was one of the bywords for semiconductor manufacturing for SEMATECH, to keep undesirable particles down so instead of the wafer being brought in and dropped from above which was common at the time, we had a section where the wafers resided below the feeding of the machine.

Addison: So SEMATECH bought the machine after that.

Toole: Correct.

Addison: The original GaSonics machine, did that continue or did it become obsolete?

Toole: Pretty much obsolete. Thermco is a big manufacturer of furnaces and we tried to consummate a deal with them to supply them with gas systems and we weren't successful but they began to manufacture their own using mass flow controllers, much more expensive than our valves.

Addison: You mentioned two acquisitions, the one in Japan and IPC. Was that a part of your strategy to grow or they were exceptions to the rule?

Toole: Well, they became available and although I had not planned to grow strategically by purchasing, it made sense so I went ahead.

Addison: Ultimately, did the IPC acquisition work out well?

Toole: Very well. They brought [the] Hewlett-Packard [account] into us and they were a significant factor in Japan sales and also with Samsung in Korea. Plus the people they had were quite good in technology and the purchase of the company brought to us a technology that succeeded I think more than our equipment would have succeeded by itself.

Our major success story was with plasma. We brought together a team in the mid 80s to develop a new method for removing photoresist from the wafer. We developed downstream plasma to process the wafer downstream of the charge created to produce the plasma. This had a significant impact on improving yields in our customer devices. Dave [Toole] got us into Intel after a very challenging qualification process. This led us into SEMATECH while our other sales guys got us into AT&T, TI, Motorola, IBM all within a couple of years. I have always had a passion for plasma and to this day believe there are so many places for the application.

Addison: Just to bring it up-to-date, were you involved with the sale to Novellus [in 2000]? Can you talk about how and why that came about?

Toole: I mentioned Bob Graham. He wasn't the founder of Novellus but he was the one that developed it and grew it and Bob and I talked on and off about the possibility of buying the company and it didn't happen. No single reason. We had developed some applications that related to the cleaning process around what Novellus was doing. This [later] led to Novellus approaching us to buy the company. Novellus basically was in the CVD business – chemical vapor deposition --and to get good deposits [they] wanted to have squeaky clean wafers and that's what we did, plasma clean wafers. Process wise it made a good fit.

Addison: Were you still with the company when it was sold, either on the board or chairman?

Toole: I was vice chair.

Addison: Was the sale good timing?

Toole: Beautiful.

Addison: Just before the downturn.

Toole: The company evaluation at that time was about $400 million which to me is mind boggling. It's a hell of a lot of money to me. To some of these software guys, it's a pittance. Considering when I started it was a $1,000 loan from Wells Fargo. The second loan was $15,000. From those I actually took money and repaid them. Subsequently I just got the credit line set up.

Addison: You said before you wanted the company to last. Did you have any regrets in selling to Novellus?

Toole: My older grandson, since I have a few, is aggressive and ambitious, enough so that I think he would be successful in building the company further. You've got the examples of Watson taking over from his father at IBM. The old man Watson had no understanding or appreciation of computers surprisingly. Of course, that's where they made their money. And then Motorola, the third generation took over. So I didn't have a sense of wanting to have a dynasty unless it made sense so that's one thing that's a little disappointing. It didn't happen but it's not a major disappointment.

END OF INTERVIEW

