

Oral History with Jay Stein, June 29, 2020
Interview by Benjamin Spohn for Hagley Museum and Library
Hologic oral histories project

Q: Well all right. Today is June the 29th, 2020. I am sitting down for part two of my interview with Jay Stein, founder of Hologic. So where we had left off last time, we were talking about how Hologic acquired Direct Radiography Corp.

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A: Right. So I think I mentioned last time that the motivation for acquiring Direct Radiography Corporation was that David Ellenbogen, who was my partner and co-founder, and I had been working in the bone densitometry business for, I'd say, on the order of about 15 years. And the business was quite successful, but also not really, no longer-- I feel it would be fair to say as exciting as it had been during its early periods of growth. And we had always known about DRC because digital radiology was just coming into more and more focus at that particular period of time.

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And really, if you think about it, the bone densitometry products that we had produced up to this time, really create a picture of the spine, of a woman's spine and hip, which were then analyzed by computer. So the bone densitometer itself was a very early, if somewhat crude form of digital radiography. And nobody thinks about it in those terms these days, because the image quality in a bone densitometer is, frankly, inferior to what you would get with x-ray film or a real digital radiography detector.

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But it just goes to demonstrate the fact that the technology that DRC had developed was a cousin, maybe a second cousin to the technology that you need for, frankly, either a baggage inspection system, which is a form of digital radiography, or a bone densitometer, which is another form of digital radiography. So it was a natural area of interest to us, because we worked in this field.

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And we decided that, contrary to decision, let me say somewhat facetiously, that Kodak had made, that digital imaging in the x-ray field would, in a relatively brief period of time, replace film, which had been the standard medium for recording x-ray images. So we thought this would be a good opportunity to get our feet wet in a technology that obviously was going to improve and grow.

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And in particular, we had always harbored a desire to go into the field of mammography, which as you will probably know, uses x-rays, because it turns out that the mammography is another digital x-ray imaging modality that is used as a screening procedure, such as bone densitometry. So although most people don't think of it in these terms, bone densitometry and mammography are very allied, both in the fact that they share a technological common base, and they also share a common tech customer base, radiology. And they also share the same base of patients for whom these screening procedures are designed.

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So it was a very natural thing to want to get into digital radiography. At the time we acquired DRC, it was only one little significant issue. In addition to not having any digital, real high quality digital radiography technology, we also had no technology whatsoever in the mammography area. But we decided a glass half full is better than no glass. And we went ahead and acquired that technology, just in the hopes that we could make something come of it.

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And the process of—it was, for a company our size, acquiring other tech companies, was an unusual occurrence. And it was sort of an interesting first experience in business acquisition for us, when we did wind up acquiring DRC. I should maybe make a note that one person, who was very helping and instrumental in our business discussions with the company that owned DRC at

the time, was a gentleman, whose name is Jack Cumming. And Jack was a consultant to Hologic at the time this acquisition took place.

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And probably, as the story continues to unfold, it'll turn out that Jack, going further into the future, wound up playing a very significant role in the history of the company. But, with Jack's help, and other people devises, we wound up acquiring this company, which at the time had very minimal revenue and great technology, but was nowhere close to making a profit. And we acquired the company at a very attractive price, the exact amount escapes me at the time. And that was the core technology, really, which had enabled the company to progress to a new level.

Q: I'm wondering if we could take a quick, not a pause, but a little trip down a side line. Can you talk a little bit about what your working relationship with Dave was like?

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A: Well, I'd be happy to. In fact, more than happy, very pleased to be able to do that, because I think I may have mentioned earlier, David and I met, either—I don't remember exactly the first day, or the first week of my first fulltime job after I finished my work at MIT. And that was at a company called American Science and Engineering. And we worked together at American Science and Engineering on and off for 10 years, on various projects, together.

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And, even without the bond of common employer, we became very good friends. And when Hologic was started as its predecessor company, Diagnostic Technology, when I mentioned, David and I really started both those companies., and the third one I mentioned, that was in the baggage inspection business. Formally, we were partners, whereby David undertook the business and sales aspects of all three of those companies. And I was in charge of the technology aspects of those companies.

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But, although the business relationship was sort of a partnership, the personal relationship was equally close to the business relationship. And I always looked at all of these companies as, all of which had varying degrees of success. And I always viewed that the success of all three of these companies wouldn't have been possible without the partnership with David.

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So I know frequently, the—let's say the popular press standard of entrepreneurship is a single entrepreneurial leader who has an idea, and the drive, and focus, and continues unabated to achieve varying degrees of success. And I don't deny that this is commonly a route to successful entrepreneurship. But Hologic is a story of a different route to success, which is a very close and constructive partnership of two people, between David and myself.

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And I would say 30 years of working together in one form or another, I believe we had—I believe it's fair to say the number of arguments and disagreements or conflicts we had would be zero. So I think that kind of a relationship was a key factor in the success of the company, and also in the culture of the companies, because the culture reflected the collaborative nature of the relationship between David and myself.

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And, just as an aside, David was a very, very memorable and personable man. And I think I mentioned earlier that, even today when I meet people who knew him 20 and 30 years ago, they regale me with memorable incidents in their own lives, revolving around their interaction with David. So I hope that gives a picture of the relationship.

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A better picture of David himself would be that he was more remembered for his personality and his sense of humor than he was for any of the other accomplishments in his life. So in terms of memorableness—I'm not even sure if that's a word—is very, very high on anybody's list.

Q: So how did you maintain that type of company culture through your period of such rapid growth after you got into the mammography business?

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A: Well, I think the main culture ingredient, and I think your question is very good. Because at some point, a company grows to the point where it is difficult to maintain all of the aspects of the culture that were important in the growth of the company. But I think the main ingredient in the cultural context of the company was a view that every single person in the company, on some level, was an equal contributor to the success of the company.

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Now naturally, everyone's role was different. And so in the end, somebody, someone, one employee's contribution viewed objectively might be more than another. But the basic culture of the company was that each and every person was fundamental to the success of the company. And I don't know if you would call that a somewhat related to what you would describe as a family culture. To me, that's not an accurate description, because we did not do things by consensus, as sometimes happens in small companies.

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We did things in a structured way, but with a particular emphasis on the value of each employee. And when the number of employees are in the hundreds or two or three hundreds, it really is possible to know each and every employee personally and as a person. And so that kind of culture is not that difficult to maintain, up to a certain size. And I think that culture of recognition of people as people, first, and employees second, is pretty much a carry-on from the culture, of the relationship that David and I had, where we knew each other, really first as people, and then as business partners.

Q: So that's all interrelated to that initial friendship.

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A: I think, I think that was a strong element in it, yes. In fact, I'd never thought of it that way. But, now that you've asked the question, and made me try and come up with an explanation, it does ring true that that was the key ingredient.

Q: Okay. So before we went down that little side trip there, we were talking about, you'd just acquired Direct Radiography and were getting into mammography.

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A: Right. So this part is one of those facts of life that doesn't coincide with the myth, which is that, in hindsight, many people thought we bought—Let me back up a minute. About a year after we acquired DRC, we acquired another company called Lorad. And that company was a very strong established company that focused primarily in the mammography business. So the kind of the myths from the present, looking back at the past, looks like we acquired Digital Radiography in order to go into digital mammography, because prior to that time, mammography was done strictly with film.

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But the fact of the matter is, we acquired these companies in the reverse order of logic, in that we first acquired a detector that had the potential to be used for mammography, and it was only by happenstance that a year later, that a mammography company became available to acquire in which this detector would be useful. So unfortunately, the facts of the story make it look like we were a lot less—had a lot less foresight and brilliance than the myth part of the story. [laughter] So I hope not too many people listen to this and find out the truth.

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But the truth is, that the acquisition, the ability to use the remarkable technology from DRC in mammography turned out to be a fortunate happenstance of good luck, and not a direct plan. But I guess it's fair to say, at least we realized that our interest in acquiring Lorad was strongly driven by the fact that we knew we had in hand, already, a digital radiography detector that was kind of remarkably well designed for our mammography systems, even though the original detector had

first been developed for a system that did not do mammography. So I guess we should take credit for recognizing the confluence of opportunities. But we certainly didn't—it was certainly not part of a directed plan.

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So about a year later, when Lorad became available for purchase, we made a huge effort to try and do whatever we could to be the winning bidder in the—among a number of people who were very interested besides ourselves, a number of companies besides ourselves were very interested in getting into the mammography business at the time. And we worked very, very hard to be the acquirer of choice when we did make a bid for Lorad to become part of Hologic.

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A very entertaining story, in hindsight, is that our chief rival to acquire Lorad was a company you probably still remember called Kodak. And Kodak, at the time, was kind of in the midst of trying to convert their elements of their business from film to digital imaging. I think they were in the, at least in intent, hoping to do that also for consumer products. But Kodak was, along with DuPont, was one of the two major world manufacturers of x-ray film.

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And so Kodak's interest in acquiring a mammography company, which was a very, very large user of x-ray film, was obvious. And we were the contender in that business negotiation with Kodak. And the story I like to tell, because Kodak had their own business issues and concerns, and Lorad was not offered for sale all by itself, it was offered for sale along with one or two other x-ray companies that the owner of Lorad had acquired in the course of time. The owner of Lorad, at the time was a company called Thermo Fisher, which was kind of a conglomerate.

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And they offered for sale, not just Lorad, but Lorad and another one or two companies that were much less desirable purchases than the Lorad, than Lorad, which was in the mammography business. And they insisted that all three of these companies be acquired together. And I could

understand Thermo Fisher's point of view, because the transactions are time-consuming and difficult enough. And having to do one instead of three was attractive.

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But the story that's kind of fun to tell is that we decided that we would—Kodak would refuse to acquire one of those three companies. And in order to acquire Lorad, we decided we would acquire the three companies, one of which was a real—a burden, because it was losing money and had no hopes of making any more money. But we decided we would acquire a company we had no interest in, just out of our desire to acquire Lorad. And the investment bankers who represented Thermo Fisher came to us on a Friday, and said, “If you sign the same contract as Kodak was willing to sign, but include the misfit company in your purchase, we will sell it to you instead of to Kodak.”

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And we worked over that one weekend, I would say, about 40—two 20-hour days, with lawyers and accountants, changing the contract that was originally meant to be signed Monday morning by Kodak, to one that would allow Hologic to acquire Lorad. And this is a true story, which is the only good part of this whole long story that's worth telling, is that on the Monday morning, when we finally signed the contract with Thermo Fisher, and at nine o'clock in the morning, and were preparing to go home to get the first night's sleep in three days, as the elevator door opened for us to descend from the lawyer's office, a whole array of people from Kodak, who thought they were going to sign the same contract we did, got out of the elevator and passed us in the hallway.

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So, as we were leaving, having just signed the contract they were arriving for, it kind of makes a nice story of how we acquired Lorad kind of as a midnight activity at the last moment, literally. And that's as good as I can make out of that story for you.

Q: Wow. That must have been—I'm trying to imagine what it might have been to have been one of the Kodak people thinking. May I ask what the misfit company that you acquired did?

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A: I'm trying to remember its name now, because it no longer exists. But it was a company in Littleton, Massachusetts. Its name escapes me at the moment. But it was a company in Littleton, Massachusetts, that made cardiac x-ray equipment, a field we weren't interested in participating in.

Q: But it seems like your willingness to take that on and deal with it is what got you what you wanted.

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A: Right. Right. It was a company that was losing money, and was really of no interest to either Kodak or us, but which was a kind of a albatross around the neck of Thermo Electron. And it was the willing to take, I guess willing to take the ugly sister as well as the beautiful one in one arrangement, which allowed us to acquire Lorad. And it was really instrumental, totally instrumental decision with respect to the total future of the company.

Q: Right. And from there, you've got your ducks in a row, and you're ready to get into mammography? Or was there something else that had to happen before that?

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A: Well, interestingly enough, pretty much we definitely knew, then, that we were going to refocus all of our activities on mammography. We only lacked a few important things, one of which was the talent that was needed, the talent inherent in the people who knew the mammography technology. And one of the key people in that talent group was so discouraged with what was happening with the sale of—with the apparent sale of Lorad to Kodak, that he had resigned and accepted an offer to work with a third company, a third party company in the business.

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And we—I guess I would say, I'm pleased to report many years later, that we invited him to come visit with us, and to renege on his agreement to leave Lorad. As a matter of fact, not only we actually hired him to join Hologic before we acquired Lorad, in the expectation that if we did succeed in acquiring Lorad, we would need someone of that degree of experience and talent. And his name, he's a very capable person who is still with the company, named Jing, J-I-N-G. His first name is not spellable. He's a Chinese national, and his first name is—I can't spell it while I'm on the phone with you, because it's not a typical western name.

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But in any way, in answer to your question, the third thing we worked very hard to do, was to retain the extremely competent technical cadre that was working for Lorad at the time.

Q: And what was that like, to have to reassure so many suddenly new again people that it was worth staying with you?

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A: Well, you know, there's nothing like the—it wasn't us so much as the—as the mission, that attracted these people. Because we told Jing and other employees of Lorad, many of whom, almost most of whom are still with us, that we were going to convert the business of Lorad from film to digital. And the challenge of that mission, I think, was the reason people were enthusiastic and excited about doing something new and good for the customer base.

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So I'd like to take more credit for influencing these people to stay with us. But I'm afraid it was the mission that was the reason for their loyalty, rather than their knowing anything about their new employers.

Q: So it seems like—I'm trying to think of a good word. It seems like novelty and the guarantee that you get to approach something new in a different way from how you'd approached it before plays a huge role in why people like to stay in this field.

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A: Well that's definitely a yes for that. And to a large extent, I would say that it's pretty much the driving force in general, for technology, or engineering-driven technology, is the excitement of the new thing that can be developed. And I felt the people I met over the years, even when I was working in my first job on building x-ray experimentation, which I mentioned to you, circled the moon, it was the excitement of measuring x-rays from the moon, which I'd never done before, which drove the energies of the technologists involved.

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People, I think the lay population has a view of engineering as a boring, fact-driven, but interesting use of time. But almost without experience, I would say that the truth is diametrically opposed to that. And the people who I've met over the years, who have enjoyed their professions and their careers the most, have been people in the science and engineering part of the companies I worked with. So that's been my experience. I would be surprised if it were not pretty widely shared.

Q: Right. So once you have your three big ingredients together of these two companies and the talent, what was it like to then—Was it easy to mix them all together and get digital mammography out of it?

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A: I'll tell you what the greatest challenge was, which is not at all unusual when you acquire companies. It's very hard to know, if you haven't worked for a company or spent a lot of time dealing with companies, a very intangible component of a company, which is called its culture. So every company does have its own particular culture. And it's very hard to just, even on a

telephone call, describe what culture is, what a corporate culture is. But there are definitely corporate cultures.

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And the biggest challenges, given in answer to your question, to having acquired all the correct ingredients, was that the cultural content was a significant obstacle in the following sense. It's typical, when one company acquires another, that the company that's been acquired thinks of their new bosses as them, like they have this—typically, a typical sentence might be, they have these ridiculous procedures. Or they don't understand how this stuff works. And it's true. All those things are true, that they don't, they too have procedures that may not be correct. And they don't understand.

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But it's the cultural difficulties of overcoming the we/they mindset, that is a major impediment in making a acquisition, especially one that's a very intimate technological acquisition work. And I would say that overcoming that problem turned out to be—that problem was solved almost accidentally, rather than [laughter] rather than with any great insight or knowledge. By being very open to allowing people to move, actually move physically, move their residences from one geography, from let's say Danbury, where Lorad was located, to DRC, to—sorry, to Newark, where DRC was located.

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And it was the—it was the exchange of—And this is, again, a pickup on that cultural issue I mentioned of treating people equally, as necessary parts of a company. It was when the them got names, Tom and John and James and whatnot, that the cultural barriers diffused and people from the different companies worked together as a single team, instead of three different organizations.

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So I would say, if you want to mix those ingredients together that you mentioned, which was the technology, the people involved, and the goal, you should include probably with equal standing, the assimilation of different cultures into one. And if you have those four ingredients, I would say it's very difficult to fail.

Q: It's an interesting insight. I'd never heard it put quite that way.

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A: Yes. Well, you probably have heard, though, have you not, of issues in acquisitions because of different company cultures? That's not an unusual occurrence. But the fact that the solution is such that is not widely known. But it's not one that we derive from insight, we derived it just by good fortune.

Q: So maybe, maybe instead of talking about the literal development of the imaging machines, which we can do that too, but I'm also curious about what it's like when you have to work from—do you need a moment?

A: No, I was just—I was just checking my weather here. That's all.

Q: Okay. Yeah. Where was I? Oh yeah. About when you have to work with an organization outside of your own, when you have this brilliant new idea or technique, by which I mean, what has your interaction been like with regulatory bodies, say, in the insurance industry or the FDA?

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A: Oh. Well, I don't have any direct experience with the insurance industry, but I have a great deal of experience with the FDA. And I've had every type of possible experience with the FDA, from the very, very best to the very worst. And I'm curious as to why you got into that area. Is that something that you've always been curious about? Because it is an essential part of a medical business. But most people don't really seem to care about it.

Q: Exactly. I mean we do try to recognize that that's important. And one of the things that I always ask, you know, regardless of what particular industry I'm talking to someone with, is how they've interacted with these regulatory bodies. You know, like when we did the craft [?] brewing [?], we always had questions about whatever the state's local like liquor control board was.

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A: Well, I think I can say without revealing any confidences. My experience over the years with the FDA consisted, I would say, of 10—well, maybe I should put it this way. Five excellent types of relationships, where the people we dealt with were helpful, wanted. They were not obstacles to progress. If anything, they were trying to facilitate progress. And were willing to bend over and try and understand enough of the technology to be helpful in providing good regulatory oversight.

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And generally very positive. And did I say four or five? But if there were five good experiences, there was one nightmare experience. [laughter] So I want to not make this an accusatory part of my recitation. But the nightmare experience was caused by the fact that in trying to achieve regulatory approval for our most advanced mammography system, something called tomosynthesis, one of the employees, actually he was not an employee. He was a consultant to the FDA who had turned out, in hindsight, had had extremely difficult employment relationships in a number of other institutions before he went to work for the FDA.

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And, for reasons that really are not clear from the outside, he decided that in no possible set of circumstances was he inclined to approve this technology, which in fact turned out to be a very, very positive contribution to the field. And the problem that was interesting from the regulatory point of view, that I think is worth mentioning here, rather than any names or accusations, was it literally took the FDA two years to fire this person, because they also felt it was a path of total destruction.

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But, just because of the structure of government versus private industry, there was no simple way to remove this person from the process. And it really involved, and there was a lot of press and newspaper articles about the whole procedure, eventually involving lawsuits and letters to Congress and whatnot. But leaving aside that level of veto, a great weakness of the regulatory process is that one person with bad intent can obstruct a great deal.

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So I don't think it's fair to spend too much time on this. Because, as I said, 80 or 90 percent of the interaction with the FDA was positive and constructive. But it did highlight a weakness of that type of relationship between the private industry and government, that the inability to make changes in government, in a rapid fashion, is a major detriment, can become a major detriment. And that's sort of the total story on the FDA, which is mostly positive, with the one exception I mentioned to you.

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The other people in our company who had dealt—the people in our regulatory department who had dealt with the agency for many years, actually also told me that this was a unique experience in their own personal employment history. So frankly, I think enough said on that topic. It's just that, maybe you'd call it the exception that proves the rule. That, for the most part, I did not find any of the stories that you hear often in industry, of the FDA being obstructionist, really, to be relevant, except for one exception.

Q: Right. And I also understand that if you're the first person to bring something new or novel in, that you have many more hurdles to jump. Because of course you would. You're the first.

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A: Yes, that's true. And when we introduced this technique called tomosynthesis for mammography, which is better known today as 3-D mammography—Well actually, now that I

think about it, even before that, when we introduced digital mammography, that is using a digital detector instead of film, the FDA decided that this was a type of regulatory procedure called a PMA, a pre-market approval process which is a more complicated process than we had ever used before. The less complicated process was called a 510K, where the requirement is to show that your new product is substantially equivalent to an older one.

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A PMA approval means you have to start all over and prove, from ground zero, that the product is safe and effective. And it really was a judgment call as to whether or not to make—I mean doesn't digital mammography sound substantially equivalent to film mammography to you? [laughter] I'll answer for you, substantially yes. But, nevertheless, for reasons that, well, are unclear today, maybe out of a specific sensitivity to mammography being such a politically sensitive topic, they decided to classify this as a device needing pre-market approval

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And so that puts an extra regulatory burden on the company. But in carrying out that burden, I'd say the FDA really was more helpful than obstructionist. So I don't really have a strong statement one way or the other on this. Although, you know, it is a true fact—Well, this is a whole area. You need to have a special part of your oral history of technology devoted just to the concept of the regulating medical products. Most other countries in Europe, until very, very recently, did not require the equivalent of an FDA approval for a medical product. All countries require some level of approval for a drug.

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And the United States was, at one time, unique in the world, of being—of feeling that doctors themselves could not make judgments about products, that there had to be a separate regulatory function called that. And the legislation, in looking back on it, I hadn't realized. But when that legislation was passed, sometime early in my career, I'm going to guess around the 1960s, that regulated all medical products, not just drugs. And we now take it for granted that this is like vital to the safe manufacturing of medical products in the country.

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But with the benefit of hindsight, not that clear how valuable that additional regulatory process is in protecting the American public. And I'm not talking—Again, I'm talking about certain types of products, like a digital x-ray machine compared to film, is not clear that the government really plays an important role in that type of product. But you know, that's a topic that we could go on for a long time, because in a way, I think that regulatory barrier hurts small companies more than large companies. And so, in a way, it's an impediment to innovation and healthcare.

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On the other hand, there's always a case of an abuse, where somebody does manufacture a product that's either harmful or useless on the other side. So I guess I'm not—I don't have any really strong or very insightful guidance in this particular area, except to say that the regulation of medical products falls in one of those areas that combines technology and politics, which affects so many parts of our lives, and is one that I never found very enjoyable to participate in.

Q: Right. So what are some of Hologic's more recent post-developing tomosynthesis projects been?

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A: Well, the ones I can talk about—We're working on a number of things, which I think are extremely exciting, which I can't talk about in public at this point, because as a public company, as you know, we can't share internal information selectively. But the things that we have done, since the production of our first tomosynthesis or three-dimensional product, we have really enhanced the capability equipment in every respect, in terms of image quality, speed, convenience, and all the normal things you find with a product becoming more sophisticated.

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One of the areas that we are working in, in general, which is no surprise, and which has a lot of interest among our customer base, is an area called artificial intelligence. And you know, there's a common perception.

[side remarks]

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A: One of the areas we are working in, as are many other companies and industries in the country, is this area called artificial intelligence. That noise you hear is the thunderstorm I was mentioning to you earlier. But in the area of artificial intelligence, it just seems so natural to people, although none of these things are that easy, that you really, I guess the first level question is, can a computer read an x-ray and find a cancer in a breast x-ray as easily as a person? And it's a really good question. It's a question which quite a lot of resources and energy are being devoted to answer.

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And that's one of the major areas we're working on, and also to answer that question. I think answering the question is a lot harder than asking it. And it might take longer to know the answer than most people expect. But that's a major area of interest, especially in mammography. Because unlike other parts of x-ray imaging and medical imaging, mammography is a whole industry concentrating on only one organ of the body, and one disease state.

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So, in a way, you would think it would be an easier problem to solve than, say, reading a CT scan of the abdomen, where there might be any one of 10 or 20 different pathologies involved. So it's a natural area of focus. But I don't really have more to say at this point, other than the fact that we are publicly announced that we're working in that area, as are all the other companies in the field of x-ray imaging.

Q: So Jim had also told me about some changes to the machines that you've recently developed and released a uniquely shaped paddle.

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A: Oh yeah, right. So we are, we also have a constant effort underway. And that is a product that has now been publicly released. But we have ongoing activities, also, to make the process of mammography much more comfortable for the woman. And the paddle you just mentioned that Jim referred to is a paddle that's curved, whose surface is curved instead of flat. It's hard to believe that, for the first 50 years of mammography, that the standard method for imaging a woman's breast is to use a very hard, very stiff, totally flat piece of plastic, which obviously leads to discomfort when it's compressed.

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So we're very proud to be the first to introduce a paddle that significantly improves the comfort, but is not totally comfortable. And it's a paddle which, in a more—It's actually a paddle with two curves in it, and it's more sophisticated than just making a curve out of a flat surface. But it has been successful. And we have done studies to demonstrate that it does improve the comfort of mammography. But we think there's—that this is an area of underdevelopment by the company, which will continue probably forever, until mammography becomes totally painless.

Q: Right. Speaking of pain, Jim had also told me about a recent addition that would allow patients to control the amount of pressure being exerted on their chest as they're getting a mammogram.

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A: Right. Actually, that's a development from a competitive company called General Electric. And it turns out—and it's an interesting development if, among other reasons, for psychological reasons. Because it turns out, when a woman has control herself, sometimes—or not infrequently, she exerts more force than the technologist, instead of less. Because of the fact that she does have her own control. So that type of development has a psychological component,

which is not fully understood at this point. Because the original intention was that maybe less force would be needed with that arrangement. So the answer, I guess the final answer to that is, definitely TBD, too early to say.

Q: And I guess, is user feedback important in how you continue to edit these machines?

A: User meaning the customer or the patient or both?

Q: How about both. Yeah.

[00:58:16]

A: Well, nothing is more important in a business than customer feedback. [laughter] So yes. And so we listen intently to what our customers say. Customers and patients don't always have the same opinion of everything. So for example, in this particular area of comfort, well we know what the patient's point of view is. The more comfortable, the better. In general, unless you're very careful, well I guess the better way to say this is, other attempts to make mammography more comfortable have led to reductions in the quality of the image achieved.

[00:59:20]

And let's say a concern about missing cancer. So the customer who's a radiologist typically has a higher concern about missing a cancer in an x-ray than the comfort. Whereas the patient, not knowing what the image really means, sort of has a higher focus on the comfort. So we have to listen to both. But you can see that these are not always points of view that are aligned.

Q: So my next little batch of couple questions is focused on winding down the interview. But I just want to take a quick second now to ask how we're doing on time.

[01:00:11]

A: Well I've allocated an hour and a half. So if you say winding down, I think that will coincide with the allotment.

Q: Yeah. I think that will wind up perfectly then. All right, awesome. Thank you. So what parts of your career have you been the most proud of?

[01:00:43]

A: I guess there's been maybe too many of those to make it interesting on an interview, because I was just reminiscing recently about the first time we introduced a product. Typically, in our field of radiology, x-ray, medical x-ray, the new developments are announced at a absolutely spectacular trade show every year that's held the day after the Monday—actually the Sunday after Thanksgiving in Chicago.

[01:01:45]

And it's called RSNA, which stands for the Radiology Society of North America. But the event itself is generally referred to as RSNA. And it's a massive really enjoyable visit for anyone, where you can see an array of equipment used in the field of radiology, as far as the eye can see. It fills the auditorium of MacCormac College has a huge meeting facility. Anyway, I was just reminiscing recently about introducing an x-ray bone densitometer at this particular show called RSNA, for the first time. I'm afraid now it was about 30 years ago.

[01:02:44]

And it was, I would say, it won an award for the most innovative exhibit among small companies. [laughter] Which you would say doesn't sound that impressive, and I would agree with you. But that was a great event. And there must have been at least—I will tell you, there must have been at least a dozen others of equal satisfaction in the course of my career, almost all of which were associated with the customer acceptance of some kind of new product introduced along the way.

[01:03:32]

So I don't know if that answers your question I don't know if I can do better than that. Everyone would like to hear about a single event. But I've had a really remarkably enjoyable career, because there have been so many of these events.

Q: Right. And I think that's a good answer, in and of itself, because, you know, that counts. And what I'm interested in is your perspective, rather than to hear that there's one event. You know what I mean?

[01:04:03]

A: Yeah, I understand. Yeah. And that's the fact. I'd say I never sat down and made a list, but there might be as many as 10 or 15 products that I have been involved in over the years. And if there were 15 of them, 10 of them were extremely satisfying and memorable events.

Q: That's a good career.

A: Yes it was.

Q: I do have to follow up, since you had mentioned that customer acceptance of a new thing was a highlight. What was it like to get customers onboard with something new?

[01:04:48]

A: Well, this is—that's a common point of view that it doesn't sound very interesting. But when I first went into the private industry, my training was in academic physics. And the point of view in academia, and particularly in academic physics, is that the goal of that profession, an academic physicist, is doing something new, or some area in science that hasn't been done before.

[01:05:48]

And when I went into the private industry, I found initially, to my surprise, but it makes total sense as you'll see in a minute, that it wasn't new that was needed. The key to success in an industrial environment is not new. It's something that customers—And let me rephrase that. It's

not something new technical. It has to be something new that makes the customer's life better. And there really is an adjustment needed, and to this very day, in terms of the goals of these different areas of society.

[01:06:40]

So that the challenge in the private industry is to find something the customer doesn't even know he would like, that may or may not involve a significant technological change. But the goal, in a way, is harder than the goal in academia, which is just to do something new, whether anyone cares or not. And if you set yourself the challenge of doing something that the customer thinks is better, that I guess the way to say it is, you have to do something the customer thinks is better, not what you think is better. And that's quite—I found that to be quite an adjustment in attitude, that is not as widely recognized as a challenge, as it turned out to be, which it was easy to make something new. The trouble was, most of the time the customer didn't care about it.

[01:07:42]

So I would say, in a way, part of the satisfaction in an industrial environment is the challenge of doing, not something new. That's easy. Something new that the customer appreciates is better, is a steeper challenge than just new. So I don't know how I got onto this particular explanation. But I do remember, when I started my career, that I really was, in a way, energized by the fact that there was a challenge to overcome, that was, in a way, a more challenging challenge than I had anticipated before I got there.

Q: So I have a feeling I probably already know the answer to this one. But if you had a chance to go back and do anything differently, what would you do differently and why?

[01:08:54]

A: Well, actually I've never even thought about that. So let's pause for a moment, and let me get that a moment's thought. I don't know. I'll say something related to your question. I guess the answer—Wait, wait. Let me back up a moment. The correct answer to that question is I don't know. I don't really know what I would have been done differently, because in a way, I

thought—and I'm pretty sure this is correct. In a way, I thought I was very fortunate and lucky in the following sense.

[01:09:55]

I was trained in a field of x-ray science that, even in hindsight, went through a remarkable transformation during my lifetime. I don't know—you're not old enough to go back as far as I can. But just to set a standard, when I entered, when I first went to work in a private industry, all x-rays were done with film.

[01:10:32]

And during my career, not only did x-rays convert from being done with film and being done with a digital detector, even more remarkable, a type of x-ray imaging that never existed before, called CT scanning, was invented. And as I mentioned to you earlier, I did participate in that for a while. When I started my career, there were no baggage inspection systems at all, because it wasn't done. And now you know there's a whole array of x-ray equipment. And it's used in the airport screening environment, both for checked baggage and for carry-on baggage.

[01:11:27]

When I started my career, bone density was not measured. And today, it's a standard medical practice for women. So one thing my career coincided with was a tremendous blossoming of real need for different types of x-ray improvement. And in hindsight, I'd have to say that was just good luck. It's like, it's equivalent, I always used to think, what would have happened to Steve Jobs or Bill Gates if they had been born 20 years later, when the opportunity for devices, the internet, and personal computers would no longer have been available? And the answer is, well, we'll never know.

[01:12:19]

But I believe that you can't—you really can't go back and disassociate yourself and your—what's happened in your life from the circumstances in the outside world that help influence it while

you were living it. So I guess the answer, long-winded answer to your question is, I don't know what I think I could have done differently.

Q: What would you say the most rewarding and least rewarding aspects of your career have been?

[01:13:06]

A: Yeah, that's a pretty standard question, which I've never thought about either. I know the most rewarding parts, the most rewarding part was working with some—I like to refer to them as the world of unsung heroes, in every profession that exists, some of these brilliant and frequently not widely recognized talented people, who teach you things, and make the job really interesting. So that was definitely the most rewarding part, was those talented people.

[01:13:58]

The least rewarding part, I would say, now that I think about it, is not a surprise either, was dealing with—dealing with some of the personalities who were some of the most difficult and frustrating people along the way, also. So there you have it, in both cases, totally people related experiences.

[01:14:38]

And I would have to say that the second most rewarding part was actually seeing the results of those efforts, the collaborations with the unsung heroes, seeing those efforts succeed in the market, meaning it improved the lives, in our case, because it's medical equipment, it improved the lives of numerous people who you never see, where rewarding is knowing that that was the result. But I think that pretty much answers your question I bet you it's a very common answer.

Q: So second to last question To your mind, what do you think has been the major contributors to the success of Hologic?

[01:15:46]

A: Let's see. I would say the two things we mentioned before, technological, technological improvements that were—it's kind of a trivial statement—technological improvements that customers liked. Not just technological improvements. Particular improvements that met the needs of customers. Ask the question again. I lost my train of thought.

Q: So to your mind, what have been the main contributors to Hologic's success as a company?

[01:16:42]

A: Oh. I'd say that. It was important that the technology be correct for the customer base. And I still, I still would say that the other biggest contributor was the issue we spent a little time on before, having a proper culture, at least in the time that my career existed, that was the appropriate culture to capitalize on the opportunities that were available. And I'd say it was mostly those two things.

Q: Say two important yet often overlooked things.

A: What's that?

Q: I said two very important, yet often overlooked things.

[01:17:42]

A: Yes, yes, that's correct. Which is not a surprise.

Q: Okay. So onto my final question It's super difficult, I promise. So over the course of our two-part interview here, is there anything that I have not asked you, that you really wish I had asked you about, or that you'd like to talk about, just to get it on the record?

[01:18:12]

A: Well, I had a number of things I did want to get on the record. And I have to, if I may answer your final question with a compliment, which is that the questions you asked did elicit

from me some of the things I really wanted to have an opportunity to say. And so the answer to your question specifically is no, I don't have anything else. But it's really a compliment to you. You may soon be entering my unpublicized but important list to me of unsung heroes, for having asked all the right questions, and been extremely hospitable host to boot. So there you have it.

Q: Thank you.

A: You're very welcome.

Q: Okay. So anything else? Or have we about covered all that we can cover in our time allotted?

[01:19:29]

A: You can—I think you've covered all that can be covered in the time allotted, and within the scope of my memory, which is not quite as good as it used to be. But to the extent that that's all I can offer, I think we've covered it.

Q: That's great. This will be such a tremendous addition to our collection. Thank you so much for taking the time to sit down with me.

A: Not at all. And thank you for your interest in carrying on this type of work. I think it's very helpful.

Q: All right. I'll go ahead and stop the recording now.

END OF INTERVIEW