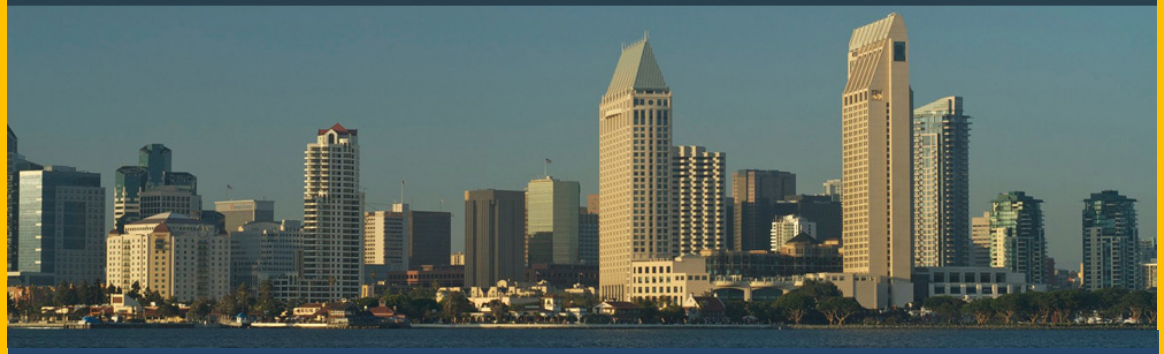
Lawrence E. Larson

Interview conducted by

Caroline Simard, PhD and Joel West, PhD

January 28, 2004

San Diego Technology Archive



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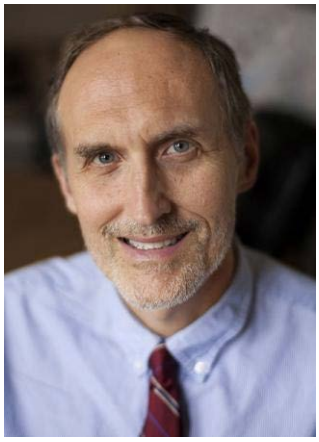

Dr. Lawrence E. Larson received the BS in Electrical Engineering from Cornell University, Ithaca, and a PhD from UCLA. From 1980 to 1996 he was at Hughes Research Laboratories in Malibu, CA, where he directed the development of high-frequency microelectronics in GaAs, InP and Si/SiGe and MEMS technologies. He joined the faculty at the University of California - San Diego, in 1996, where he was the inaugural holder of the Communications Industry Chair. He was Director of the UCSD Center for Wireless Communications from 2001-2006 and was Chair of the Department of Electrical and Computer Engineering from 2007-2011. He moved to Brown University in 2011, where he is Founding Dean of the School of Engineering. He has published over 300 papers, received 40 US patents, co-authored three books, graduated 23 PhD students, and is a Fellow of the IEEE.

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THE SAN DIEGO TECHNOLOGY ARCHIVE

INTERVIEWEE: **Lawrence Larson**

INTERVIEWER: **Caroline Simard and Joel West**

DATE: **January 28, 2004**

LOCATION: **San Diego, California**

SIMARD: A big part of our interest is the role of university-industry interfaces in the original economy. Obviously I thought that the Center for Wireless Communication was an important component. It wasn't here at the very beginning, but it was created in '95?

LARSON: Ninety-five. That's exactly right. Yes.

SIMARD: Do you know how it was created? What was the motivation?

LARSON: It was like many things here in San Diego. I think Irwin Jacobs had a lot to do with its founding. He had been pushing for UCSD to get something like the Wireless Center going for a number of years. Things move very slowly at universities, and there's a built-in inertia, and it required kind of catalyst on our side to really make that happen. Bob Conn was a fairly recent dean. I believe he joined in '94 or '93, from UCLA. Bob was a very dynamic kind of guy and he liked to form these university-industry partnerships. So he got together with Irwin and they finally decided that, "Yeah, this really would be a great thing to do." And so, Bob started to push it here on this end, and Irwin began to push it from the industry side in the sense that he brought in people from other companies that would step up to the plate and support the Center. I was not here at the time, but there were a whole series of endless meetings, apparently, involving Bob and Irwin, and Larry Milstein, who is the founding director of the Wireless Center. Together they started off with maybe thirty companies that expressed some initial interest, and eventually a deal was struck and the Center was created with five, I think, founding industry partners. And, that got us

going. So, I think that, the combination of Irwin's persistence and – [Joel West enters] hi.

SIMARD: Hi.

WEST: I'm a bit late.

LARSON: Oh, that's okay. I'm Larry Larson.

WEST: Joel West.

LARSON: Joel. I'm sorry. Have a seat.

SIMARD: We were just talking about the founding of the Center and how it came about.

LARSON: I think the combination of the persistence of Irwin and Bob Conn's leadership here at the school, and Larry Milstein's patience and persistence too. And ever since then . . .

WEST: What year was that?

LARSON: That was '95.

WEST: So, this is before the naming grant for the school, is that correct?

LARSON: The naming grant by the Jacobs?

WEST: Yes.

LARSON: That's correct. Yeah.

SIMARD: Right.

WEST: Okay.

LARSON: That was '98, '99, something like that.

WEST: Other than the fact he used to teach here, what kind of relationship had Irwin Jacobs had with the school before the Center was founded? I'm sure there must have been some sort of informal or ongoing relationship with all his former colleagues, and feeding students, and so on and so forth.

LARSON: I came here in '96, so this is sort of before my time.

WEST: Was there an institutional linkage? I mean, was there a precursor to the Center?

LARSON: I don't believe there was any institutional linkage, formerly.

WEST: Okay.

LARSON: There were a lot of informal, ad hoc kinds of things. We have many, many ex-students here that are very high employees at Qualcomm.

WEST: Right.

SIMARD: Uhm-hmm.

LARSON: And Andy Viterbi was here as a faculty member.

WEST: Really?

LARSON: And he went on . . .

WEST: I thought he had been, I thought he went straight from UCLA to Linkabit? So, he actually taught here?

LARSON: He did. He had a – and once again, this is before my time, so I may be getting the facts slightly off. But, he had a part, not a part-time . . .

WEST: Maybe adjunct?

LARSON: It wasn't adjunct even. One could have a full appointment or a half appointment, and he had a half appointment.

WEST: Oh, because he had been tenure-tracked in the UC system, so probably was using that?

LARSON: Right. So, he came in and he would teach. He was basically sort of half-time.

WEST: Okay.

SIMARD: Right.

WEST: So, he was teaching here long after Irwin stopped teaching? Right?

LARSON: That's correct.

WEST: Okay.

LARSON: He was. Yeah. Then he sort of switched over to adjunct professor at a point and I think he was an adjunct up until quite recently, maybe just until two or three years ago.

WEST: Yeah. And as I recall, he was keeping his textbook current through the '90s?

LARSON: Right.

SIMARD: Yeah.

LARSON: Yeah. I think that's right.

WEST: I hadn't even thought about that. I was thinking, why would somebody who's running a company be keeping their textbook up to date? The only people that keep textbooks up to date are people in the classroom.

LARSON: Well, he just wrote a book on CDMA that came out two or three years ago, so he's still active, technically. He's still a pretty deep technical guy.

WEST: Now, did he play any role in the Center, or was it more Irwin and the business?

LARSON: I think it was more – actually, one of the things about the Center, which I appreciate, is that we are sort of perceived externally as being very heavily tied with Qualcomm. But, that's really not the case. In fact, they're quite hands-off in terms of the administration. They're no different from any other company.

WEST: But, they did put in a lot of the money to get it started, right?

LARSON: No more than any other company.

SIMARD: No more?

WEST: Okay.

LARSON: No more than... There were five initial companies, Fuji, Hughes Network Systems, TRW, Nokia, and Qualcomm, and they all put in the same amount of money. Now, Irwin was very . . .

WEST: Nokia in '95? I didn't know Nokia even knew San Diego existed in '95?

LARSON: They had a small group.

SIMARD: Yeah. They already had opened their CDMA group.

LARSON: Every one of those companies that I mentioned had a group.

SIMARD: They opened in '91.

LARSON: They had a strong local presence.

WEST: Okay. What was Fuji's interest then?

LARSON: Fuji may have had a local division here at the time. Fuji is very interested in wireless sensors. They do a lot of work on wireless poles, these smartcard types of things, and on smartcards. Actually, I'm not quite sure. They don't have a local presence. They may have had one back in '95 but I don't think they do anymore.

SIMARD: What was the fifth company? You mentioned Fuji, TRW, Nokia, Qualcomm, and?

LARSON: And Hughes Network Systems, HNS. Irwin certainly put in a lot of time, but from a corporate perspective, Qualcomm has never put in more than anyone else.

SIMARD: Do you have the members over time? Lists of the members?

LARSON: We do. I could get you that.

SIMARD: That would be great.

LARSON: I don't have it off the top of my head. We're actually up to, I think, sixteen members right now. We've been as high as sixteen, and then during the downturn it was down to thirteen, and now back up to about sixteen. But, we do have a fair amount of companies that have financial issues that come up that prevent them from continuing. You know, Hughes Network Systems has had a horrible time here locally,

financially, and so they were a founding member that finally has left us. Most of our founding members are still with us, and we've grown over time.

SIMARD: So, what is the model? Companies pay a membership and then what do they get, access to research, or the technology?

LARSON: Yeah. They get a little bit of everything. They get lots of different things. They get access to the research. There are a couple ways access can come about. One is just through, we have twice-a-year research reviews, which are pretty intense two-day affairs. They send their best engineers to our research reviews and hopefully they get access as they're talking. There's also an IP agreement that we have with our companies, where they get early access to the IP, and nobody else outside the Center gets access to it for a period of time.

WEST: How long is that period?

LARSON: It's sort of two and a half to three years. There are some vagaries in the patent process that make it somewhat obscure. And, the patent has to be actually issued. So, if the two and a half year window expires and the patent hasn't been issued, then the window keeps going until the patent is issued.

WEST: Now when you say "access to IP" . . .

LARSON: That means patents, usually.

WEST: Well, I was going to say, the "access to patents" and "access to trade secrets" are very different.

LARSON: Right. Right.

WEST: So?

LARSON: We do not do trade secrets.

WEST: Okay. So, it would be patents or copyright?

LARSON: Or a copyright. There has been some software that we have considered copyrighting, but we haven't gone down that path. That would be another possibility.

WEST: So essentially, they can license the patents before anybody else so that people can't license them until it's issued?

LARSON: Correct.

WEST: So, they can license the IP, which is not yet patent granted, before it's patented, whereas everybody else has to wait until the patents granted?

LARSON: Or two and a half years.

WEST: Okay.

LARSON: If the patent is granted before the two and a half years, they're still the only ones who can get it. So, they get a minimum of two and a half years, and then more if the patent is filed.

WEST: Who pays for the patent filing?

LARSON: The companies do, and those who are interested. When we have a patent disclosure we ask them, "Is anyone interested in potentially licensing this?" If they do express an interest then they have to share in the patent costs amongst however many companies. Typically . . .

SIMARD: But, they do not own the patent in any way during that process?

WEST: It's still owned by the Regents of . . .

LARSON: That's right. Yeah. UC always owns the patents.

SIMARD: Do you go through the TTIPS [Technology Transfer and Intellectual Property Service] Office at all?

LARSON: Exactly right. Yes. We go through TTIPS.

SIMARD: So, they work with the companies?

LARSON: Yes, to license it. Put a license agreement in place. The most common license agreement we strike is a royalty-free nonexclusive, because the companies usually don't want to pay royalties, and if they have early access to it they don't care so much that other people might get access to it a couple years down the road. So, that's a typical agreement that we strike.

WEST: Essentially what you're doing is generating spillovers for most of the wireless economy and your sponsors get first dibs on the spillovers?

SIMARD: First dibs? Right.

LARSON: I think that's a good way to put it. We have a lot of members from Europe and Japan, or the Far East now I should say. They seem to derive more benefit from sending visiting scholars over here. If they send their young engineers here, they spend a year or two, they take the classes, they work with the professors, and then they go back. That's also covered in the member agreement. So, that's how they get the benefit.

WEST: Are they actually matriculated as degree students, or are in they in a . . .

LARSON: No. We have a so-called "visiting scholar" designation for them, where they get a desk and computer access, and they get to sit in on the classes.

WEST: But effectively they're nonmactriculated graduates?

LARSON: Correct. Yeah.

WEST: Okay.

LARSON: Yeah. Also, human resource or recruiting was another benefit of membership. A lot of the students do summer internships for the companies, and the companies were hiring students who became incredibly important to these companies. That was a big benefit. Obviously, when the bubble burst, the hiring was nonexistent and that's slowly being built back up again. But historically, that was always one of our missions, to put our students into these member companies.

SIMARD: Yeah. That would be a big benefit.

LARSON: Yeah. Yeah.

SIMARD: When you decide on your research agenda, do you try to consider commercialization potential? Or do you decide what the Center will research purely in an academic sense, and then if it applies, good for them, if it doesn't . . .

LARSON: Yeah. No, it's really almost the opposite of the traditional academic sense. We experiment with all kinds of models on how we choose the projects that we work

on. When we first started, we tried a lot of things that didn't work terribly well. We finally kind of stumbled onto what works well for our Center, and that is that we run our projects on a two-year cycle. About a year before a new project begins we start talking to the member companies.

WEST: When you say "a project," how big is a project?

LARSON: A project is five to seven graduate students and two or three professors. From a monetary perspective that's $200k-$300k per year.

WEST: What percent of man-hours are professors working: quarter-time, half-time on this? And the grad students are working half-time?

LARSON: Grad students are full-time. We do only PhD students. We don't support master's students. We have twenty professors in the Center, and roughly fifty graduate students at the moment. Graduate students are full-time. The UC counts professor hours strangely. So whatever they can spare, they do. We give each professor about one month of summer salary. They're supposed to spend at least a month in the summer but then when they're not teaching I'm hoping that they're doing the research.

WEST: My understanding is it's a UC rule, and I don't know how it goes for sponsored research, but for consulting you're limited to essentially one day a week.

LARSON: That's right.

WEST: It's your free time. But, that wouldn't apply to doing sponsored on-campus research?

LARSON: Oh no. No. No.

SIMARD: No.

WEST: Okay.

LARSON: Sponsored on-campus research you should be doing four days a week.

SIMARD: Yeah.

WEST: Well, they are supposed to be in the classroom at some point? [Laughter]

LARSON: I won't touch that one. All I can tell is the more research you do, the better, as far as your career goes.

SIMARD: Yup. Yeah. Uhm-hmm.

WEST: So they're working twenty to thirty hours a week then, typically, on that sort of sponsored research?

LARSON: Well, I'll just tell you my own – when I'm teaching I probably put in ten to fifteen hours teaching and thirty to forty hours research. So that's, three to one, four to one kind of numbers. I don't know if that's typical. My perception is that's pretty typical around here. But, every school is different.

WEST: And when you say "teaching," that's just standard two-two?

LARSON: One or two classes per quarter.

WEST: Okay.

LARSON: Okay. So, the process for picking up the projects. About a year before a project ends we start to meet with our member companies. Usually this is done at the time of the board meeting. We have board meetings twice a year. We basically say, "Okay, what do you guys think is important, what's important coming up in the future?" And our board members get up and give us presentations on what they think is important. A little more than a year ago, we had this wonderful meeting where everybody gave a ten-minute presentation on the important wireless technologies of the future, from their perspectives, from their corporate perspectives.

WEST: And when was that?

LARSON: That was last November 2002.

WEST: Okay.

LARSON: For projects that begin in August of 2003, we kind of took that and we distilled it. We took good notes and then we all got together and came up with a bunch of projects that sort of addressed what we thought they told us was important. We came up with probably about eight or nine projects that addressed each one of the key areas. We sort of had to match these to their interests and our interests too.

LARSON: Right. Right.

LARSON: But generally speaking, a project that is of no interest to them is a nonstarter. I'll tell you why in just a second. Because, what we do then is we write a bunch of white papers based on these projects that we think are going to be important. In the late winter we send these white papers to our member companies and they vote their dues on the project. So, they choose where they want to put their money.

WEST: How much are their dues?

LARSON: $120k a year.

WEST: So essentially they could say, "I'll fund $125k on this project or I can fund five projects at $25k" or whatever?

LARSON: Right. And we have both extremes.

WEST: Okay.

LARSON: And everything in between.

WEST: What's the most scattered that somebody would do?

LARSON: Some companies peanut butter it very evenly amongst every single project.

SIMARD: Hmm. But then the access to IP they get is not limited to the project that they chose to fund?

LARSON: Exactly. All members share equally in all graduates. You don't see, "Oh gee, if I don't support this project I don't get access to it." Nobody has that feeling. Everybody shares equally.

SIMARD: That's kind of like almost a venture capitalist. They won't be worried, "Where should I put my money?"

LARSON: Yeah.

WEST: Exactly. So, out of the eight or nine that you propose, how many get funded?

LARSON: Well, that's interesting. You know, we've been doing this for about six years now and the first time we did it, it was a little bit of a culture shock. We maybe proposed twelve projects and only eight got funded. But, of the four who didn't get funded, nobody wanted to fund it. [Laugh] So, so last November and last spring when we did this, every project got funded. People got a little bit savvy. They realized that they can't be too far in front of the companies or the companies won't support it. So, this works pretty well. The companies seem to be reasonably happy with this model.

WEST: What about the faculty?

LARSON: The faculty, I think, are pretty happy too, because it has led to a very healthy Center, financially. I mean we, there was this horrible downturn in the telecom economy. It was just a complete meltdown, and we stayed strong through it. We lost a few members, but by and large, our membership stayed strong.

WEST: So, they're willing to accept the applied direction in exchange for knowing that this is going to go on?

LARSON: Right. It's a growing concern.

SIMARD: And it's a nice way to fund a research project as opposed to writing grant proposals?

LARSON: Yeah. I don't want to say it's easy money, because actually, there's a lot of interaction that has to be done. These twice-a-year reviews are very intense with the member companies, and there's a lot of overhead. But, I think that the nice thing about it, from the faculty's perspective, is that there's a very high probability that you get funded if you write a proposal. With other funding agencies, like NSF or DARPA, it's very hit and miss. So, it's a good way to get a very stable source of funding for your group. Now, there are very few professors that rely on this exclusively for their funding. Actually I think that's a good thing, although it leads to some faculty disengagement with the Center. And so the problem . . .

WEST: What do you mean "disengagement?"

LARSON: I'll explain what I mean by that. I'm sort of the exception as the director, because I was completely consumed by the Wireless Center. But, for any other faculty member, the fact is the Wireless Center can only fund a third to a half of a strong

group here. So, you have to be out also developing contacts with funding sources outside of the Wireless Center. What that sort of . . .

WEST: Is there an overlap? Do they talk to the members outside of the Center or is that forbidden or not going to happen?

LARSON: You mean the faculty?

WEST: Yeah.

SIMARD: Can they have funding outside of the Center?

WEST: Can they cut a deal with Qualcomm or Nokia separate from going through the Center?

LARSON: Yeah. In fact, we do that very often. And I'll explain how that happens too. It's fine. I've even done it. It's really not a problem. Tony Acampora was director for many years here, a splendid director. He came from a Center for Telecommunications Research at Columbia. And there, if you were CTR faculty, CTR was all you did. You didn't have any other really funding outside it. So, it was a very tight, faculty were very tight. They met regularly. They brainstormed together constantly. It was a very, very close working relationship. We don't have that. We had that kind of sporadically here, but it's not Wireless Center oriented. It's more sort of just fun oriented. Like the com guys would be very tight, and the circuits guys would be very tight. As a Wireless Center we don't have a kind of a group, you know. There's no kind of group mind that has developed over time.

WEST: Could you really set up something that tight in the School of Engineering?

LARSON: It's hard to do. If you go over to the Center for Magnetic Recording, they're a little bit more like that. The reason for that is that there are only four or five professors associated with that Center, and in their own separate building. All they do is get money from the Center for Magnetic Recording. They don't have any other funding sources. So, they're a pretty tight group. That might create its own problems. To me that's not necessarily an ideal.

SIMARD: No, because you bring in knowledge from all over these networks with different people?

LARSON: Right. Right. Right.

WEST: But, it just seems to me that in the UC culture it would be very hard to have a group that's tight.

LARSON: Right. Yeah.

LARSON: The other thing that we do that helps a lot is the UC Discovery Grant process. We take these white papers that the companies fund and then we turn them into full-blown proposals. Then we send those proposals off to the UC Discovery Grant people. If they pass a fairly rigorous peer review process, they match the money on sort of a dollar-for-dollar basis. It doesn't really allow us to double our funding, because they strip off the overhead. The company money and the state money are burdened with overhead. Whereas, if we didn't go through the UC Discovery Grant process, there would be no overhead. So, we get about fifty cents on every dollar, from the State. But, that's still a wonderful additional source of money flowing through the Center.

SIMARD: When did they start that initiative?

LARSON: About four or five years ago. It's gone through some name changes and things like that, but it's a really great program. I just can't say enough good things about it.

SIMARD: Is the rule, like "If you find a company, industry funding then we'll match it"? Or is the rule, "Submit anything," and . . .

LARSON: No. You have to have a match.

SIMARD: Okay.

LARSON: So, you can't just submit it.

SIMARD: From whomever?

LARSON: From whomever. It has to be a California company.

SIMARD: But, it has to be in industry?

LARSON: It has to be in industry.

SIMARD: Not a research – not . . .

LARSON: Right. That's a lot of good questions. Yeah, specifically they want electronics, like electronics or telecom manufacturing, or research within the state of California.

SIMARD: That's interesting.

WEST: Matching was the problem in Sacramento. I'm surprised it survived.

LARSON: Yeah. It's taking some hits in this budget. In fact, I've just been on some conference calls about it with some of that Executive Committee. The cuts could be draconian or just painful, and we're not really sure. [Laugh] It will not go away. Apparently, the program will not go away, which is very good news.

SIMARD: That's good. Yeah. That's really good.

LARSON: Yeah. But, it does have some implications for us, because it really allowed us to grow our budget by about fifty percent. So, if it goes away we have to plan for that. I've been working with my associate director and the budget people on some of the worst-case scenarios. Of course, the other problem is that next year, tuition goes up dramatically, but our funding doesn't go up dramatically. [Laugh] So, we have to also . . .

SIMARD: Fund fewer students or . . .

WEST: Oh, you have to buy off at whatever the going rate is for your students?

LARSON: Sure. Yeah.

WEST: Okay.

LARSON: I think in-state tuition at the graduate school is supposed to go up by forty percent next year.

WEST: Whew.

SIMARD: Oh my god. I knew it was bad, but I didn't know it was that bad. [Laugh]

LARSON: Yeah. I think it is twenty percent for nonresident and forty percent for residents.

WEST: Well, I had also heard, and I don't know how this applies to engineering, but at least in business schools that nonresident tuition now at UC is higher than USC.

LARSON: Is that right?

WEST: Uhm-hmm.

LARSON: I hadn't heard that. Yeah. Well, it should be really. Or, it should be comparable.

SIMARD: Right. Right.

WEST: Which is not a problem for UCLA, but it's a problem for Irvine and Riverside.

LARSON: Right. Yes. Yes. And we're starting up a business school here. I don't know if you saw that.

WEST: The Rady School.

LARSON: There's some press on that recently?

SIMARD: Next year, right? 2004?

WEST: Well, they've been hiring. They hired the dean?

LARSON: Right. It was so funny: there was a long article in the Economist on this last week. They had this picture, but the picture was of Harvard. This is an article on the UCSD Business School and they had a picture of Harvard. It made me mad.

SIMARD: Oh, interesting. [Laugh] Okay.

WEST: Yeah. Well, the view is much better at this school.

SIMARD: They want to be the Harvard of the West Coast? Or . . .

LARSON: Ah. Thank you. Of course.

SIMARD: Stanford is competing for that already.

WEST: Just something quick on this matching. With this matching money, this is for grants outside of the Center, is that correct?

LARSON: No, it's within the Center. So, I mean it's for anything.

WEST: Okay. So, it applies for a faculty member who gets thirty percent of his or her money from the Center and seventy percent from other deals, then if the other deals involve California companies they do matching?

LARSON: They do.

SIMARD: Right. Right.

LARSON: And, that actually leads into this other question that you brought up about, "Can professors cut separate deals?"

SIMARD: Right.

LARSON: So, I don't know if you are going to talk to Larry Smarr or Ramesh Rao?

SIMARD: Yes. I've talked to them at a previous occasion.

LARSON: Right. Calit2 has these engagements with companies that they help facilitate. I have one with Intersil and I have one with Ericsson, both of whom are, by the way, members of the Wireless Center. I got separate contracts for some specific research that they wanted to do. Frankly, they didn't want to share the IP with the other members of the Wireless Center, so they had their own separate IP deals for those contracts.

SIMARD: For the whole Calit2 it's a separate IP project?

LARSON: Right. And . . .

SIMARD: Do they have the same members of companies? Or, are some members of both?

LARSON: Some are members of both.

SIMARD: Okay.

WEST: So, this came through Calit2.

LARSON: This came through Calit2. Right. Almost every Calit2 member is also a member of the Wireless Center.

SIMARD: Oh, okay.

LARSON: With very rare exceptions. So, AMCC, Ericsson, Intersil, IBM are all members of Calit2 and the Wireless Center, and they've all concluded separate deals for additional research that has separate IP arrangements and separate funding.

WEST: What would the typical IP relationship be for Calit2?

LARSON: I actually wasn't involved in negotiating all of those. The Wireless Center IP Agreement is so complicated that I can barely keep that one going. [Laugh] But, at Calit2 there's no one blanket IP agreement. Every company has its own separate agreement that was negotiated separately. Every company wants to do things differently. Very commonly, however, a nonexclusive royalty-free agreement is the way that we do it with these companies and Calit2.

WEST: Do they get exclusivity?

LARSON: They get exclusivity for a certain period of time. So, it's not exclusive after Year X, and it's royalty-free in perpetuity. But I have to say that there's no typical agreement in Calit2 because every company has its own peculiarities and pressure points.

WEST: Will the Regents of University of California grant have permanent exclusive license?

LARSON: They might. I mean, you've have to talk to Alan Powell about that. I don't see any reason why, in principle, they wouldn't. If it financially makes sense for the university to do that and ensures that the technology is used by society—I think those are the two major criteria—then they probably would.

SIMARD: For your center, is it royalty-free in perpetuity as well?

LARSON: Once again, every company is different: some companies want no royalties, so a royalty-free non-exclusive is a great way to go. Other companies, they don't care about that, but they want to pay a certain amount of money up front and then have an exclusive.

SIMARD: Right.

LARSON: Right. Just theirs. We've done both. Every company has its own culture and they've all got these big Excel spreadsheets with cost models.

WEST: Wait. I guess I wasn't clear. I thought you had said that all of the Wireless Center IP was non-exclusive? Or is that just typical?

LARSON: No. That's not all, but that's typical. I would say that our most common approach is non-exclusive, royalty-free.

WEST: Okay.

LARSON: But, some companies actually would prefer to pay money up front and then have exclusive.

SIMARD: Right.

WEST: And that's exclusive to all members of the center or that's exclusive to the people who pay for it?

LARSON: You can't have something exclusive from all the other members of the Center. If another member of the Center wants to participate, then we cannot conclude a license agreement that would exclude anyone else. But, it can be exclusive to people outside the Center.

WEST: Wait, so Company X says, "I want this exclusive." And Company Y says, "Oh, I hadn't heard about that. I want that too."

LARSON: And, they're both members of the Center?

WEST: Both members of the Center.

LARSON: Right.

SIMARD: They both . . .

WEST: They write the same check, cut the same deal, and then those two members get it while the other eleven members don't?

LARSON: Correct.

SIMARD: Right.

WEST: Okay. So, basically any member of the Center can buy into an exclusive deal?

LARSON: Yeah. Actually the way we have it is that companies have a certain time period where they can jump in and be allowed to license. If they miss that time window, then they can't do it anymore. It's a year or two years, or something.

WEST: So, in the one case the non-exclusive, they'll get it anyway because it's available to all Center members.

LARSON: Right.

WEST: But, in the other case, then, if it's exclusive in perpetuity they'll never get it, and if it's exclusive for some period they'll be treated like an outside company?

LARSON: That's right. That's right. There was one case where one company wanted it exclusively and no other company in the Center had any interest, and they got it. They got the exclusive license on it.

SIMARD: Right.

WEST: I was actually talking to my colleagues at UCI. We're trying to set up a Social Science Research Center, and we have some of these same issues. One of the things that I was wondering about, that they've faced, is that the presentations you were talking about for the stuff they're interested in are very tricky. They're worried that Company X won't want to stand up with the other eleven companies in the room and say, "This is what we think is an interesting area and we'd like you to pursue it."

LARSON: Yeah. You know, we have been shocked by how open they are around each other. We were worried about the same thing, and we gingerly took the step of asking them to do this. And, not a single one said no. And so, maybe they pulled out all this stuff, which is possible, or maybe . . .

SIMARD: That would defeat the purpose?

LARSON: Yeah. Or maybe it's so far out that they'd. . .

SIMARD: A five-year window?

LARSON: It's five years away. So, what they're saying isn't on a critical roadmap path for them. I suspect that if they think a really critical thing is super-secret, they will not share.

SIMARD: They will develop in house?

LARSON: They'll develop in house. Yeah. I don't know why it's worked so well. I think that our members are a very public-spirited bunch of companies. There's another center that's being set up here on telecommunications, and the – I'm sorry, the – I can't remember the name. But, Andrew Chen is starting it up and his worry was that one company would say, "Okay, I don't want you to let Company X, Y, or Z in. We're Company A and we don't want X, Y, or Z to have anything to do with the Center." I guess he had some hints from some companies that this was an issue. We've never once had any of our companies say that to us. So they . . .

WEST: Well, you don't have Microsoft in Wireless, you see. [Laugh] That's the company usually people specify most often that they don't want to be let in.

LARSON: That's a good point. Well, believe me there is no love lost between many of the members of our Center. But . . .

WEST: And again, Qualcomm comes to mind?

LARSON: Now, I won't mention any names. [Laughter] There's no love lost between them. These people are tooth-and-nail competitors, and they'll do anything that they can in the business world to take market share. But here, it never comes to mind.

SIMARD: It's about exchanging ideas?

LARSON: It's about exchanging ideas.

SIMARD: And setting up the future?

LARSON: And idea flow, and educating the students, and doing great research. Sometimes, financially, they just can't hack it. They get to a certain point and they can't afford it anymore. But . . .

SIMARD: Do you know how much they pay to be in Calit2 as well?

LARSON: Once again, it varies totally. Sometimes it's quite a bit more than what we charge for the Wireless Center and sometimes it's quite a bit less. They're more open to in-kind contributions and all kinds of creative financing that we can't do.

WEST: Now, you say that they kind of all pull together and there's almost an identity. Among the representatives in the Wireless Center, is there any sort of sense of loyalty to the cluster, to the San Diego Wireless Community or Industry. Because, it seems to me that if they're doing anything beyond what benefits their company, they're building up the infrastructure and capabilities of this area. Or, is it just more that they're accepting that what they lose to Company X will be matched by what Company X loses to them and it'll all cancel out in the long run?

LARSON: I think it's more of the latter. Yeah. It's not so much that they're loyal. I think building up the San Diego area is not high in their list of reasons to join the Center and engage with us. I think building up UCSD is pretty high on their list. Getting the good IP and getting good students is also pretty high on their list.

WEST: Why is building up UCSD high on their list?

LARSON: I think that they see it as a long-term... I think they sort of bought this argument that Silicon Valley has used for many years, that Stanford and Berkeley were kind of centers of the world.

SIMARD: The IP? Yeah.

LARSON: Yeah. And I think that they sort of bought into that argument. I think more at the VP level in a lot of these companies they sort of buy into this. So, they see that, "If we can have a strong university here, we can develop great people here, and great people will want to come here, and the graduates will be the tops in the country, and this will be an international center of excellence.

WEST: Did somebody explicitly sell this vision or is it just sort of osmosis into their . . .

LARSON: Bob Conn had to sell his vision constantly. I think Irwin has also, very, very persistently. So, I think that, and I think Frieder Seible, our new dean for UC has. I think if you're a good dean at a major research university you sell this vision. They all sell it now. But Bob was particularly good at it. And, I think it's true. I think so.

SIMARD: Yeah.

LARSON: It's not just salesmanship. I think there's an element of truth to it.

WEST: Have you talked to Bob Conn?

SIMARD: No.

WEST: Looks like we need to.

LARSON: Yeah, you ought to. Yeah.

WEST: Well, the reason I asked this... Kind of as anthropologists we're not supposed to 'disturb the natives' and tell them about our findings, but this is kind of an interesting feedback loop. Because, we're studying whether this is, in fact, the next Silicon Valley, and the fact that somebody says, "It's going to be the next Silicon Valley. [Laugh] Let's . . ."

LARSON: It's a self-fulfilling prophecy.

WEST: Yeah. Exactly.

SIMARD: Let's do it. Yeah. Exactly.

LARSON: Yeah, but I don't think these things ever grow organically.

SIMARD: Except it seems to me as I talk to people from the university inside out, that the university was there first. Here, you have other elements first, but then the industry grew and fed back to the university a lot, which, I guess, happened at Stanford. But when Qualcomm got started, you didn't have the top engineering school here.

LARSON: Yeah. Right.

WEST: Well, when I applied to Stanford as an undergraduate in '75, Stanford was not anywhere near the top. They were maybe in the top twenty, but they weren't top five, by any stretch of the imagination.

SIMARD: Right. Right. So, they did grow too.

WEST: So, the fact that the semiconductor industry and the PC industry and whatnot grew up, and all the wealth and the resources that came back to it, was really something that happened in the last twenty years. It was a good school. Don't get me wrong. But, people were saying about Stanford, "Harvard is the Stanford of the East," because they were insecure about the fact that they were still thinking of themselves as the Harvard of the West.

SIMARD: Of the newbies? Yeah. Yeah.

LARSON: Right.

WEST: Berkeley was a much better engineering school in '75 than Stanford.

LARSON: Right. That's right.

SIMARD: Right.

LARSON: I think, you're right, San Diego, historically, has this reputation of being kind of a sleepy town that ...

SIMARD: Uhm-hmm. A sleepy military town.

LARSON: ... and kind of Navy oriented, and that we're not up at the level of Silicon Valley yet. But, it's improved since I got here. I had lived in L.A. since 1980 and it's improved a lot since the early '80s. The trajectories haven't been a problem.

SIMARD: Yeah. Yeah.

LARSON: I think UCSD has not had much to do with that, but I think recently it's starting to become more of an engine for the local economy. We have a lot of people in startups, key positions in startups, who are very interested in startups.

SIMARD: Do you have any cases of startups emerging from the Center? I'm not sure how that would happen, if the companies do get the IP first. But, let's say then they give it up. Have you had faculty from the Center leave with some of the IP and start a new company?

LARSON: You know, you couldn't have picked a worse time, because. . .

SIMARD: Yeah. It doesn't happen right now? [Laugh]

LARSON: Well, there were some startups and they've all gone under. So, I don't think our record of startups is particularly great. Tony Acampora was involved in a startup known as Air Fiber. They had some IP from the Center that was licensed to them, and that was a great company. I knew many of the founders, and it just was terrible timing.

SIMARD: I'm meeting with Jim Dunn on Friday.

LARSON: Right. So, that's one example. It's kind of a sensitive thing, and I don't have much control over it, but I'm uncomfortable with faculty members starting their own companies with Wireless Center IP. The members, in particular, are extremely sensitive about it. I've been co-director or director from May of 2000, and no issue has been more contentious and caused more bad feelings than IP from the Center.

WEST: IP to startups, or just IP in general?

LARSON: IP in general.

WEST: Okay.

SIMARD: Uhm-hmm.

LARSON: But, IP to startups too. I don't want to get into all the details of who said what and when, but the companies are really sensitive about this, as they should be. We have to handle IP very carefully. We have to make sure that it's made available to our members equally, at all times, and that nobody gets preferential treatment of any sort. As long as we do that I think we're okay.

SIMARD: Yeah.

LARSON: We also had some issues with the licensing. Our original membership agreement states that, "Here's the IP. You've have ninety days to decide if you want to license it." That was way too short of a fuse for these companies to make these decisions. So, that's how we came up with this three-year, two and a half, two-year kind of model, and companies seem very happy with that now. So, we had some fine tuning to do on the IP agreement.

SIMARD: Uhm-hmm. What about students? Do your graduates frequently go work in industry after they do a PhD, or do they typically go into academia? Do you have a mix?

LARSON: It's a mix. Most go into industry.

SIMARD: Most?

LARSON: Yeah. There are not a lot of faculty jobs. We just couldn't possibly train . . .

SIMARD: That kind of number? Right.

LARSON: Yeah. That would go into faculty positions. Actually, I just had one of my PhD students, who worked at Qualcomm towards the end of his PhD, he went to a faculty position back East, but that's the only one I've ever had. It's pretty rare. Larry Milstein has had a couple go to faculty school jobs. Most go into industry. I'd like to say that all of them go to our member companies, but that's not the case. But, it's a good, healthy percentage. It's two-thirds, fifty percent, two-thirds.

SIMARD: Wow. That's still pretty high.

LARSON: Which is pretty good. Yeah.

SIMARD: Yeah. Considering there's a worldwide job market slump.

LARSON: Right. And we don't track that too carefully, because once graduate students leave, it's a little hard to keep track of them.

SIMARD: Keep track of them?

LARSON: They go to a company and then they go to a startup, and then they come back to a company. It's very hard to really track that carefully. But, it seems to be about half to two-thirds that will go to . . .

WEST: Just out of curiosity, is that because they know these companies, because the companies know them, or is it because once you get past the member companies there aren't a lot of major companies that are playing in the area that they're studying?

LARSON: I think all of the above. The students really want to stay in San Diego.

LARSON: I think we have every local company as a member. And so, if you're going to stay in the wireless industry locally you're going to go to a fairly big company.

WEST: Right.

SIMARD: So, do many of them start their own, or not?

LARSON: Yeah. The typical model is they go to a company and they work for a couple of years, and then they do a startup. We have quite a few who have done that. Quite a few. And, I wouldn't say any of them are big hits yet, but, you know . . .

SIMARD: But, they're out there?

LARSON: You know the numbers, one out of five will be a big hit. One out of ten.

SIMARD: Yeah. Yeah. But yeah, they're out there and so they are not just staying with Nokia, or Qualcomm, or the big players? Some actually do startups?

LARSON: Yeah. It depends on temperament and...

SIMARD: Yeah. Oh yeah. Absolutely. It's highly individual.

LARSON: I don't know what the percentage is.

SIMARD: Yeah.

WEST: So then, nobody is actually tracking companies founded by UCSD alumni?

LARSON: The dean's office is.

WEST: Okay.

LARSON: I don't have those numbers. But, I bet you that the dean has tracked those very carefully.

WEST: If for nothing else than to send them a request for a donation?

LARSON: Of course. Exactly. Yeah. [Laugh] And actually, they had a great – what's her name? I can't remember her name now, I'm sorry. The woman up in the dean's office who is in charge of gift giving for alumni. She has this wonderful history of Irwin Jacobs. He started off giving $75 in 1978 for a library fund or something, and she

has records of every gift he's given all the way up to the final gift, which was $100 million.

SIMARD: Yeah. One of my colleagues at Stanford used to work in the Business School's Development Office, and the things she knows about people. [Laugh]

LARSON: Oh yeah.

SIMARD: It's really unbelievable. She was telling me about they have this database that contains information on every donor, what they like to eat, who are they married to, who are their kids?

WEST: I thought it was interesting last week, they said, "Mr. Rady, the Budweiser dealer, gave the second largest grant in UCSD's history" and they didn't mention who the largest one is. I was thinking, "Gosh, larger than $30 million. Who gave more than $30 million to UCSD? I can only think of one person."

SIMARD: One person. Yeah.

WEST: Yeah. I guess they didn't want to steal the thunder from Rady or something.

LARSON: Yeah. They're very careful about talking about it.

SIMARD: Mention Jacobs again. Yeah.

LARSON: Yeah.

WEST: Yeah. Rady was generous, but he wasn't quite as generous as Irwin. [Laughter]

LARSON: Yeah. Exactly.

WEST: So, let's see. Companies founded by UCSD? There was a question here. Right now most of the companies out there were founded by students who came through here well before the Center was established?

LARSON: Uh . . .

WEST: We keep running across people like Marco Thompson who is extremely loyal.

LARSON: Right. Right. Marco's a big supporter. Yeah. I'm trying to think, Anton Monk is a friend of mine, and he's a founder of Entropic. I think he was here at the

early days of the Center. I don't know if he was funded by the Center or not. He was Larry Milstein's student. Robert Parra was a recent guy who got his masters here. He was funded by the Center a little bit, and he's starting his own company right now. I don't have any formal networks on this. David Critchlow was a founder of Magis Networks. He went through the program here. Magis just went out of business.

SIMARD: Yeah. We read that. Right.

LARSON: I'm trying to think of a really high-profile student who's left who's started their own company and I can't. We didn't really start to graduate a lot of people until fairly recently, because it takes five years to mint a PhD, and we started off with five students. Even after a fourth year we only had about ten. So, we're only now starting to graduate five to ten PhDs a year.

SIMARD: A year? Yeah.

LARSON: Which is sort of what we're steadily trying to do. Of course, I have great expectations for the future. But, a lot of the students want to go to the big companies, too, these days, because the perception of startups is that they're very risky, and flaky.

SIMARD: Getting a good job has regained some value. [Laughter]

LARSON: Yeah. Yeah. A good job at a stable, big company.

SIMARD: Exactly. With a steady paycheck.

LARSON: Yeah. This is attractive now.

SIMARD: I have so many laid-off friends.

LARSON: Uhm-hmm. Me too.

SIMARD: What's interesting in regions like this is that people who get laid off are full of talent. They have PhDs and they have great experience, but they'd rather stay unemployed and stay in the region and live on their meager savings, than pack up and move.

LARSON: Yeah. I have many, many friends who have been out of work for six months now, and they're not leaving San Diego. They've got a nice house in the hills that they built themselves.

SIMARD: That gives a lot of hope for the future of the region.

LARSON: Yeah. Because maybe they'll start their own company or something.

SIMARD: Yeah. They'll be back. Their talent will be reinfused back here.

WEST: Well, if they have a nice house in the hills that they built themselves, they're not the hand-to-mouth, two-year out of a bachelor's type of people.

LARSON: That's right.

SIMARD: But even people that I know, who certainly don't live in Atherton or anywhere like that, they're still hanging on, having sold their big house, and [Laugh] rented an apartment, and just hanging on by the skin of their teeth until they can find employment in the Valley again.

LARSON: Oh, really?

SIMARD: Yeah. Yeah. A lot.

WEST: Now, I guess one of the questions I would have here, and in Silicon Valley I think I know the answer, but how much of that loyalty of the workforce to the area is professional versus personal? From your observation. . .

LARSON: I don't understand the question.

WEST: Yeah. Let me draw this picture, because somebody I knew when I was a kid went to Stanford when I went to MIT. He moved to Stanford from San Diego, and he never left. He basically stayed in the area. When I talked to him about his resume, which was a new job every two years, he said, "Oh, I would never leave the Bay Area, because I can always jump around and find another company if something goes wrong." So, there are people I know in the Bay Area who are there because of the politics or the weather, or the skiing, or whatever. Something about the geography. But then there are other people there that from a professional standpoint say, "I want to have the career flexibility so that if my current employer screws me over, or I don't like how they're treating me, I can jump."

SIMARD: Yeah. Can go back home.

WEST: And so these two are related, but they're not the same motivation. Do you have any sense of that in terms of these people you know who are hanging on even though . . .

LARSON: Yeah. It's much more the former than the latter here. Those people love the region, and professionally I think that they feel, "Well, it's okay here, it's getting better, but it's not Silicon Valley by any stretch of the imagination." So, I think it's much more the weather, and the – the weather. [Laughter]

WEST: Okay.

SIMARD: Funny. Because, I was on an Advisory Committee for Canada's R&D, and we were trying to get the input of young people, even those that left. I'm from Canada, and I keep saying, "I'm sorry, but -20. Look at the places that have made it big. They tend to have that quality of life."

LARSON: Right. Right. And for a while it's a little cheaper here than Silicon Valley. I think it still is, but now it's . . .

SIMARD: Yeah. But barely. Yeah.

WEST: Do you think that's going to make a different in the long run? The housing prices?

LARSON: Yeah. Housing is going up everywhere all over the country. I think in general if we became comparable to Silicon Valley then people would say, "Oh gee. I'll go up to Silicon Valley." But, until it gets to that point we'll be ok.

SIMARD: Right. We still have the advantage?

LARSON: And still, I think, cheaper than Orange County.

SIMARD: Uhm-hmm.

WEST: Where do people live? Do they live in Del Mar Heights? Do they live in Carmel Mountain? They're obviously not living in La Jolla, or Rancho Santa Fe on a PhD student's, PhD engineer's salary?

LARSON: Yeah. No. But, Carmel Valley, Encinitas, Carlsbad. Rancho Bernardo. Those kind of places.

WEST: Okay.

LARSON: They're pretty nice places to live, you know.

SIMARD: Yeah. No matter what.

LARSON: Yeah. Yeah. Even on an engineer, a PhD engineer's salary.

WEST: Well, I'm a native of San Diego. I lived in Oceanside until a year ago. So, I know the area, but I didn't . . .

LARSON: Yeah, people don't live in Oceanside, too much.

WEST: Right. But, you're talking northern . . .

LARSON: North County is very popular.

WEST: Generally newer settlements?

LARSON: Right. North County is very popular.

WEST: Yeah. Yeah.

LARSON: I lived in Del Mar. I could never afford it today if I had to buy in today, but I moved here seven years ago.

WEST: Yeah.

LARSON: It was okay then.

WEST: Well, we've talked about your ramping up the production of students. We've talked about sort of the boom and bust of the economy, and effect on startups, and desirability working for startups and the formation of startups. We talked about housing prices. What other kind of sort of broad trends, ebbs and flows, or trends taking off of UC that are changing the way the Center fits in, or UCSD fits into the local industry?

LARSON: One virtuous thing that we see happening, that I think in the long run will have the biggest impact, is that the quality of our graduate students has just gone through the roof. Well, we've always had a really strong communication theory group here, so they always had a pretty good set of graduate students. But, in the other

disciplines, we were perceived as maybe number twenty in the country, and so we wouldn't get the best. The Berkeley, Stanford, Caltech, MIT people would go to Berkeley, Stanford, Caltech, and MIT. When I first came here seven years ago we had maybe sixty applications for the PhD in the Circuits Program, for maybe ten slots a year. This year it's about 800.

SIMARD: Oh, my god.

WEST: Wow.

LARSON: It's gone up by a factor of more than ten. These are all people who are 4.0s from Caltech, from Berkeley, from Stanford, and they'll come here. They come here. We get them all. We're actually starting to steal people from the really good schools.

WEST: Now . . .

LARSON: And again, the weather's nice and we're near Qualcomm. So, there are a whole host of reasons, not just that we're such a great school. But, the reputation has gone up. And so, we're now perceived as a kind of borderline Top Ten school, whereas we weren't for the twenty-year period before. That's going to have a huge impact ten years from now.

SIMARD: You know, that actually . . .

LARSON: That and the teaching jobs.

SIMARD: Some people at Berkeley, I've heard through Ollie Williamson, who was on this Dean's Committee of Berkeley, they were extremely nervous because UCSD was very close to surpassing them in the rankings.

LARSON: Berkeley?

SIMARD: On some indicators. Yeah.

LARSON: Really?

SIMARD: Yeah. They feel very threatened by UCSD, [Laugh] from what I've heard. So, it's a good sign. [Laugh]

WEST: Yeah. You know the problem here, of course, is the local media and some of the leaders are still prone to sort of small-town boosterism. You know, "Let's cut the NSF funding list to the shortest numbered list that includes UCSD." So, the "Ten most extramurally funded universities, UCSD is number ten." So, they always are kind of really . . .

LARSON: We're still kind of insecure, right?

WEST: Yeah.

LARSON: You can see that in the way that we're portrayed a little bit. Of course the Berkeleys and the Stanfords know they're good so they don't have any occasion for that kind of stuff. But, I think we have to keep doing that for a while. Hopefully by the time I retire from here we will be as good as Berkeley. I think that's all of our goals here. It's going to be hard to get there. But that's . . .

SIMARD: I spoke to one person, who was talking about the Business School, and she had a nice comment. She said, "We used to send people to Stanford and Berkeley to go to business school, and then they wouldn't come back. So then we realized that it was very important to develop our own so that they would stay in this area."

LARSON: Oh yeah. Yeah. I think that's true.

SIMARD: Especially sending those engineers who you want to become entrepreneurs, business people, and that kind of stuff.

LARSON: Right.

SIMARD: I think that's why their target student population is strong engineer background.

LARSON: Especially engineering. Entrepreneurial engineering. Yeah.

SIMARD: Are you going to have some sort of joint program with them? Or . . .

LARSON: Supposedly there will be some joint . . .

SIMARD: It would be on the grad level or at the joint faculty level?

LARSON: Actually, I have an MBA, and I did a lot of work with UCLA people when I was up in L.A. So, they've sort of talked with me earlier on about what I wanted to do in this area. I've got my hands full as it is. [Laugh] You know, there might be some other people who are recruited, certainly, with that in mind.

WEST: Can I go back to this increase in the reputation. Your reputation has gone up and obviously you gain better quality students. And with the choice of spending the winter in Boston or San Diego. But has there actually been a change in the substance of the education they're getting, in terms of the quality of the faculty, or the resources, or anything? If you got a PhD here today, versus a PhD ten years ago, then other than this reputational effect, is there any rational reason why you'd be getting a better degree this time than . . .

LARSON: I don't think so. Well, let me think about it. First of all we have more faculty. It's a bigger . . .

SIMARD: And more resources?

LARSON: We were in the high thirties ten years ago. We're now, we're close to fifty.

WEST: When you say "we" you mean?

LARSON: The faculty of ECE.

WEST: Okay. Okay. Okay.

LARSON: There are more of us, so is it a better degree? It would only be a better degree if the people that we hired in the last ten years are better than the people that we hired before. I don't think that's the case. I think it's just that the program has grown. Bob Conn, Larry Larson, Ramesh Rao, and Tony Acampora are beating the drums for UCSD all the time. We're telling people how great we are. We're getting lots of money in. We're publishing zillions of papers.

SIMARD: Good.

LARSON: Is the quality better? I don't think so. In fact, I probably shouldn't say this, [Laugh] but I'm not even sure if the quality isn't worse because the student population has grown much more than the faculty. In this department, in particular, the student-to-faculty ratio is horrible. Especially the undergraduates suffer.

SIMARD: And with the funding condition of the UC System you're not getting new appointments?

LARSON: We are.

SIMARD: You are?

LARSON: Apparently we're hiring three new faculty this year and we're supposed to hire three new faculty every year until we get up to seventy-five.

SIMARD: Wow. So, there is some acknowledgement that . . .

LARSON: Yeah. I think so.

SIMARD: They need them?

LARSON: We're on a five-year tenure track here to hire, but the student population doubled in two years, it was almost literally that bad. So there was a huge mismatch between what happens at the student level and what happens at the faculty level.

SIMARD: Yeah.

WEST: When did the student population double?

LARSON: It didn't double, but it grew by eighty percent from 1998 to 2002. Paul Yu, who is our chair, will give you the numbers, but I think we went from 900 undergrads to 1,600, which is where we are today. In ECE.

WEST: And it hasn't, and it hasn't tapered off?

LARSON: Right. It has not tapered off.

WEST: Which is interesting because in a lot of other places a lot of computer jobs and engineering jobs demand has tapered off, because the boom era's over.

LARSON: Sure. I expect it will taper off. But, first of all, that's perceived as being a high-paying profession during the boom. And, the tenth campus didn't get going. UCSD is really a campus that can grow enrollment, so they're sending the fresh people towards UCSD, because Berkeley and Southern Cal, UCLA can't grow their facilities.

SIMARD: Right.

WEST: Okay. So, is it better than it was? Certainly in terms of facilities we're still in the same building that we had ten years. It's not a great building. We're building some nice new ones, but that hasn't . . .

SIMARD: With so many applicants now, I'm sure the experience for students, by being with high-quality peers, is providing them with a better education as well?

LARSON: Right. Yeah.

SIMARD: Because you're learning a lot.

LARSON: The quality of students has gotten much better since then.

SIMARD: Yeah. So, that would make a big difference.

LARSON: Yeah.

SIMARD: Well, I want to be mindful of your time. Because . . .

LARSON: Yeah. Well, this is really interesting.

SIMARD: It's really interesting to hear you and your thoughts on this. It's great.

LARSON: Yeah.

WEST: If we were going to explore this issue of linkages between UCSD, particularly the School of Engineering, and the industry prior to '95, whom should we approach? Who would be the most likely to know something about that?

LARSON: Do you mean in telecommunications in particular?

WEST: In wireless in particular. Because what we're doing is we're studying wireless.

LARSON: Larry Milstein. You should talk to Larry Milstein.

WEST: Okay.

LARSON: Because, he's been here for twenty, twenty-five years now. He was Mr. Wireless here for as long as anyone can remember.

WEST: Okay.

SIMARD: That's great.

END INTERVIEW

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The San Diego Technology Archive (SDTA), an initiative of the UC San Diego Library**,** documents the history, formation, and evolution of the companies that formed the San Diego region's high-tech cluster, beginning in 1965. The SDTA captures the vision, strategic thinking, and recollections of key technology and business founders, entrepreneurs, academics, venture capitalists, early employees, and service providers, many of whom figured prominently in the development of San Diego's dynamic technology cluster. As these individuals articulate and comment on their contributions, innovations, and entrepreneurial trajectories, a rich living history emerges about the extraordinarily synergistic academic and commercial collaborations that distinguish the San Diego technology community.