Oral History of Theodore (Ted) J. Gallagher

Interviewed by:
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Craig Addison: Let start with your first exposure to the semiconductor industry, which was at Tracer Labs. Can you talk about the early plasma technology efforts there?

Theodore (Ted) J. Gallagher: My career [at Tracer Labs] began in 1966. I was hired as a product salesperson to look at the various product lines that had been developed in various parts of the company with the idea being that there would be applications into the analytical instrument field or other industries where the technology would fill a need. So it was a somewhat reverse order of what most people learned in marketing school of find a need and fill it. We had various technologies and we were looking for markets and the major market that I got involved with, or major product technology I got involved with was what we know today as plasma technology and at that time the application was primarily into the analytical instrument field as a means of sample preparation, ashing of organic materials to provide the basis for trace metal analysis. And we looked at various opportunities in industrial areas as well as looking at the ability of gas plasmas to cross-link polymers and provide better adhesion coupling of plastic materials to metals, connectors, Teflon wire, printing, things like that.

It was in 1967 that a researcher from Signetics by the name of Steve Irving called the company to determine if he could come up and try to remove photo resist material from silicon wafers. At that time, I think the wafers he had were probably an inch in diameter and they conveniently fit into the small chambers that we used for ashing and he was successful in being able to remove resist.

At that time, resist was relatively new to the process. Different resists were being developed for different reasons and the important thing was to be able to get the resist to stick to the wafer. As they developed technologies, they got the resist to stick on the wafer better [and] it became more and more difficult, in some cases, to get it off. So the first look was to remove resist from silicon wafers that had been baked on perhaps to the point where it was difficult to remove by conventional wet processes. That led to additional development at Signetics that was based on using fluorine-based chemistries to etch silicon dioxide, silicon nitride and so it also started the application for using plasma as an etching, as a dry etching process.

Addison: How long did you end up staying at Tracer Labs?

Gallagher: My time in Tracer Lab relating to the semiconductor industry lasted from ’67 through the early part of 1970. It involved moving myself and my family from Massachusetts where the home office was to California, to Richmond where the technology center was for this particular application. And [when] we got to California, we liked it. The division was moved back to the East Coast in early 1970 and I chose to leave the company at that time and go off on my own.

Once I was fully assigned to the West Coast division, Dick Bersin was the general manager of that division and he became my boss. In that period of time Dick’s background was primarily a technical one and he was interested in trying to develop the technology for multiple applications. My job as sales and marketing was to visit various companies that had expressed interest. The semiconductor industry was one that basically came to us with a need and it turned out that the technology had some ability to fill that need and it basically shifted the emphasis in our company from maybe a broad marketing base, a very focused marketing effort, and that got me to California. At the time that I came to California, which was in

1968, Dick had already left the company with the chief engineer, to form International Plasma Corporation (IPC). By the time I got out, I'd say maybe one year later by '69, they had a product and there was a competition between IPC and Tracer Lab for the business.

Addison: How did you end up forming Tegal?

Gallagher: Tegal initially was a manufacturer's rep firm. I called it Tegal Scientific and I represented various companies basically outside the semiconductor industry back more into the area that I worked in for Perkin Elmer in the early 60s. But in 1972 I was approached by two people -- Jim Mitzel and John Hollahan -- who I had worked with at Tracer Lab. John was a Ph.D. chemist whose specialty was plasma physics and plasma chemistry and Jim worked for me directly in Tracer Lab as a service engineer. He was also a technician in the engineering department at that time and when the company moved the division back to the East Coast, Jim took a job on the West Coast in a sales and service capacity basically covering the West Coast plus Motorola in Phoenix and Texas Instruments in Dallas. They had the opportunity to start a division for a company and they wanted me to join them in that endeavor.

I basically convinced them that we should start the business on our own and I set out to raise some money so we could get started and we raised essentially $48,000 from friends of mine -- one relative of mine, one relative of Jim's -- and some money that I had put in myself and we launched Tegal. At that time John Hollahan was working for NASA Ames. He was a National Academy of Science Fellow there and he continued to work there on a project [basis] about his half time. We entered into a contract with NASA [where] we basically sold half of John's time and he was working on a plasma-related project but more on the deposition side than the stripping or etching side but also outside the semiconductor arena. It was a project making membrane filters from plasma deposition.

So we developed the product. At that time it was called a Plasmod. It was our first product and it was initially developed just for stripping and cleaning applications and basically Jim Mitzel ended up making contacts in the Bay Area and we started selling the product and we eventually expanded to cover southern California and Arizona with a sales rep. [By about 1974] we had a network of reps in all of the states, or all of the geographical areas, where there was semiconductor activity and we basically started selling throughout the United States. By 1975 the company had developed an etching product as well. We developed a product that utilized metal aluminum chambers and it was effective for etching nitride. At that time the primary application was for silicon nitride etching.

Other companies started looking at Tegal as a potential acquisition because they saw the activity in the area of both stripping and etching growing and we were contacted by Thermco, which was at that time a fairly large supplier of systems in the diffusion area. They had an international network of salespeople and agents and we decided that we would use Thermco to sell our products. So we entered into an agreement. We basically went away from the traditional sales rep concept and we became essentially a product company developing additional products in our area and Thermco became the sales arm for Tegal. That basically lasted for a few years…and the operation that we had with Thermco worked out very well because we sold them the products, they resold them. They were still sold as Tegal products by Thermco but we sold it at a discount and they paid us the money for the products and that minimized the problems of cash flow for a growing company.

Addison: How did you fund the next phase of growth in the company?

Gallagher: In 1977 we had probably grown the company to $1 million in annual sales. At that time our products were selling for about $10,000 a piece, so we were selling about 100 units a year and we had products under development that we decided needed more money to develop and we looked at that time at the venture capital market a little bit and we looked at Thermco's parent company which was Sunbeam. They were looking for acquisitions and there was one other company, Tylan General. Anyway, we actually looked at the potential of merging with IPC at that time as one of the opportunities that came up, talked a lot with Dick Bersin about that. Dick, his company had really been taken over by the financial partners at that time and they put in a manager by the name of Jim Beatty, to run the business. Dick was no longer in charge of IPC.

The market size in the mid-70s was probably about $5 million a year in sales of plasma equipment and that was probably spread, oh, I'd say maybe 40 percent on the etch side and 60 percent on the strip side. There were two competitors for Tegal, both larger than Tegal. One was at that time LFE which was the parent company of Tracer Lab. They were now selling the products as LFE. And then IPC which was Bersin's company, and they were each about a $2 million a year business and Tegal was about a $1 million a year business.

We were rapidly gaining market share and our forecasts for the next two to three years was to achieve market superiority, or at least major market share, and we were developing technology at that time with Motorola on a joint basis by working with their R&D group and it's really that work and the progress that we made there that caused Motorola's interest in acquiring the company.

Addison: How did the Motorola deal come about?

Gallagher: In the timeframe then, we are up to 1976, 1977, we were looking at various opportunities to financially support the growth of the company and we ended up choosing the opportunity that was presented by Motorola for a number of reasons. We liked the opportunity of working with a company that, from a technical standpoint, we felt that gave us a major advantage versus our competition at that time. The make up of the financial opportunity was one that, I think, was a lot different than was offered in the case of Thermco or Tylan. It would have been an acquisition and we would have been more than likely merged into their facilities and it would have required either leaving the company, from my part, or moving, so that wasn't attractive.

The IPC opportunity was not attractive because, in my opinion, I felt that one of the reasons that was holding back IPC from growth was the highly conservative management philosophy of the person who was in charge of the company and I didn't see that changing just because I was there. In fact, we would have all -- we being the major players in Tegal -- would have all been essentially demoted or dismissed as part of that type of merger.

The Motorola opportunity was one where they came in and they bought 80 percent of the company. That money was used to pay off the investors. We then entered into a 10 year program that allowed for us to draw down additional money. For every dollar in equity we could borrow $5 from Motorola. The 20 percent ownership was shared at that time between three of us. George Gorin had joined the company as

head of engineering. John Hollahan had left the company by that time and he was actually working at that time for Applied Materials, and Jim Mitzel, of course, was still there and myself, so we shared the 20 percent ownership and we had a 10-year contract. At the end of four years we had a put option. There was an evaluation formula established and once every six months between year five and year 10 we had the opportunity to put our shares to Motorola and they had the obligation to purchase them at the then price of the company. There also was a cap on how high the evaluation could get before Motorola had a call option on our shares and it turned out that that cap happened in about seven years and so the call option was made in 1983, beginning of ’84 timeframe, and the company was then 100 percent owned by Motorola.

Addison: Was it evident in those early days of the company that plasma would be a big market opportunity?

Gallagher: It was a time when the market was still extremely small. You know, the overall market of semiconductor equipment in the mid-70s was relatively small but the market for plasma processing was really small. It was certainly less than $10 million a year and, as you know, today the opportunity for growth within that market was probably 10 to 20 times in the next decade and it proved out to be that and it required an aggressive combination of, I think, marketing and product development to take advantage of the opportunities that were being presented.

From ’77 to ’84, the plasma etch market grew dramatically. In the case of Tegal we grew from about $1 million a year in annual sales to over $44 million in annual sales in 1984 and at the same time during that period, during the latter part of that period, Applied Materials entered the etch market with their hexode technology which they got from AT&T, from Bell Labs and hired two major scientists from that operation and they embarked on one of their first major expansions and became market leaders in the overall business almost overnight.

At the same time, IPC and LFE pretty much stayed the same. When Tegal grew from 1 to 40 [million dollars], I think LFE probably went backwards in sales during that time. I don’t think they ever got above $2 million or thereabouts. IPC grew a little bit during that time. They probably went from, I don’t know, $2 to maybe $10 million, I’m not sure of their numbers. But they became a very strong supplier of the quartz-based cylinders and their expertise was in stripping. They stayed in batch processing and Tegal went to single wafer processing and single wafer processing got its start with Tegal and Motorola and it was the first major product that we developed with the joint R&D programs that we were entered into. The single wafer etcher for poly silicon was the first product that was developed and, actually, Motorola bought the first unit through a fund that they had that was managed by the head of the Motorola Semiconductor division, a fellow by the name of Bob Heikes and Bob gave us the money to supply two systems to Motorola but one was our first formal system. I would say within the first three months of having that tool they proved its worth and when we had sold I think 17 of our systems, Motorola owned 16 of them, and they were distributed between Mesa and in Austin. They had started the Austin facility by that time and we then started aggressively selling that product to our other customers.

The first product was used for poly and for nitride. Then we developed one for oxide and we developed one for metal. The metal product never really made it and the oxide product didn’t. Although we sold several, it was not a very successful product in the beginning [because of] the competition for the oxide

process, which has always been the market that Applied went after and it was the market that Lam [Research] went after. Lam had a single wafer system that was load-locked. The Tegal system wasn't load-locked and so as you got into the chemistries that were required for etching of oxide, and especially metals, the load-locked system proved to be a far superior tool for doing that. Even though it was more complex and more expensive, it was still cost-effective. The Applied [system] being cost-effective on a basis of a batch process which they could operate very slowly, but in terms of the process itself, they could slow the process way down but by having 20 wafers in their hexode at one time, they were still able to process more wafers per hour and the precision of their process and the cost-effectiveness that the hexode system gave them worked out very well.

Addison: What was your strategy to address competition from Lam Research and Applied Materials?

TG: We chose at the time to continue to improve our product. We developed from the 700 series. We spent our money to develop an 800 series which got us into 6-inch wafers and got us into a far more reliable mechanical system, wafer transfer system, but still did not include a load-lock. But we had a very successful oxide process which we developed, again, with the working relationship with Motorola and actually a working relationship with IBM at the time where the process improvements that were made were a result of some proprietary reactor design changes and, in the case of IBM, they had their own proprietary reactor that Tegal actually built for them and that was a secret essentially. We built a different one. It was different enough so it didn't infringe on their patent and they approved it so we actually had two different versions…the model was called an 803. And that was, I'd say, probably the most successful product that Tegal ever sold. I think the first year it was in full production, we probably sold 120 systems at close to almost $200,000 a piece. We probably sold $20 million worth of equipment which doubled the size of the company from the $20 million range to the $40 million range.

I think the growth in the industry just mushroomed from where it was in, say, the 1977/78 timeframe where at that time total sales of equipment was still in the $10 million range as opposed to the $100 million range and I'd say by 1982, only four years later, the market grew to probably $80 to $100 million. So by '84 it certainly was over $100 million. So when you looked at the market…in that timeframe we never competed with Applied at all. If the customer needed the technology that was offered by Applied, they had to buy a hexode-type of product and Applied had almost 100 percent of that market. LFE tried to compete in that market and never were able to. And a company called Plasma Therm, which was the company that had built a lot of the reactors for Western Electric and Bell Labs, so they had the technology of being able to build a hexode reactor before Applied did but they didn't have the marketing capability to go out with it. So although they sold some, Applied -- like they've done with a lot of products -- they just went from not even being in the business to being a giant in the business overnight.

The story ends for me at that time, in 1983/84. That was my last year. I did stay on and in part of '84 I was still working with Motorola. They had established a venture capital-type segment of their business and it was the part of the business that Tegal was in in terms of the structure of the business. It was called New Enterprises. It was managed by a fellow called Levy Katzir and Levy talked me into joining his staff and I stayed there for about eight months and my job was to try and help him develop additional technical resources to support a more aggressive semiconductor equipment arm to make Tegal more than just an etch and strip, and the areas that we identified that we wanted to look at were deposition and automation and inspection. The fundamental drive of Motorola's New Enterprise was factory automation and so as

you thought of mid-80s, factory automation in the semiconductor industry was one that needed all those components to essentially grow the business. We were very, I would say, unsuccessful in attracting companies. We talked to several companies at that time that were either for sale or that we identified as being companies that would be useful technologies to add into the family.

At the same time as that was happening, Tegal went backwards in sales and they lost an awful lot of money in 1985. By 1984 Tegal was twice the size of Lam. By 1985 Lam was twice the size of Tegal. It just flipped. I think they [Tegal] spent a lot of money developing a load-lock system. It didn't work well as a product. Reliability wise…Tegal always was a very, very strong process technology company. I think probably without any question it was always the leading company in their understanding of the process. A lot of that came from the working relationship that we had with the Motorola people and…the people that we had that understood the technology from the interrelationship between the reactor designs and the ability to do a specific process effectively.

So a combination of those things worked to our benefit. They built even an additional version of their 800 series which became the 900 series. It was a mechanical nightmare for a while and it got repaired and it's been really their only product that sells with any regularity, even today. But the 1500 product, which was the larger product that was designed to compete directly with Lam and Applied, never really made it to the market and still is only sold in very unique applications where the process is critical and their process expertise has made them a desired supplier for certain materials.

Addison: I'm sure some of your device customers would be uncomfortable knowing that their equipment supplier was owned by another IDM. How did you handle that situation?

Gallagher: The person who basically championed our cause into Motorola was Earl Gomersall…at that time the Semiconductor Division was divided between the discrete devices and the ICs. The other was all the peripheral businesses that were support arms for the main two businesses. They had a wafer business in Europe. They had sizeable machine shops. They had a flat panel display, an LCD business. They had little things that were just outgrowths. They were trying to get into the solar panel business at that time. And then R&D was all managed by Earl…his goal ironically was no different than what ultimately became the goal of New Enterprise [which] was to create an automated dry system for wafer processing. And the idea at that time, which we put together as our first strategic business plan within Motorola, was to develop a common transport system with the various processing heads to perform a completely dry process on the wafer. And when you think of that…in our case it was a pre-alignment and a post-alignment process. It never included buying an aligner company.

If you look at the history of Applied Materials, what have they done? They've built a pre-aligner and a post-aligner company. They bought an inspection company. They have that technology and they are a proven model in the industry and it was, I'd say, Earl Gomersall'**s** vision in the mid-70s that caused Motorola to acquire Tegal. That was predicated on the same philosophy, same strategy. It was a very unique situation. If you looked at the growth of the Japanese semiconductor equipment market, it was all done with arms of the major players. In Japan it was the way they did things. They developed everything internally and they formed a company to build the product so all of the major suppliers of equipment in Japan were outgrowths of the Fujitsus and the Hitachis and NEC and so forth.

TI had a major equipment arm. They built a lot of products themselves that offered what they considered to be unique opportunities to gain market share advantages. That was a major conflict within the management of Motorola for the same reason [namely], "Why have an equipment company?" The idea wasn't really to have a big, successful equipment business. It was to provide technology leadership to being able to get a leg up in the making of devices and they felt that 6 to 12 months was enough of a leg up. And look what happened in single wafer system. It worked perfectly. That was our first real product there. It worked perfectly because we worked with them in a unique program between our company and the R&D group. They [Motorola] had what they called APRDL which was the Applied Research and Development Lab, which was a step between R&D and the fabs and that's where the first system went into. They proved it there and once approved, it got assigned everywhere.

And that's the way Intel worked. We supplied every poly and nitride etcher to Intel, and strippers, from the beginning all the way through probably to 1982/83. They didn't buy our oxide etcher…they tried it but it didn't work. When they went to 6-inch wafers, it was right [at the time] where I was leaving as president of Tegal. Somebody else was coming in. They hadn't been hired yet, or they didn't have someone to bring in.

There was such a strong feeling on the part of the management in the semiconductor side of Motorola, the main one being Al Stein, that having an equipment arm was really diametrically opposed to [being an IDM]…it just didn't belong there. It also ultimately hindered us in Intel. We got called to Gordon Moore's office one day when they were making all their decisions on the 6-inch plant down in Arizona, which was the 1983/84 timeframe. And it was a major concern [Intel] had that we were so closely tied to Motorola that it would ultimately be a disadvantage if our production capability was limited and we could only build X number of units and [if] Motorola wanted them, they would get first dibs on the products. So I think it became a major factor and I think it became a real major factor when I left because at least…I really wasn't Motorola. We were always Tegal. We had a separate corporation. We had none of the internal structure that Motorola had…finance was a unit and personnel was a unit and each of the operating divisions had assigned people and those people had joint responsibility to a financial manager as well as a division manager. In our case, everything was internal to our company and I knew a lot of the key people. Ironically our major account was Motorola and it was our major account by far. Intel had years where they were our biggest account and we worked very well with them for a long time but ultimately the union [with Motorola] became a disadvantage for us.

Lam did very well and so they got into the oxide with Intel and it was very simple for them to do the poly and they even had a metal process that evolved early on. At the time we had only poly and nitride. Lam had oxide, metal and poly nitride. They had three models and they built their system load-locked. They built it as a 6-inch capable system from the beginning. So we just weren't fast enough in bringing our product up to speed. We spent too much time during the '82 timeframe working on trying to make our oxide system work.

Addison: What is your view on the efforts by conglomerates, such as GCA and Perkin Elmer, to get into the plasma etch market?

Gallagher: Two of the largest equipment suppliers to the semiconductor industry, other than Applied, were Perkin Elmer and GCA and they both tried to develop capabilities in plasma etch and they both failed miserably. I think in each case they had no appreciation for what I would call the relationship of the

sales and marketing budget or percentage of revenue that was required to be effective in selling that type of process equipment. They were so used to selling high-ticket items, aligners that were sold in each case in different timeframes solely on the basis of their capability. When Perkin Elmer first came out with their aligner they immediately took orders from everybody and they had a very low selling expense.

We looked at GCA as a company to sell or couple with Matrix [Integrated Systems], when Matrix was for sale, which we'll touch on a little bit later, but their total sales and marketing [budget] was like 5 percent [of sales]. When you are selling products that were as expensive, a $2 million aligner, 5 percent of that is a lot of money but if you are selling a $400,000 or $500,000 etch machine, 5 percent of it is $20,000. So instead of spending 5 percent, you really need to spend 20 percent to provide the level of customer support required to be effective and I think that probably really hurt them.

I stayed sort of quasi-friendly with the fellow who hired me in Perkin Elmer in my first job. His name was Horace McDonnell. He was head of sales at the time, in 1960. Horace ultimately became chairman of the board of Perkin Elmer and so I'd see him. We'd have a cup of coffee at the SEMICONs…I was attending those meetings for probably almost 10 years after I left Perkin Elmer because we were still somewhat involved in that market and I always took the time to go to Perkin Elmer and find them and say hello. Of course, he kept going up the ladder in the company and I talked to him at one time about buying Tegal and it was in the timeframe before we were part of Motorola and at that time he said, "We hate the semiconductor industry."

It was just way too cyclical for them and they are used to markets that they could just grow at 10, 15 percent a year and they were just an ultra, ultra conservative company and they backed in [to the market] because they had such superior optics that they were able to develop a very effective aligner. I'm not even sure how they even developed their first one but because of technology superiority in the critical element of an aligner, they were able to build a very effective product and captured a market share for a few years and just immediately became $150 million arm of their company. So it was a very successful business for them but, as you notice, it ultimately went away. They weren't able to hang in there and do the things that were required to be effective, and GCA, which had been in [that market] in the beginning, they came back with their stepper and they did the same thing. They immediately became enthralled. If you notice, Applied has stayed out of that business. It turned out that the companies that have been effective in the alignment business were not necessarily effective in anything else they tried and nobody else has really tried. It's just such a major undertaking. I think they can get their returns somewhere else.

Addison: Can you talk about what you did after leaving Motorola?

Gallagher: When I left Motorola early '84 it was after having spent about eight months working with the concept of trying to build sort of a multi-product supplier company for the semiconductor market and in the contacts that I made and the things that I was doing, you constantly ran across the same combinations of people. On the product side you had individuals who had the capability of designing a unique product or developing a unique technology that I think, at least in their mind, clearly had an application or filled a need, or would fill a need, as the design rules continued to go in a direction that they were going.

And on the financial side you saw a far more astute venture capital market where they learned through the process …this was kind of a second go through for them by then. They learned that the people who were technically capable of doing what needed to be done to develop a business were probably not able to manage the business from a marketing and financial standpoint. I decided well, I am going to go out and try to position myself as a consultant between the people who need money and the people have money and it seemed that everywhere I went or everyone I spoke to on either side wanted me to become an employee or become captive. The financial people were saying, “We need people like you that we can put into run our troubled business or help develop the strategic plans and do the things that you are capable of doing,” and on the user’s side they talked to the financial people and they were saying, “You need this type of person,” and then perhaps Ted Gallagher was the right type of person to add to your product people portfolio to be attractive to a venture arm to raise the money to do your project.

As this was going on, I was approached by Hunt Chemical, a fellow by the name of Bob Zetena who was president of Hunt who we had worked very closely with over the years as a supplier of photo resist materials because of the technical interaction between resist and the need for the resist to hold up in the etching process and the need to get it off after the etching process was complete. I had known Bob for a long time. We actually gave Hunt the “Thinker Award” one time, which was an annual award that Tegal gave out, at least in those days, for major contributions to the plasma world. We gave one to Hunt because they were at the time the only resist company that was really sensitive to that interaction and that was willing to work with us.

So at that time…Bob’s interest was to develop an equipment arm for Hunt so they could more formalize this interaction and get the synergy between the equipment and the resist. They had a program going at the time which ironically we were part of because they were working with Motorola on it, we being Tegal…to create a plasma developable photo resist, a resist material or like material that could be developed using a plasma and then selectively removed so that they could create the patterns between the undeveloped and developed in the way that process works. And then, of course, etch and the removal, all those three things were part of it.

They also ironically had a program to have plasma deposition of photosensitive materials so that they could get a dry process for putting resist on the wafer. And these were internal R&D programs at Hunt. So it was Bob’s desire to create an arm of Hunt that would be an equipment arm that would be aligned along the same way that the R&D programs were aligned and he asked me if I would come onboard…and help put together a strategic plan that could be presented to their board for funding. So I did that. I thought that would be an ideal type of thing. I would be able to work a little, make some money and when it was over maybe become a board member of that company but not have to act in a managerial capacity.

So that seemed like a very workable situation for me and I started out on that program and that was probably in the mid-year of 1984. Our goal was to have a plan put together within four to six months, by the end of the year really, but to have at least the initial plan put together by the end of the year and then critiqued and polished and finalized by the end of the year. So it was a six-month program for me and it involved going to Europe and interviewing. They had a division in Belgium that was very active and actually a person there who was very much involved in the process of coupling the technology of dry processing with resist and I talked to the R&D people [there]. I talked to the people in Yale University where they were doing R&D work on depositing photosensitive polymers.

And at the same time looking at the automation needs, because of other contacts that I had, I was very close with the founders of Brooks Automation and they were two brothers that had founded the company and they were looking to sell out essentially. So I thought that owning Brooks would be an interesting part of the overall concept which would provide the automation component of the wafer tracks, etc. Meanwhile, on the etch side, Jim Mitzel, who was my original partner through all of Tegal, was working with a fellow by the name of Randy Crockett to develop a single wafer stripper and he was also working with a fellow by the name of Lou Rigali who had purchased the original rep business that I started, Tegal Scientific.

So it was a very aggressive program and it was one that supported the goals which Zetena had set out for Hunt. Well, it turned out that in this same six-month period Hunt was acquired by Olin Corporation and by the time that we had our program, our strategic plan put together and sort of approved at the Hunt director level, Hunt was no longer an independent entity. Their board of directors was essentially kaput and they became an operating division of Olin.

Addison: So what did you do?

Gallagher: This was now the beginning of ’85. We took our plan to Olin and basically the same plan that we had presented to the Hunt board we presented to the Olin management team first. It turned out that as part of Olin’s strategic plan they had specifically identified equipment as an arena that they did not want to participate in and that they wanted to focus strictly on specialty chemicals and then develop other chemicals that would provide a stronger product base for Hunt Chemical or what they thought was going to be Olin Electronics or Olin Electronic Chemical Company, or whatever they were going to call it. It was probably the most ill-conceived work that I had ever seen. The major part of their business came from selling development chemicals to that market which was dominated by Kodak but Hunt was the number two supplier and they had about 10 percent of the market for selling development chemicals to independent people or people who had their own lab in their house or small companies that develop pictures for drug stores or whatever. That was the major part of their business, Hunt’s business.

The second part of their business was toners. They sold toners for copy machines. That was a pretty big part of their business. They sold chemicals for the printed circuit board industry and then they sold chemicals for the wafer processing industry. The wafer fab business was less than 40 percent of their [Hunt’s] total business but it turned out it was the only business that Olin really wanted. They didn’t want any of those other businesses but this is what they got. They got a totally non-cooperative management team in Hunt.

When we were exposed, then, to Olin, they said, “We can’t take this.” They had just gone to their board and convinced them to buy Hunt Chemical and part of their statement was that their strategies specifically excluded equipment. They said, “We can’t go back now two months later and say, ‘Oh, by the way, we want to change our mind. We want to add this equipment arm and we are going to have to buy this company over here and we are going to have to fund two start-ups over here and it’s going to take us this many million dollars to launch this program.’”

In the meanwhile we had started Matrix, which was just Mitzel and Crockett and myself… but we hadn’t really funded it to any great extent… [it] really was something that we were just doing on the side and then Hunt came in and said, “Look, we will put up some money.” This was before we went to Olin even.

So we had actually started something and they put in some money and we hired some people and we actually started…we had a building and we started doing the development work on the product.

So what Olin said was, “We will fund an R&D project and we won’t buy Brooks Automation for sure. We are not going to buy anything. We can’t do that without board approval and we don’t want to do two programs. We’ll just do the one program.” And we were asked if we were willing to do that. So we then sat down with Hunt and we negotiated a plan that said OK. We totally changed the structure of what we were doing and it became [a case of] “we’ll develop this piece of equipment and we’ll sell it and we’ll work with your people and we’ll just do this little arm of the program but we won’t address any of the deposition or any of the automation or any of the dry development or the deposition of photosensitive materials.” So that was a big, big letdown, so to speak…and part of the commitment for me was to run that business through the start-up phase of the business. But it was something I could do. We had the company right where I lived. We were right in the same neighborhood, so to speak, and it wasn’t going to require me to move and it looked like something we could do. We had basically a three to five year plan that would launch the business. We had a commitment for financing that was enough to make the financial plan that we put down work and so we started down that path and that was ’85, ’86, ’87 and by 1988 the management of Hunt had been fired.

The person running Hunt was an Olin manager and Hunt was losing money. So the acquisition looked bad on Olin’s books and the biggest single source of money that was being lost was Matrix because we had a $2 million a year budget [for three years] and in year one we had no sales. That was on purpose. So year two we had some sales, about $3 million, but on $3 million worth of sales we lost money. Our goal was to break even at the end of year three. By then we would be able to support the sales part of it on our own. That’s exactly what we did. Our year three sales forecast was $8 million. We went from zero to 3 to 8 and that’s exactly what happened. But, in the meantime, we were put up for sale and, again, Olin went to their investment banking company in New York that had absolutely zero knowledge of the semiconductor business, let alone the semiconductor equipment business. There wasn’t a prayer of them getting the company sold so in 1988 we went back to Olin and we said, “OK, we’ll buy the company back from you,” and so it was really Jim and myself. We settled on $1.5 million but we said “You have to give us a $1.5 million loan.” So we basically bought the company with no investment for $1.5 million and by the end of one year we had enough history in the market that we were able to get a bank partner, a bank loan and we basically borrowed money on our assets and we were able to pay…Olin discounted the note to $1.4 million and we paid them $1.4 million. By the end of 1988 we really owned 100 percent of the company.

Addison: What was your strategy after you bought the company?

Gallagher: There was no way we could grow the company without some other partner so we looked at that time at different ways of forming partnerships and we had an opportunity in Europe to buy a company that was in Belgium that was owned by a combination of venture money -- a European venture firm and a Belgian government venture firm -- that owned this spin-off of IMEC…it was called Cobrain. IMEC had an ownership in it, the Belgian government had an ownership in it and then they had a venture arm and we ended up merging Matrix with this company which involved an infusion of capital into Matrix but we were never majority owners of the company. The venture combination of companies always own the company and we had a minority position which, over the years from ’89 until I left in ’90, had shrunk from probably

40 percent in the beginning to 10 percent at the end as a result of taking on additional financing as we needed it and we were never able to grow the business effectively. We got it up over $20 million in size but by that time $20 million was nowhere big enough to be a global supplier and one of the things that happened early on…our best customer, and probably not surprising, our best customer in Matrix was Motorola by far.

But early on I interfaced with the key management in Motorola and they said, “We are changing.” Bill Walker [general manager] said, “We love your product and we want to keep buying them forever but you’ve got to understand that our corporate philosophy has changed.” Up until about 1990 Motorola was pretty independent in their decision making process from fab-to-fab, from product line-to-product line. They prided themselves on giving the fab manager the authority to set up his own process line and so forth and a company like Intel, as an example, did it totally opposite. IBM did it totally opposite. They basically established a process system interaction and…if you wanted to etch polysilicon, you bought a Tegal 701 or 801 or whatever their current numbers are or whatever took its place. And wherever you were in the world, if you went into an Intel fab, every process was done on the same piece of equipment and Motorola said, “We need to do that because we have products that aren’t working.” Motorola was such a multifaceted product company, and they had some products that were hot, some that were failing, and they wanted to be able to move the product line into whatever fab was equipped and appropriate and it needed to have the same technology that existed over here.

He [Walker] said, “We have sister companies in Scotland and France and we want to make sure if we need support -- if we want to put a product there, we want to buy equipment there -- that we get the same level of support there that we get here.” So basically I said, “You got it. We will do that.” We ended up with a full-time employee in France. I’m not sure he’s still there but he was there for a lot of years when I was there. And we put in an office in Scotland and we had full-time both process support and service support in Scotland and then, of course, we had full-time process and service out of Belgium out of our Cobrain company there. So we were very well equipped to support Motorola and they remained our major customer. I’m not sure where that stands these days but that was certainly the case through the late ‘90s.

So our trek through Matrix was certainly not as successful and certainly wasn’t as much fun. The world had changed and the philosophies that worked well in the 70s and 80s needed to be changed and we were just not equipped with our financial partner to make that happen. It just wasn’t working. The products that were developed in Cobrain, the major one, we had to put a stop to. It wasn’t an effective tool at all. There just were a lot of hardships that turned into hard feelings and we were not able to develop the products fast enough. We were not able to gain from the advantage that we had in Cobrain and the communication with the Europeans was just very difficult.

We agreed to change what we were doing. I left. I was ready for retirement anyway so it worked out. I actually stayed on for an extra year after I stepped down as president and I worked part-time, had a couple of projects, one of which was to determine what to do about Motorola.

Addison: What ended up happening with Matrix?

Gallagher: We hired a fellow by the name of Jim Marshall who came in and he was the president and then he ultimately became the CEO as well and he hired his own technology director and his own sales

director, so the company really changed dramatically. They built a totally new product line which has been somewhat successful. [Editor's Note: Matrix was acquired by Axcelis Technologies in 2003].

END OF INTERVIEW

