Oral History of Larry Rowe

Interviewed by:
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Larry Rowe

Conducted by Software History Center—Oral History Project

Abstract: Larry Rowe has had a distinguished career as a researcher, a professor, a software developer and an entrepreneur. As one of the founders of the original Ingres Corporation, Larry was a leader in database design and developing tools for ease of use. In this interview, Larry discusses his childhood as a member of a military family and the constant moving about. He describes his undergraduate days at UC Irvine and then his graduate work, also at UC Irvine. He then discusses going to UC Berkeley and working there with Mike Stonebraker and Eugene Wong, as well as other faculty members and many talented grad students. They developed what ultimately became known as Ingres, which started as an open-source, QUEL-based relational database management system. After the research project was completed, the challenge was to get Ingres into a commercially viable environment. Larry describes relationships with the venture capital firm who did the initial investing and the fierce competitive market dominated by Larry Ellison's Oracle Corporation. Larry Rowe was later involved in several successful startup businesses and retired in 2003 from UC Berkeley. Recently, he has been President of FX Palo Alto Labs, a Fuji-Xerox research center focused on information retrieval, multimedia computing and "smart" environments.

Burton Grad: It's November 28th, 2007. I'm Burt Grad and I'm at the Computer History Museum in Mountain View, California. I'm interviewing Dr. Lawrence A. (Larry) Rowe, under the sponsorship of the Software Industry Special Interest Group of the Museum. We usually start by asking a little bit about personal background, family, where you grew up, siblings, that kind of thing.

Personal Background

Lawrence Rowe: Well, first, thank you very much; I'm thrilled to be here today. I was born April 11th, 1948, in Boston, Massachusetts. I was the first child of Robert A. and Marylou Rowe. My dad, Bob Rowe, was a Naval Officer for 30 years, ended up as a Captain before he retired. My mom was a housewife. I have one sister who's 3 years younger than I. We moved around

the country a lot when we were younger because, being in the military service, you tend to move every couple of years.

Grad: So, every 2 or 3 years you had to go from one location to another?

Rowe: Yes, although the pattern was a little bit more structured. It would be 3 years typically in Washington, DC, at the Pentagon or at some military location, and then two 1-year or 18-month tours at places where there were ships. My father was a line officer which meant he drove destroyers, so we spent time in Long Beach, in San Diego, Mayport in Florida, Norfolk, San Francisco - actually we were in San Mateo for one year – and Newport, Rhode Island.

Grad: Now, when your father was in Washington, he would be pretty much at home most of the time, but I gather when he was on duty at these other locations, he'd be away for considerable periods of time?

Rowe: Yes he would be. A typical sea duty tour would be 12 to 18 months and ships would go out for 6 months and then come back into port for 6 months.

Grad: Can you recall as a child, that kind of life?

Rowe: Oh distinctly, distinctly.

Grad: So it was just you, your mother and your sister, then?

Rowe: Right; however, one thing that a lot of people don't realize is that because you tend to live in places where there were lots of military families, the families tend to get together and support themselves. So, if you were in Norfolk, Virginia, you knew all of the other naval families that were there and so you tended to have certain friendships that would happen. I think the only time that we lived some place that we were really pretty much on our own was when we were in San Mateo, and we were only there for about 12 months. It was more difficult because we didn't have other Navy families to talk to, and I think it was hardest on my mom because - it was just we didn't know anything - you didn't have people you could go to, to ask for help and advice.

Grad: Were you athletic as a boy?

Rowe: I would like to have been. I played some sports but was not very good.

Grad: Moving must have been, from both an educational standpoint and a social standpoint, a difficult transition for you, or was it balanced because of the other naval families?

Rowe: The moving was a big issue, but I've always said it was both a positive and a negative. The positive was I saw every part of the United States, or at least I should say the coasts; I didn't see a lot of the middle of the country except as we were driving through it. Living in the Boston or Philadelphia area is very different from living in Florida. It's very different living in California and so you would see things that other kids would never see, so that was one real positive. The negative, at least for me, was that I ended up going to 4 high schools, so every year in high school I moved, and that was difficult but it also was socializing because, to survive, you have to be able to make friends and find a group of people that you can interact with and I think that had something to do with why I am somewhat gregarious and able to go and meet with people and talk with people and enjoy interacting with people. My sister had a more difficult time because she spent 3 years in one school and then her senior year moved to a new school. She had a very hard time fitting in because her interactions with everybody was, "Oh well, we didn't do it that way at my school, we did it this other way," and so I think she actually had a harder time with it.

Grad: Yes, that doesn't work so well sometimes. Let's talk a little bit about high school and those periods. Were there any particular technical interests? Were you interested in building things or working with any kind of equipment? Were you interested in programming? Did you get involved with programming at all when you were in high school?

Rowe: Only a little bit, which I'll tell you about, but I was always interested in technical things, current events, historical things, science. I was always interested in those areas, but we didn't live in the kind of environment where it was that rich. I didn't have a lot of support for doing those sorts of things. My dad didn't graduate from college when he first went to college; in fact, in our family, the first person who graduated from college was my grandfather, my dad's father, and he got a degree in mining from the Montana School of Mines, and ended up coming down to Los Angeles and working for the City Engineers of Los Angeles; and he was involved in most of the major construction projects in the LA area between 1925 and 1960, including the first freeways and LAX Airport; Dodger Stadium was another biggie. My dad went to USC, but he left a year early because the war was ending and he wanted to go to war, so he didn't finish his degree. Many years later, it was very apparent he would not get promoted to Captain unless he completed his degree. So he went into a continuing education program offered by the University of Maryland at the Pentagon, he struggled through Spanish, mathematics, statistics, what else and eventually got his degree. So the fact that when my sister and I went to college, we both kind of had it in our minds that we were going to go to college and complete college; this was something that our parents were very supportive of, but it wasn't something that was a tradition; and the notion of going on for an advanced degree - I think I'm probably the first in the family to get an advanced degree.

Grad: What were your special interests in high school, any kind of clubs or activities?

Rowe: No, I really didn't do that sort of thing. I was involved in sports; I played basketball in my freshman, sophomore and junior years.

Grad: Do any debating, any of that kind of thing?

Rowe: No, I didn't do any debating. Part of that has to do with when you change high schools every year, it's difficult to get involved in those things. Although there were high schools I went through that had very rich environments that there might have been something I would have done if I'd been there. But when I got to other high schools, they didn't have those programs. Also in my sophomore year I had a problem because we'd been in Virginia where high schools are 4 years, and I was taking advanced math and advanced Spanish for a freshman. The next year, we came out to the San Diego area and there they have a junior high school that goes 7, 8, 9 and then high school's 10, 11, 12. Well in the 9th grade, I went to the junior high school and there were no classes for me because those classes were being held up at the high school, so the first year I would go half a day to the junior high school and half a day to the high school. So I was the funny little kid in the back who was not really there.

Grad: Were you small?

Rowe: No, not particularly. I was roughly the same size as the other boys.

Grad: Because, you know, some of the people who were small did certain things, some people were tall did other things, we found some differences. What other hobbies did you have during that time?

Rowe: Well, I did some sports. As a kid I used to collect stamps; that was something I did. I read a lot of books; I enjoyed reading. In terms of my first exposure to computing, my dad, as part of his job at the Pentagon at one point, (I guess this would have been in 1957, 1958 so I would have been 9, 10, maybe 11 years old) was being exposed to computers and he was sent to IBM classes.   Then and later in the early 1960s, when he returned home, there were times I remember very clearly sitting around the table and him trying to teach me about computers.

Grad: Were these computers and/or punch card equipment, do you remember?

Rowe: The early ones were punch card and the latter ones were computers and in fact, one time, I went into the Pentagon with him and he had to be very careful where I went because they had a punch card system that had a list of the locations of every Navy ship in the world and, as he said, that's one of the few things around here that's very secret.

Grad: Were there any particular courses in high school, subject areas that you found particularly rewarding or that you were particularly interested in?

Rowe: Mathematics, without a doubt. And I really enjoyed chemistry and physics. I had a great experience with a high school English teacher my senior year, Miss Senio, who taught me to write and it's something that I've continued to enjoy to this day; so that was really an important thing and it's funny I don't know if she's still with us but I did run into her about 10 or 15 years later and tried to talk to her but she'd had so many students go by, I could kind of understand her not remembering me.

Grad: You obviously are very articulate, both in your speaking and in your writing and I was wondering where that had started.

Rowe: I would ascribe it to Mrs. Senio, and this was in Virginia, Northern Virginia.

Grad: Did you get any special relationships or work with the sea, with the ships, with that kind of thing because of your father's connection?

Rowe: At the time no, I really didn't, although when I was in graduate school at Irvine, my best friend's father-in-law had an ocean racer, a sailboat at the San Diego Yacht Club, and for 2 years, he and I would go down many weekends and go sailing.

Grad: Did you crew for just that one or other boats?

Rowe: Yes, we crewed on racers, both short races around the buoys and also longer distance races, and one time we even were involved in a race that went down to Mexico.

Grad: Did that become a lifetime interest of yours or not?

Rowe: Not really. I enjoyed it, it was a lot of fun but there were other things to do so it didn't become a major interest. I would still go sailing today; in fact one of the things I got to do a couple of years ago that was a great thrill was the first America's Cup syndicate, that came from San Francisco was headed by Paul Cayard, and a fellow that worked for me as a videographer was the videographer for that program, and he arranged for me to go over and be treated as the VIP on the boat, so I was out in the San Francisco Harbor steering one of the America's Cup boats, which I have to say was an absolutely thrill.

Grad: That's a great experience. Anything else related to the fact that your father was in service that you would find significant other than the things you've talked about?

Rowe: Probably the most important thing is, as with many sons and fathers, there was a definite conflict and the conflict was he was very much a conservative, a strict, kind of military focus in the world, and my view was completely opposite, which tends to happen with kids.

Grad: Was that true then, too?

Rowe: It was definitely true then and there was a period of - I mean we never stopped talking to each other - but there was a period of estrangement and I certainly did some things I'm not proud of today. Fortunately, later those things became less of an issue. It may very well be that one of the reasons that I tend to be somewhat liberal and somewhat open in my thinking, had to do as a reaction to that other perspective, and I think that first really happened when I was in San Mateo. In my junior year, there was a teacher I had who challenged us to think, that's what it really amounted to, and so that kind of all came at one time and then being a person who grew up in the 1960s, it was like you couldn't help but be somewhat activist.

Grad: But you raise a very good point: in a service-oriented family, families that are in the service, you tend to get a more conservative point of view.

Rowe: Yes, very much so.

Grad: Because the service itself as well as the people who go into it, I think that is I think probably still the case.

Rowe: Yes, I'm sure it is.

Higher Education

Grad: We'll move ahead then. Let's talk about your education. You went to UC Irvine.

Rowe: So why did I go to Irvine? My dad was born in Montana but he was raised in LA - and even though we moved around, he always retained California residency. And he did that for two reasons: one, he expected that he would retire there, but he was also very aware of the higher education system in California and thought that I and my sister, Bonnie, would have a chance to go to one of the colleges there. When we were in San Mateo, he made a big deal to drive down to Stanford and say this is really the place you want to go, and again, that's the worst thing to do, because that told me I didn't want to ever go there. But I did apply and was rejected; actually I'm a 2½ or 3 times reject from Stanford. But what happened was it then became time to apply to some place, and I really didn't have a strong idea of where to go. I was graduating from high school in Washington DC, and most of the kids were going to Ivy League schools. I knew we probably couldn't afford it, so it never really entered in my mind and I ended

up applying to Northwestern, largely because I was dating a woman who was dead set on going to Northwestern. So I applied and then I also applied to Irvine, because this was the new campus of the University of California and it was supposed to do computers and computer assisted instruction and my dad had said computers were an important thing and I thought, gee, computers sounds like fun, I'll do them. And so when it came down to a choice - I'd never seen Irvine so it couldn't have anything negative associated with it - I ended up going there and had a great experience; it was a great place.

Grad: But by then, you already had some interest. Now it's interesting you say that your father saying computers was the thing was a plus, and yet on some of the other aspects, it would have been a minus, if he had said it?

Rowe: Well I didn't actually go into computers as an undergraduate, I was a math major. I started in economics and for reasons that aren't worth going into, eventually switched into mathematics. But I also was taking all the classes in economics and all the classes in computer science and really completed the degree requirements in all three majors, at least in terms of taking those courses.

Grad: You were at a brand new school; that must have been an interesting experience?

Rowe: It was a great experience. UC Irvine opened in 1965 and I arrived in the fall of 1966 and, boy, am I glad I wasn't there the year before, listening to all the stories. In fact, I've travelled back to Irvine several times - most recently last June or July - for an award ceremony and the place is unrecognizable. It's just stunning how much those things change.

Grad: You said it was a relatively small school with about 5000 students at that time or so?

Rowe: Yes. I think the first year I was there, there were probably 3000 to 5000, and today I think it's around 25,000. So that was really good because it meant your classes were small, there was a lot of enthusiasm because it was a new school. There was a tremendous program in computer assisted instruction and they had been able to attract some good faculty in selected areas and I did get a chance to take classes from some really great faculty. One of the faculty members in computer science really became my life model in some sense; then later I went and studied under him.

Grad: And who was that?

Rowe: Fred Tonge, and he had been one of the founders of the Computer Science Department there.

Grad: I happened to be working on computer assisted instruction in the late 1960s and I was at IBM, working with the people at IBM Research Center and so that was a very new subject at that point in time.

Rowe: Well, for anybody who knows about it, I am one of the kids who went through the wheat market experiment at Irvine, which actually was done on an IBM 1401, and it was an attempt to teach supply and demand. It was based on a model that you are the chosen one for your tribe in Africa to go to the market with the wheat for the tribe, and get the best price so that you can make the most money for the tribe.

Grad: Was that somewhat of a simulation model as well?

Rowe: Yes.

Grad: We were working to some extent on more prosaic subjects, on how to teach math or English or things using CAI. I stayed involved with that for almost 25 years, in fact, and it was an interesting area.

Rowe: Yes, it really was, and continues to be actually, I think.

Grad: Part of my products at IBM were computer based training systems; ITS and IIS were my products there when I was out there.

Rowe: No kidding.

Grad: You mentioned this one professor. Any special courses while you were in college that really turned you on, that really helped to set a direction for you?

Rowe: Well, I think there were several. My freshman year I took a course on logic and philosophy and I was lucky to get into the course since it was typically a sophomore course. It was already filled but as a naïve freshman, I went and asked the professor if I could get in the class and he let me, and I think I was the only freshman in the class and that turned out to be really valuable because logic is an important tool in terms of making arguments and understanding things and having studied it formally that way really made it easier in math as well as in history.

Grad: Was this Boolean logic or Aristotelian?

Rowe: Actually it did get to Aristotelian logic. I mean it was kind of a full scale course and that was real valuable. Jim March, who was the Dean of Social Sciences, taught a course called "Social Science 1" that attempted to show the ideas of social science from modeling to psychology to social activities, political science and the like, and it was a great course. I remember a lot from the course. I'm not sure how much I can say I learned from the course, but I know it was influential and, you know, how sometimes you realize you know something, but you didn't know you knew it. I think a lot of it might have come from there.

Grad: Did you do any speaking or writing that wasn't part of your class work?

Rowe: Yes I did, but let me first talk about the third course that was important to me. The third thing I did is to take Computer Science classes so I was part of the group that was the first group going through the computer science program, which at Irvine, was called Information and Computer Sciences (ICS). They offered an introductory programming class before but they had not offered the higher level classes, and my sophomore and junior year - pretty much every year or every semester - there was a group of us taking classes and the faculty would grab the ACM guidelines for classes and turn to us and say, "Okay guys, which one should we do next?" And so it was the first class on systems and the first class on theory and the first class on data structures.

Grad: Where were they getting the professors from?

Rowe: There were 3 or 4 faculty who were founding faculty: Julian Feldman, Fred Tonge. There were other affiliated faculty, for example, Alfred Bork was an affiliated faculty, and then they were hiring younger faculty. Between 1966 when I arrived and into the early 1970s, Irvine tended to have a characteristic where it would attract a lot of very good faculty, then they would all leave, and then we'd go down, and then they would attract more good young faculty.

Grad: I guess my question was really did these people come out of industry or did they mostly have academic backgrounds?

Rowe: Some from both areas. Dave Farber was one of the faculty we had for a while, and he came from Bell Labs. We hired many junior faculty from academia including Rusty Bobrow, Danny Bobrow's younger brother, and John Seely Brown.

Grad: So you had some mixture of people who had real experience?

Rowe: Oh yes, quite definitely.

Grad: Besides those who were just dealing with computer science as an academic discipline?

Rowe: That's exactly right, exactly right. In answer to your question asking how I gained experience speaking to groups, ICS needed Teaching Assistants (TA) for the Introductory Programming class. There were very few graduate students, so they turned to us advanced students and said, "Why don't you be TA's?" So I think starting my junior year I was a TA for the Introductory Programming class, and that was my first teaching experience, and I could tell I really liked it. That was an important influence and the other important influence was working with the faculty, because it was a small department. Everybody was together and so as an undergraduate, it felt more like what I think a typical graduate student experience would be, in terms of interacting with faculty and in terms of what the key ideas in the world are. To that end, one of the major research projects at Irvine in the early 1970s was the Distributed Computing System (DCS) that was headed by Julian Feldman and Dave Farber. I actually was in the room the day that a group of us said, "This is something that ought to happen." And it happened in part because the Altair came out and everybody was looking at these small computers. There was a lot of discussion about using minicomputers in place of larger computers and Dave made the comment that we ought to do a network and put them together, and that's where the idea of building what today we would know as networked computers or clusters began at Irvine.

Grad: Now was that to do something on the campus to create such a distributed computing system for Irvine, or was it for another purpose?

Rowe: No, it was a research project to try and build a system to see if you could make it work. It was an NSF-funded project so we had to build the hardware for the network cards because there was no computer networking cards, and then you had to build an operating system, and because it was an NSF project, we didn't have a lot of money, so we bought cheap hardware with lousy software on it. We started from scratch, and one of my big projects and accomplishments in graduate school was to be one of the chief programmers on DCS. Today we would call it a network operating system.

Grad: To move on that, you were actually doing some programming work for Hughes aircraft during that time is that correct?

Rowe: Yes. My dad was in the Navy, at the Pentagon. He was in the Department of Defense research and development organization (DDRNE) that was responsible for future surface ship projects. At the time, there was a big deal having to do with sea-based ballistic anti-missile systems, and Hughes was a contractor trying to get some money. They found out that one of the key people in DC had a son who knew something about computers, and they offered me a job. I went to work for them and spent a summer programming. It was a very good

experience, and there was a cute story at the end. My dad was completely uninvolved, supposedly, but I'm sure that's the reason I got the job. At the end of the summer, he had to visit California for some meeting and supposedly I wasn't allowed to go. I wasn't involved at all, but all throughout the time he was there, everybody kept saying, "Oh, you're Larry's dad," and told him nice things about what I was doing. Later that night at a party my father supposedly said in response to "Oh, you're Larry's dad":"No, God damn it! I'm Bob Rowe."

Grad: That's a cute story. You graduated in 1970?

Rowe: Yes.

Grad: Good grades, good degree?

Rowe: Oh Yes. I graduated cum laude, and, in fact, I think I had 3 or 4 quarters of straight A's when I was taking advanced classes in math, econ, and computer science.

Grad: You had been a good student pretty much all along during school?

Rowe: Oh yes.

Going into Military Service

Grad: Tell us briefly about going into the service at that point.

Rowe: Well, for folks who know the history, in the fall of 1969, the draft was being ramped up to provide troops for the Vietnam conflict. A lottery was established to supply people. They had the first lottery, and I lost. I think my number was 9 or 10 or 11 and frankly, I was in shock for 2 days afterwards. Actually, the lottery must have been held later, maybe it was February or March of 1970. I had already decided I was going to graduate school. I'd already applied to some graduate schools. I had one or two people telling me they were going to admit me and offer me fellowships. I was going to graduate school. But the lottery meant I was going to have to go into the service. I had several choices. My dad had talked to Admiral Bobby Inman, who was in charge of the National Security Agency (NSA), and they were very excited about me because I did computers and mathematics, and they wanted me to come. But, I had to sign up for 4 years and I looked at it and said I want to do the minimum length of time, and that was to be drafted. I got very lucky that I ended up not having to go overseas.

Grad: Was there anything that happened during your time in service that was directly relevant to what you did afterward?

Rowe: The Army had established a program for science and engineering students, where the idea was to take people who were troops - soldiers, privates - but had bachelor's degrees. They put them in office jobs that were equivalent to GS9 or GS10 positions. It was a great resource for the folks in those offices. I didn't know anything about it, got into that program and was actually in an office job working for the Director of Personnel at the Strategic Communications Command in Fort Huachuca, Arizona. We built database applications; eventually, we got around to dealing with databases that kept track of all the personnel for the Strategic Communications Command.

Grad: This was computer based?

Rowe: Yes, it was all computer based, as a matter of fact. The group of guys that I was with, - there were 6 or 7 of us in this program almost all draftees - many of them went on to get advanced degrees. I mean it was quite a high powered group.

Graduate School

Grad: So you had already decided that you were going to get an advanced degree?

Rowe: Yes.

Grad: Before you went into the service?

Rowe: Yes, I had already decided and I think the question in my mind was whether I was good enough to do a PhD, and I thought, well, I'll go to graduate school and see if I can get a PhD and if I do, then I'll figure out what to do. For reasons I'll get to later, I never thought I would end up in an academic position. I thought I'd end up in an industrial research lab. I was interested in that, so I thought that would happen.

Grad: So you saw yourself as doing research?

Rowe: Oh definitely, and that was part of the experience with the faculty in ICS when I was an undergraduate. I had a chance to do research and I really enjoyed that. I was exposed to papers and what was going on, and I really enjoyed that.

Grad: What always amazes me about how some of the younger people, 20, 21, 22 years old, the range of things they can actually do if they're not afraid to tackle it.

Rowe: Yes.

Grad: In some of these interviews we've had, it's been a surprise, because a few are late developers, they're in their '30s before they really start to move ahead, and yet you were able to do so much, between these research projects and the work you did when you were in the Army. It must build confidence at that point. Was that ever an issue with you in terms of self confidence, in terms of how you thought of yourself?

Rowe: I don't think so. One of the experiences that gave me more confidence than I had was when I was finishing my PhD and now the question is I have to get a job. I had to give a talk at the ACM hiring conference and it was quite stressful. I really practiced that and really worked hard to do well. I did well, and then got on the tour and visited a number of universities. It was an enjoyable experience, and I saw the world in a way I'd never seen before. And I remember very clearly talking to Fred Tonge, my advisor. I said, "What should I do, what should I look for at these places?" And he didn't say anything other than, "Just go and enjoy yourself and learn what you can," and so I took off.

Grad: I was actually going back at an earlier point in time, because certainly by the time you completed your PhD work, you had accomplished things that were significant. I was thinking earlier. Did you have that same kind of self confidence? Often times with military parents, there's a certain amount of: "you can't do things well enough." You apparently did not have that?

Rowe: I know what you're getting at. Having been to university and having dealt with students, I've seen that criticism from parents can sometimes make it impossible for the kids to do things. I remember that my parents challenged me, questioned me, but I always had the feeling that they said, "You can go do whatever you want to do." So I didn't have that feeling of fear coming out of high school and maybe that was part of what it was.

Grad: Let's do the UC Irvine. You're getting your PhD, took your courses; what did you do your thesis on? I understand you did switch your thesis?

Rowe: Yes, I switched topics. Well, part of the problem was working on the Distributed Computing System, it was clear you could do a PhD thesis on a network operating system and, in retrospect, I probably should have done it. But, at the time, the hardware didn't run that reliably, the software was questionable, and I wasn't convinced that I could do a good enough thesis so that I could actually get a good job, and I was concerned about whether I was going to be able to make it work.

Grad: Did you feel you actually had to be able to produce a working system in order to make the dissertation?

Rowe: Yes, I had to be able to do experiments. I had to do experiments so I could do measurements, and the hardware we had was okay, but we had problems with it and I wasn't convinced I could actually do enough experiments to make it work.

Grad: And one thing I skipped: you went back to UC Irvine after you left the Army. Why?

Rowe: Well, mostly because it was easy. At the end of my senior year, when I knew I was going to be drafted, I'd actually gotten a job at Standard Computer Corporation which was a computer vendor. They were making IBM 7090 clones, as a matter of fact, with microprogramming; and I worked on compilers there which was important for later. I was drafted in October of 1970, and so I was going to get out in October of 1972, and I thought that meant I wouldn't get to go to graduate school until 1973. Because the Army was drawing down personnel with the end of the Vietnam War in late 1971, they let us out 6 months early, so I got out in May 1972. I found out that we would get out early, I think, 6 or 8 weeks ahead of time. It was going to be nearly impossible for me to get into a graduate school because the application submission deadlines had already passed. So I talked to the people at Irvine, and asked if I could get in and they said, "Oh sure Larry, please come back, we'd be thrilled to have you come back." And so it was just easy for me to go back to Irvine. So I went back in May. I spent the entire summer with the students admitted the previous year studying for the preliminary exams, and I took the preliminary exams that fall and pretty much aced them. I had taken all of the undergraduate classes and many of the first year graduate classes at Irvine, I knew all the professors, so in the fall of 1972, I was essentially a second year graduate student, which was really a great experience.

Grad: That saved quite a few years.

Rowe: It saved a few. Yes.

Graduate Thesis

Grad: Your thesis now, we'll go back to that. So you decided to make a change.

Rowe: I decided not to do the Network Operating System and at some point, I was talking to Fred Tonge and we got to talking about - let's see, this must have been in late 1974 - there was a discussion about trying to build programming languages where you don't prescribe the implementation of the data structures, you just specify what the behavior should be, and then have the compilation system select or create data structures. So we developed an AI [Artificial Intelligence] solution to the problem of specifying what the behavior should be, and then automatically produced data structures, and that's what it was. It was an interesting idea.

There was some good research done later on the topic; unfortunately, my solution was totally impractical.

Grad:　　　　Were you comfortable with your dissertation, did you feel good about what you were doing at the time?

Rowe:　　　　I thought it was okay. I wasn't thrilled because I knew it wasn't going to be a great dissertation, but I wanted to get it done and I was concerned that I would not be able to do a PhD, so when we got the project outlined and you could see exactly what had to be done and how it was done, and it was something that was totally under my control, I said, "Boy, I'm just going to go for that and do that." I enjoyed the work and the work was fine.

Grad:　　　　And you were fully self supporting during this period of time or was your family helping?

Rowe:　　　　I was self supporting. Because I'd been in the Army, I had money from the military; the GI Bill was something I took advantage of. Also, when I worked for Dave Farber and Julian Feldman on DCS, I was a research assistant, so I had money from that as well. Then, when I was working on my dissertation I think, there was only a short time when I wasn't employed. I don't remember how I supported myself the last year but it was probably the GI Bill money.

Grad:　　　　So once you graduated from college the first time, you were basically self supporting and even during college it sounds like you were.

Rowe:　　　　During undergraduate, my parents supported me, and then when I went to graduate school, I supported myself.

What Next? Get a Job!

Grad:　　　　So you got your Ph.D. in 1976?

Rowe:　　　　Correct.

Grad:　　　　And what is the Ph.D. in, what is the subject?

Rowe:　　　　I think it's a Doctor of Philosophy in Information and Computer Science.

Grad: So the same name that you'd been using before there, the Information and Computer Science name at Irvine that they had used earlier?

Rowe: Right. That was what the degree was in.

Grad: Okay. Now, you need a job.

Rowe: Yes, now I need a job.

Grad: So what do you do? Where do you look?

Rowe: I had met many people from Bell Labs, and people at Xerox PARC. I had met Bob Metcalf after he graduated from Harvard and he was on his way to Xerox PARC; there was a program at Lake Arrowhead, called the Arrowhead Computation workshop, I think; UCLA organized it. Dave Farber took me and a couple of other students up there. I was pretty familiar with industrial research labs, and I read a great book about Bell Labs and how they're organized and what they did. And I just thought that was really an interesting thing, and I liked building products and systems. So I thought that would be a really interesting thing to do. I also love to teach, but I didn't think I'd be able to get a good job at a reasonable university, so I decided that I would just apply everywhere and go interview and see if I could figure it out later. As it turns out, I got absolutely no interest from the industrial research labs; nobody even wanted to talk to me. But I did get some interest from universities. So I went on the big interview tour in February 1976. And, let's see, where did I go? The first place I went was North Carolina. Then I went to Penn State. Then I went to the University of Pennsylvania, the University of Maryland, UMass Amherst, and then I came back to the west coast. It was a great experience. I learned a lot; I met a lot of interesting people; I saw a lot of interesting things. I met Fred Brooks and actually had what I thought was one of the more shocking experiences. I was at UC Irvine and we knew about the ARPANET, and we knew about email, so we were very, very aware of that. So here I am as a young Ph.D. student, going to the University of North Carolina into a department that's totally controlled by Fred Brooks. And we're walking over to lunch and he says, "Well, what is it that you'd like to ask about North Carolina?" And I said, "Well, do you have an ARPANET connection?" And Fred stops for a minute and then says, "Well, no, we don't. Why would you want it?" I said, "Oh, because of email and to be able to transfer files and things like that." And he stops for a second, and he says, "No, that's not what you want. What you really want is a very good secretary, because a secretary will answer the phone and deal with other people." And he went on and on and on about why you do not want an ARPANET connection. And I just kind of went, oh, okay. Interestingly enough, 25 years later, Fred was on a review committee for the EECS department at Berkeley, and he and the other members of the committee had to interview all of the faculty in small groups. And when I walked in, he looked at me and he says, "Yes, I know. I was the idiot that told you 25 years ago that the ARPANET wasn't very good."

Grad: That's a wonderful story.

Rowe: It was funny. I laughed.

Grad: The Computer History Museum has recently done an oral history of Fred Brooks. He was actually in England at the time the oral history was done. And I did an interview with Dick Case who worked with Fred Brooks at IBM.

Rowe: I went and interviewed at all these places and, frankly, I thought I was going to UMass Amherst. It was a small department, very much like Irvine, very good people; it just seemed like a very comfortable place. And I thought that was where I was going. So I came back from the trip, and that's what I thought would happen. Well, I was just about to commit to that job and I got a call on a Wednesday from a friend who was on the faculty at Berkeley saying, "Gee, Larry, why didn't you apply to Berkeley?" And I said, "I did." And he said, "You did?" And I said, "Yes, I sent my application but nobody called, and I'm heading to UMass Amherst." And he said, "Don't do anything. I'll be in touch." And he went, and as I now know, chased down the file, arranged for me to come up and interview. He called me on Wednesday; Thursday morning I got on the plane and flew up to Berkeley. Normally, they do two-day interviews, but they had to tell me to go away Friday afternoon because they were having a faculty meeting in which they were making another round of decisions. I was the last interviewee, and I was lucky. They made me an offer, and then I was really in a quandary, because I really liked UMass Amherst. On the other hand, I knew Berkeley was a great university. I looked at Berkeley and I said, there's no way I could get tenure there, and there's no reason I should go there. I like San Francisco. It's a great place, and even if I'm there for just a couple of years, it would be an enjoyable experience. And, then I'll go out into industry, so maybe I'll do that. So that's how I ended up choosing Berkeley.

Grad: Were these computer science departments?

Rowe: Yes. By 1976, there were many computer science departments around, and in terms of industrial research labs, I mean, I applied to most of the major ones. They just weren't interested.

Grad: Including IBM, for example?

Rowe: Yes, I applied to IBM; I applied to San Jose; I applied to Bell Labs, to GE.

Grad: IBM out here or IBM in Yorktown Heights?

Rowe: Yes, both places. Nobody called.

Grad: Joel Birnbaum never called you?

Rowe: No.

Origin of Ingres [**IN**teractive **G**raphics **RE**trieval **S**ystem]

Grad: Okay, you're now going to work at Berkeley. You have some teaching responsibilities, you have some research work you're doing and you have to publish. Obviously, that's some of the things you have to do. Let's talk about the research aspects; what did you start doing?

Rowe: My interest, because of the data structures work, very quickly focused on programming languages and application development tools. One of the people I met very early in the process was Mike Stonebraker, and Mike said, "Why don't you do something with databases?" So another colleague, Chuck Prenner, and I started working on programming languages for databases. And that's when I joined the Ingres Project. Chuck, for various reasons, went elsewhere, so it really was then -- starting in 1977, the Ingres Project morphed into being lead by Mike Stonebraker, Gene Wong and me.

Grad: When you mention that, I don't understand. They had been there for a while, both of them.

Rowe: Yes.

Grad: And I don't know if they were tenured at that point or not?

Rowe: Gene is quite a bit older. He'd been tenured for quite a bit of time. Mike had just gotten tenure in the spring of 1976, and so when I arrived on campus, he had just been promoted to associate professor. Within the project, our interests took us in different directions. Gene tended to really be interested in the query optimization questions and data modeling questions. Mike was very much interested in how do you build the systems. But neither of them was particularly focused on applications, and so I filled a niche in terms of understanding applications and building programming language interfaces and tools.

Grad: Did they have other professors and graduate students working with them at that point?

Rowe: Well, they had a lot of graduate students. It reads like a Who's Who in the database community. But in terms of faculty, there was only one other faculty member: Pravin

Varaiya, who was very instrumental in helping get early funding for Ingres. There'd been a previous project in the department, in the mid-nineteen sixties, having to do with maintaining data and geographic data. That was part of the idea behind Ingres, which was to be able to maintain geographic data. But the real impetus was Ted Codd's paper which had appeared and everybody was saying, could you implement a relational system?

Grad: Codd's paper appeared in 1969.

Rowe: Correct.

Grad: There was an ongoing relationship between Stonebraker and Gene Wong with the people with IBM in Santa Theresa.

Rowe: Right.

Grad: Now, you come in as a relatively new boy; they've been working on this for some years. You get into a position where they're treating you as an equal almost immediately. That surprises me; it just seems unusual to me.

Rowe: Well, Berkeley was an unusual place and Mike and Gene were and are unusual people; I think that is what it really amounts to. First off, Santa Theresa didn't exist until later, it was like 1976, 1977.

Grad: But those same people, the ones that had worked on SQL and so forth, were actively involved.

Rowe: Correct. So Mike and Gene were together from the very beginning, and when the project first started it was a reading class, where they were reading papers, and Mike and Gene were both involved. And Gene knew Pravin, and Pravin and Mike kind of got together, and between the three of them, they went and got some funding to try and build a system. Mike became the person who managed the building of the system, and Gene worked on the algorithms, particularly query optimization. I come along and I'm doing stuff that's in a different area, and so they were very excited to have me there to work on the problems, because they understood those were important problems. They opened their arms and said, "Join us, let's be partners and go do this." And that's when I met all the System R guys, Jim Gray and Mike Blasgen and Frank King, the whole crowd. And so from 1976 to 1978 or 1979, we were doing this research project. We had all these students, and Mike and I spent more time together than with Gene, possibly because of age, possibly both being single, we just spent more time together. We would talk about students and papers, and we wrote papers together. In fact, Dave Patterson and I arrived at Berkeley the same year, and it turns out that before that, there were

very few cases of papers being co-authored by two faculty members at Berkeley. Subsequent to that, Berkeley started to get lots of papers written with multiple authors being faculty members, and it continues to be one of the positive strengths of the department to this day. That was the kind of thing that happened because of the faculty involved, and the fact that Dave and I were more collaborative in terms of working with other people.

Grad: One of the interesting things that I look at here is that you seem to have gotten involved starting then with this movement of technology from an academic framework into a business or operational use framework.

Rowe: Yes.

Grad: And you mentioned the word applications, your interest in databases; you had worked on database structures before, but now what was it that you were working on?

Rowe: Well, one of the questions was, you have a query language and you have a programming language, and the nice thing about SQL is it's a declarative specification rather than a procedural specification, as in a programming language which is strictly procedural. So, many of us took the question and said, how would you redesign a programming language if one of the primitive data types was to be a relation? And that was one of the issues that we looked at.

Grad: Did QUEL exist at that point in time?

Rowe: Yes.

Grad: So that had already been done?

Rowe: Yes. In terms of the history of databases, there was a very famous panel held at the National Computer Conference (NCC) conference in Anaheim in the fall of 1975. I was at that panel, and I remember very distinctly, Chris Date gave an introduction to relational databases, and it was very clear that was real good. I even remember Mike getting up and talking about Ingres. So Ingres existed and QUEL existed by the time I joined Berkeley.

Grad: We have an oral history with Chris Date as well. Okay. So you had been involved, but had you known about that stuff, the Codd material before you came to Berkeley?

Rowe: Yes, I'd heard about it. Because Fred Tonge was interested in databases and at one point we were looking at Michael Senko's work because that was an important piece of

work. And in fact Mike Stonebraker and Gene Wong were looking at Senko's work, and as we now know it had a big impact on Ted Codd. Yes, I was definitely aware of it.

Grad: So you started working collaboratively with Mike there at the university?

Rowe: Yes.

Starting a Commercial Company

Grad: At some point in time the company is formed as a commercial venture?

Rowe: There's something that happened before that that made a difference. Mike and Gene were teaching courses at Santa Cruz in the summer. Bill McKeeman had a summer institute where he would offer classes, one-week classes, two-week classes. Mike and Gene would teach a course on databases. They invited me to come and be a partner. We started teaching more courses, because we had more labor; we did that for a couple of years. We decided we weren't making very much money, so we went and started to offer the courses ourselves. In addition to teaching at Santa Cruz, Bill McKeeman at some point moved to the Wang Institute, and we started teaching the same classes there. We actually had a company where we were doing these classes and making money for ourselves. It was just kind of typical academic consulting. Then, the big issue of commercializing Ingres happened, and there's an extensive story about that. Did Mike go through the details of that?

Grad: Some of it.

Rowe: There was a period starting in late 1978, when we kept getting visitors from DEC, who would come in and look at Ingres and say, "This is great stuff, we've got to make it a product. I'm going to talk to so and so; we'll be in touch. Something significant is going to happen." And they'd go away and nothing would happen. We were okay, feeling that maybe we can't commercialize the software. Then, Larry Ellison got started and he started saying that his system was 10 times faster than any system in the world. He also said that those Ingres guys, they don't know what they're doing; they're a bunch of academic airheads. And my reaction and Mike's reaction was, "Oh, Yes? Let's do battle." And we actually had a student, Dan Reese who had Oracle out at Livermore. Dan had been doing benchmarks and was telling us what was going on, so we knew what was happening. In particular, the early Oracle system did not have a good query optimizer and so Ingres, which did have a good optimizer, was faster on many queries. We decided that maybe we should try and commercialize Ingres. We looked for somebody who would take the technology and produce and support a commercial product. At one point, we met some guys from Newport Beach who wanted to do that, and Mike and I flew down to talk to them. In retrospect, they offered us a pretty nice deal. We didn't understand

enough about starting company, and we believed if we gave the code to them, they would immediately show us to the door and we weren't going to get the value from it. So, we decided we would start a company. Mike had previously met Jon Nackerud, who had been a sales guy and senior executive at Cullinet. We talked to Jon who lived in Berkeley and he said we should do this. We decided we should try to put together a company. And Jon wrote, with a lot of our help, the business plan and we went and started to shop it to the venture capital community, and eventually found somebody who was willing to fund it.

Grad: That was Sutter Hill?

Rowe: That was Sutter Hill Ventures. Right. And so we got the company started. But I think there were two reasons we did it: one, we were kind of pissed that we were being told we couldn't do it; the second thing is, the students had gotten to where they kept telling us, "Oh, you have to do this; oh, you have to do that." We had 300 users, and they kept wanting us to make the software work better, and they wanted more business features, like report writers. We were having trouble getting the students to take the system and do this crazy thing and let's do this experiment, because they'd go, "Oh, we can't support it. It won't work, we've got to do this that, and the other thing."   We needed a way to decouple the commercial use of the system from the research, and so the idea was, if we're going to go commercial with this code-- and we knew there was some value in the code -- we said now's the time, if we're going to do it. Independently, we thought about it, and together we talked about it, and eventually just said, okay, we're going to do it, and then we got the money and got it going. We started this process in the summer of 1979 and the formed the company in the fall of 1980.

Grad: Was that an unusual thing at Berkeley for professors to start a commercial business?

Rowe: It was somewhat unusual. Gene was very concerned because I wasn't tenured at the time, and he was worried that something bad would happen to me. I was oblivious to it. In retrospect, there were some consequences.

Grad: What kind of consequences?

Rowe: There were people who, I think, turned against me as a result of that, and while it didn't in the end stop me from getting tenure or being promoted to full professor, there were some points where things were delayed, ostensibly because I hadn't published enough, and in some sense that was true. But there were also some jealousies going on.

Grad: Let me separate that. Not publishing enough, I understand that seems to be one of the criteria for tenure. But the other side was the fact that you went into the commercial venture and were putting time in that?

Rowe: There was an issue of time, but there were also some people, some faculty members, who believed that it was inappropriate for a faculty member to gain financial return from commercial activities, that that was not an acceptable behavior.

Grad: And yet faculty members consult all the time.

Rowe: Yes, but consulting is different, supposedly. So that was an issue that was in the air. Berkeley had a long tradition of being open to people going and doing things. We weren't the first to spin off a company.

Grad: MIT has a long-time reputation for people coming out and starting companies with things that were incubated while they were still there at the university.

Rowe: Right.

Grad: Where was the ownership of this material? Did the university feel it owned Ingres or owned the material or owned the ideas, or anything?

Rowe: Well, you know, it depends on who you talk to. The original code was constrained by licenses, and everybody who got a copy of it, would get a license. And the license was basically free, with a minor fee to write the tapes.

Grad: What we would now call open source?

Rowe: No, it was not open source. We gave them the source, but they had a license that said they weren't allowed to go commercialize it. There was a specific license. We had 300 users. People from companies would come ask us for it, and if it was for research use, we'd say sure. But then we had somebody come from, I think it was Martin Marietta, who wanted to use it in a commercial product, and they had money to pay for the software. We couldn't charge them the research license, and so we asked them to pay what we said was the commercial license. So they said sure, and they sent us the money. I forget what it was, thirty or forty thousand dollars. Well, AT&T found about it, and immediately came to the university and said, "Okay, you are producing commercial software; you can no longer use the research license for UNIX to do that development work. Pay us our commercial license for UNIX." All of a sudden, we go whoa, that wasn't what we wanted to do! So, we had all these discussions about should we pay the license, could we make some more sales, and we quickly realized we don't want to be doing

this in the University. So Mike, Gene and I had many discussions about what we were going to do. And this was going on around the time that we were deciding to start the company. Clearly the solution to the problem with the students and with AT&T was to spin-out the software into a company.

Grad: So now you incorporate. You'd never had a business-- you had this little business the three of you were doing with your teaching, but that was small. Now, you're putting together a real business. Was it really Jon Nackerud who knew what to do and how to go about it, or was it you guys?

Rowe: No, I think we all contributed. Jon definitely knew how to set up a company and how to go sell to the customers, but in terms of any of the technical decisions and most of the strategic decisions, it was all four of us together.

Grad: I'm not asking the question right. Let me try it a different way. Creating a business organization, knowing what elements have to be in it, knowing what it's fully going to involve, takes a certain amount of business background.

Rowe: I think Mike, Gene, and I knew what that was, because we'd done enough consulting with companies; we understood everything there was to understand about development, support, and we appreciated what sales were. We didn't know exactly what sales involved, but we pretty quickly figured that out, because we went and hired sales people. Jon brought a lot of experience and guidance, and he was the full-time employee. We weren't full time.

Financing the Company

Grad: Was Jon a full partner?

Rowe: Initially, he was. As in the usual VC model, there are a certain percentage of shares that go to current employees and founders. And when we did the distribution of shares, we distributed between the four of us equally. But there was a big difference. In our case, the shares were already vested. They couldn't take them away from us. In Jon's case, they could be taken away until they had vested.

Grad: A four year kind of a deal?

Rowe: Yes, I think it was four years. Later when Jon was fired, the VC's went back and said, we want the shares back, and that became very acrimonious.

Grad: Did those shares go back to the company?

Rowe: Back to the company.

Grad: What did you have to give Sutter Hill to get in at the beginning? Was it half of the stock?

Rowe: They took 55, 60 percent. I think-- Gene once told me and I believed him, because he tends to look at these details, that if you looked at founders and employees, at the point we went public, I think he said we got 36 or 37 percent. And one of the people that we had talked to early in the process was Harvey Wagner at Technochron. He was very anxious to do something with us. Mike and I went to lunch with his "business development people," and at the lunch, the business development guy said, "Now, what is this business you're doing?" and we explained databases. They said, "Well, what is it you need to get going?" and we said "We need some money to start development, and we need a president or sales guy to go start selling the product." And so they then proceeded to tell us, "This is wonderful and we have this model for doing this, so here's what we're going to do: Technochron is going to teach you how to write government contracts and proposals, and we're going to go get money from the government to fund your project, and because Technochron is such a good name and we know how to do it, you'll be able to get grants that you wouldn't normally be able to get." And Mike and I looked at each other and we go, "Let's see, we're each running three, four hundred thousand dollar-a-year research projects, and you're going to teach us how to write a grant to get government money?" So he said okay, and we kind of beat him up about that. And then we asked, "What about the sales guy?" And long story short, they basically ended up saying you should know who the right people are in the industry and you just tell us and we'll go talk to them and hire them. And then we asked, "What percentage equity are we giving you for this sort of a thing?" But their deal would have only given the employees and founders something on the order of 33 percent, so we actually did a bit better.

Grad: So this was a reasonably attractive deal. Do you remember how much money you raised initially?

Rowe: Oh, absolutely! $600,000. And it came in two pieces: $300,000 when we signed the deal, and the remaining $300,000 in warrants to be released at a later date. Did Mike tell you about that one?

Grad: I didn't talk much about the business side of Ingres.

Rowe: The Sutter Hill guys were reasonable guys, but I have to say, we were sheep and we were naïve. We basically got taken. We said we needed about this amount of money, and it

was going to be $600,000. They came back and said we don't want to give you $600,000 right now; what we'll do is give you $300,000 now and $300,000 later. We said great, you want the time value of money, we understand, so we'll do this and then we'll come get the money. When it came time to do the deal, the question is how do you represent the promise to fund the second half? They said they'd do warrants. And then the question is, the warrants have a certain value and they expire at some point. What's it going to be? And they said we don't want to make them expire too early because you might not need the money, so we'll do three years. So sure enough, somewhere, 15-18 months later, we need the second chunk of money and we call up and say we need the second chunk of money and they go, "Oh, well, we don't have to do the deal. We've got these are warrants, they aren't due for another, whatever." It took awhile, but eventually we had to take less than the second $300,000 and it was computed as a time value for money.

Grad: Who was your business person in all these discussions?

Rowe: Jon Nackerud.

Grad: Had he ever been involved with VC's at Cullinet? Didn't he come in later?

Rowe: No. He was in Cullinet when it went public, and he was involved relatively early.

Grad: But John Cullinane hadn't used VC's with Cullinet. It was self-funded, if I remember correctly.

Rowe: Right. But there was a point when Mike, Gene, and I did talk to a lawyer very late in the negotiation process. Time was really breathing down our neck, because Ellison was already out the door, and we knew we had to get going. In fact, in the summer of 1980, we hired a student that I had from Berkeley, Derek Frankforth, and along with my best friend, Paul Butterworth, from Irvine, were working in my front bedroom on the code. We started the development using money that Mike, Gene, and I had made with the short course business.

Grad: You realized that you had to produce a commercial version, a production version?

Rowe: We knew we had to do it. So, there were two things going on. One, there was the transition from the DEC PDP11 to the VAX, so we had to convert to the VAX. That conversion was being done at Berkeley by Eric Allman, and it was something we needed to do at Berkeley, and we understood that. The other thing we wanted to do was convert it to VMS, because that was the commercial operating system. So what the guys started out thinking was let's do the conversion to VMS.

Grad: Oracle was running on the PDP?

Rowe: Oracle was running on the VAX in PDP11 emulation mode. So Ellison was out the door running on VAX VMS from the very beginning, and I think he ran on PDP11's, although I don't know that there were very many of those systems.

Grad: Jon was your business man at that point in time?

Rowe: Yes, exactly. Well, except that as we're going through signing the deal, Sutter Hill says we've got to get another business guy in there, and they arranged for us to meet Gary Morgenthaler. So that's where Gary came in. Gary was obviously upwardly mobile and negotiated with us. And I really like him. He's a great guy, but I tell you what: if you want to be in a negotiation, you want him on your side of the table, not the other side of the table. He'll wear you out. He wore us out and we made him executive vice president. He really was the business guy once the business started. He was an entrepreneur in residence. I don't know if it was called that, but that's what he was doing at the time, but not necessarily for Sutter Hill.

Grad: Was he with McKinsey?

Rowe: I'm not sure if he was still working for McKinsey at the time or had left McKinsey by then.

Grad: But he had been with McKinsey and he knew his way around there.

Rowe: In the early 1980 period, a lot of things were happening. We had the issue with AT&T; we had the let's get the code started; we were shopping a business plan to try and figure out what could be done; we finally decided that the only way we could deal with AT&T was just to declare the code public domain and give it away. So we did that. The Martin Marietta people were really angry because they'd paid money they didn't really need to pay, and it was at that point we made the code "open source." It was that experience that caused us and a number of other faculty at Berkeley to say open source is the way to go. All of our subsequent projects have been open source projects. Part of it was we thought that the value of Ingres was the code. What we didn't understand was that the value was the experience and knowledge in our heads. For the company, the code was a help, but what really made the difference was the experience that we had in terms of how to build these things and how to use them.

Ingres Organizational Responsibilities

Grad:　　　So you had Nackerud, you had Morgenthaler, and the three of you?

Rowe:　　　Yes.

Grad:　　　What roles did you end up playing?

Rowe:　　　Okay. Mike and I handled engineering and support. Jon was the CEO and he managed sales. Gary was the Executive VP (COO) managing the whole business. The technical people were Derek Frankforth, who was an undergraduate we'd hired, and Paul Butterworth. Paul had received his master's at Irvine, and when I was in graduate school, he and I were good friends. We used to go to baseball games; we played softball together. We remain close friends to this day. He had grown up in Marin County, and so at a certain point I called him and I said, "Okay, Paul, if you want to do something, come now." And he took a risk before we'd signed a deal-- although we were pretty confident we were going to get a deal-- and came up. Paul took the day-to-day responsibility for making the code work and managing Derek, and Mike, Gene, and I filled in, whatever needed to be done.

Grad:　　　How much of your time were you spending at that point with the new company?

Rowe:　　　Well, one of the things we did was that we would take leaves of absence, and we would hand off the job. Mike and I would hand it off back and forth depending on our teaching load. If he wasn't teaching and I was teaching, then he would take over. We would try to arrange it for six months periods, so it wasn't just little short term thing.

Grad:　　　You didn't have tenure?

Rowe:　　　No, I did not. But I was coming up for tenure.

Grad:　　　Wasn't that a high risk for you?

Rowe:　　　In retrospect, yes.

Grad:　　　So you didn't realize it though, particularly?

Rowe:　　　I did. Although I had been involved in consulting at Apple-- and I have quite a few stories there-- and they had approached me that same fall about setting up their support and translation operation in Ireland for Europe. The promise was that if I went and did that for a year,

they would then bring me back and I would set up the research lab. I was very tempted by that offer, because, again, it fit into my being an industrial researcher.

Grad: You were still single at that point?

Rowe: I was still single, so it was easy to think about doing that.

Grad: Tell me what you did as a VP of engineering? What kinds of things were you actually doing? What was the company name at that time?

Rowe: It was Relational Technology, Incorporated, because we lost the name Database Technology, Incorporated. Mike and I drove up from Sutter Hill one day and we had one hour to come up with a name. Here are some of the major things that we did early on: a lot of time was spent hiring people; getting access to computers; managing the projects; monitoring what was being done, giving talks about the software to commercial conferences; dealing with executives, helping them understand the technology.

Grad: Where did you learn these skills?

Rowe: On the fly.

Grad: Had you been doing some of those already?

Rowe: Yes. What we ended up doing, at least as far as managing the projects, was exactly what we did with research projects. We would have three to five graduate students and undergrads working on projects. We were producing software that we delivered to the research community. We understood what it took to package software and how to develop it, and how to run computers.

Grad: But you didn't feel you needed an experienced software development director?

Rowe: We didn't, but in fact Paul Butterworth brought a lot of experience. And because Paul was there day to day, in some sense, Paul, in the early days, was very much the operational manager of things.

Grad: He has a lot of strong skills.

Rowe: Yes, he has a lot of skills there. And he'd been a first level manager when he worked at Hughes, and he may have even been a second level manager before he left. But he grew tremendously, he did a phenomenal job.

Changing Management

Grad: I'm moving ahead on some of this. The relationships with individuals, I gather that during that period Nackerud didn't quite, on the sales side, measure up to what you had hoped he would be able to do? Is that accurate?

Rowe: Early on, Jon did sales and we were doing okay. It was hard to get the early sales, but eventually we got those sales. I don't know how much of this to go into. The company was doing okay. The first board member from Sutter Hill was Bill Draper, the dad. When Reagan got elected he asked Draper to be president of the import/export bank. So we ended up with a different partner from the VC firm. He was not particularly good to deal with. So we were having troubles dealing with him. Sales weren't making the numbers that everybody thought they should, so at a certain point, there was a discussion, particularly between those of us who were not full time in the company-- by this time we had a second board member, Bill (Kip) Moore from a New York firm. I think Kip was there. There were some discussions that we needed to make a change and one of the nice things about Sutter Hill when we raised the issue they said, "Let's really just change things." So they put a new partner on the board, and that's when Jon's position got changed. They came to us and asked us to fire Jon. I have a certain amount of hostility toward the VCs over all of this. When we talked to them before they invested in Ingres, we asked "What are you going to do for the company?" And they would say, "Oh, we're going to help you be strategic about what you're going to do, and we're going to help you deal with management." And we were thinking, "Oh, you're going to try and take the company away from us." Then I remember very clearly, it might have been Bill Draper, said, "Usually what happens is the founders come to us and ask us to make a change because they recognize things aren't happening the way they should." We were at that point. So we went to Sutter Hill and said, "We think it might be time to make a change." And they came back to us and said, "You three should go tell Jon that he's going to be replaced. You need to do that because if you don't do that, you won't be able to have a relationship with him." So we went over and told him that he was being fired, in essence, and Jon was shocked. He basically hasn't talked to me since, and it's always made me sad because he deserves a lot of credit for what we did originally, and it was unfair.

Grad: Was it you who was the spokesperson or was it all three of you?

Rowe: It was all three of us. We tended to talk all the time about what was going on and never did things individually. Part of the problem was that Mike and I had gone to India on a

UNDP program, to teach some courses over there. We had vice presidents by this time and the vice presidents were all just pounding that we had to make a change, and we kept saying, don't promote Gary, don't promote Gary. Then Mike and I went off to India and when we got off the plane, within minutes they were on us like a wet blanket saying we have to do it, we have to do it; we have to make Gary the president. So we made Gary the president, and six months later the VC's come to us and says, "Gee, I see why you guys say we shouldn't have done that." And so there was a problem with the transition, but the business about us having to go over and say to Jon, you're fired, and it's us firing you, that was very difficult, and I've felt bad about that every since.

Grad: Did you stay involved then? You're no longer VP of engineering after a few years?

Rowe: Well, Mike and I traded it off and pretty much built the organization until there were 100 people in the engineering organization. I was the major hiring force. Many of the people we hired were people I identified and recruited. We got to the point where we needed a full time VP of Engineering, and Paul wasn't ready for that job. Stu Schuster was the director of marketing, and he wanted the job. We chose not to offer him the job; I think it was a mistake, in retrospect. We really should have done it, but that's when we found Marty Sprinzen. I think we found Marty through a headhunter. Marty did a really good job for the company.

One Tough Competitor

Grad: You said you were sort of trading off the assignments. You hired most of the people. You now are hiring a new person in to head engineering.

Rowe: Well, we had vice presidents and we hired some very good vice presidents and managers. We had an executive committee which was Jon, Gary, the vice presidents, Mike, Gene and I, and that was the operational strategy, do it by committee. At that point, the full-time employees were starting to try to cut us out and keep us less involved because they had their own agendas and wanted to do things, and we tried to step back because we thought, "You are the professional managers, you ought to know what to do, so go do it." Well, our primary competition at the time was Oracle. Informix existed, and there were a couple other little companies that existed but we weren't really in the same market so it was really Oracle and us. It was hard because they would come in and the solution to every problem was to do everything Oracle was doing, but do it better and do more. But Ellison was a year ahead of us. He had more money and he's an incredible competitor. He is really, really good, and so we were always struggling to catch up and there were a couple times we got close, but basically didn't quite make it.

Grad: You felt that number two would not be a profitable place to be?

Rowe: I thought it would be a great place to be. But the VCs wouldn't have any part of it and the other thing the VCs did is, at one point, they came in to us and said, "Look. You guys are going to do $20-$30 million. Explain to us how you're going to become a $500 million a year company." And so we looked all around the database business and there was no way we were going to get that amount of money in the database business. So, we would have to go elsewhere. Well, where do you go? You go into applications. So the first thing we said was, "Okay, great. We're going into applications." Well, the biggest application and most important application is financial accounting and the VCs went ballistic; they said, "Absolutely not. Under no circumstances can you go into financial accounting." So we didn't do it, and we adopted a strategy that said we will support third parties in that business. Well, you can't cut the deals. You can't do business the way you can if you're a full service one-stop shop. Ellison knew that and did it, and we basically were getting crushed. And he did stuff that was difficult for us to compete with because we believed in delivering a quality product and whenever we did something, we said, "If we're going to do it, we're going to do it well and really make it work." As a consequence, he did ten things to our three and his software may or may not have worked, and although our software worked, we couldn't translate that into a competitive position in the marketplace that was visible. Ellison was spending so much more marketing dollars, and he had the dollars to spend, to basically drown out anything that we did.

But one of the truly genius things he did -- I tell this story all the time because I think it's so cute -- is that he sold a financial management package, and basically here was the sale: "Mr. Customer, you want a financial management package. Oracle Financials will do it for you. Just install it. It runs. No problems. It's your solution. Oh, you don't like the solution? Well, I'll tell you what. Why don't I introduce you to Oracle's systems integration team and you pay us and we will customize it for you, whatever you want. Oh, you have your own internal development group that's doing a financial management package? Well, I'll tell you what. Why don't you buy the Oracle financial source code, and it'll give your developers a leg up and make them more efficient at getting it done, and by the way, it'll interact with the database system and all this will be wonderful." If I were a customer I would have said, "So let me see if I can understand this. You're going to sell me a product that doesn't work and then you're going to ask me to pay you to make it work?" It was sheer genius and people bought it.

QUEL and Forms driven "Programming"

Grad: The QUEL versus SQL argument-- Did you get involved in that aspect of that?

Rowe: Oh, Yes. We were involved with that from day one.

Grad: How about you personally?

Rowe: I was not as invested in QUEL. Mike and Gene were invested, Mike more than Gene. My sense was that we should do both; it wasn't that big a deal. Unfortunately, the way we did it was the correct way, which turned out to be horribly expensive and inefficient, when in fact all we really needed to do was the surface syntax. We hired Chris Date to consult with us. He made sure that our system results were identical to System R and DB2, and so we worked very hard to make that happen. I doubt that that was necessary, but we actually did it.

Grad: Who actually had created QUEL as a language?

Rowe: I think it was Mike and Gene.

Grad: That wasn't a personal thing of yours then.

Rowe: Oh, no. I had nothing to do with QUEL. QUEL was well in existence before I arrived.

Grad: You got involved, though, in the language and how to use it, how to program.

Rowe: Right.

Grad: Tell us a little about that.

Rowe: One of the things that Ingres did very well is we built a series of front-end tools, the so-called "By-Forms Tools." We had Query-By-Forms, Report-By-Forms, Application-By-Forms, and Graphics-By-Forms.

Grad: What did that mean?

Rowe: Well, one of the nice things that you could do is if you wanted to create a database, you would just create the database and then you'd say, "I have this table and it has these columns." And then you could run Query-By-Forms (QBF), it would look up the table definition and create a form so that you could do data entry, replace operations on fields, and search operations. You didn't have to write any code. Then, we had a forms definition package where you could design the layout of the screen, add extra labels and decorations (e.g., inverse video, blinking, etc.), and introduce edit checks so you could then use that customized form with the QBF system. You had a different visualization, but in essence you were still running against the same underlying data. We built a whole series of those tools, and actually Ingres was well-

known for the quality of its front-end tools. Starting in 1986, people were saying to us, "Well, your database is okay but we need to run Oracle, but the Oracle tools aren't any good. Why don't you guys make your tools run against Oracle?" And that's when we first got into the argument of should we be portable across different databases, but it was hard for a company to de-couple a piece of technology that's successful and let it go run on its own. We chose not to do that and it probably was a mistake.

Grad: Were you aware of Moshe Zloof's work at that time?

Rowe: Oh, absolutely. Query-By-Example (QBE) had been around earlier and, in fact, the real impetus for QBF was two things. Moshe had done QBE. Everybody knew about that, but Fred Maryanski, who had been a researcher at DEC Research, created a package called "query by forms." When I was working on front-end tools at Berkeley and we needed something of that nature, Fred mentioned it to me. I never saw the software. He just said it and I said, "Oh, of course that's a great idea." I went and built packages for doing data entry and some limited operations at the university in 1978 or 1979. So, when the company started, it was well, great, let's make it really work and let's put in the forms package.

Grad: That's something you were personally responsible for?

Rowe: I did all of that, yes, and then later we developed Application-By-Forms (ABF), which was a way to create applications by filling-in forms. ABF had a scripting language so that it was a database plus a language. Today it would be something like PHP, where you can take data from the form, put it into a database, you can take data from a form and use it to query the database and display it in another form. You can also call procedures written in a procedural language. The By-Forms products were very successful. Towards the end of my time at Ingres, we did the graphical user interface version of ABF, which was called "Windows 4GL." That was also a very popular product.

Q: That was Picasso?

Rowe: Picasso was the university prototype of some of the ideas that eventually went into Windows 4GL. We never actually transferred code from the university to the commercial product except for the original Ingres open source code. I had developed a system at Berkeley, called Forms Application Development System (FADS), with a couple of graduate students, Kurt Shoens and Joe Cortopassi. That system was a terminal-based forms interface programming environment. Those ideas went into the ByForms products at the company. After that, the question was how to develop graphical user interfaces, and that's when I started Picasso at the University. We developed a graphical user interface programming system that connected to Postgres at the university. Two years later, the folks at Ingres were saying "We have to do

something with graphical user interfaces." They came to me and asked, "What should we do?" I said, "You should do something like ABF, and use some of the ideas from Picasso." So they asked me to work with people at the company to build a new programming system for graphical user interfaces which became Windows 4GL.

Grad: It seems that was an ongoing, intensive relationship between what was going on at the university and what was going on at the company.

Rowe: Yes. One of the things that I actually think made me a better faculty member was that the experiences in the company gave me a better understanding of what was going on in software companies; and I could take those ideas back to the university and teach. It also gave me ideas about things I could do in the research program. I would look at what was happening in the commercial marketplace and say, "Oh, well, let's do something much beyond that." Mike and I were at a point where we were trying to figure out what to do in 1985. As I remember it, we had lunch one day, he started mumbling about doing a new database system, and that's when we put together the ideas for Postgres. I simultaneously was saying, "I've got to do an object-oriented programming environment to develop graphical user interface database applications." That's when I started on Picasso.

Postgres

Grad: But a separate company was set up to do Postgres, correct?

Rowe: Sure, but that was timing, I think. Mike and I wrote the first paper on Progres, I think, in late 1985 and it appeared in ACM SIGMOD in 1986.

Grad: It's in the mid 1980s.

Rowe: I think it was 1985 or 1986 and the development project was 1986 to 1990 time frame. We left Ingres in 1990. That's when the company was sold to Ask Corporation. Postgres had been released by the university project. It was public domain. By 1988 or 1989, I was much less involved with Postgres, because I was getting involved with semiconductor manufacturing and multimedia. The Postgres code was available, but it was still a research project. Mike and I were very clear about separating research from product. We were trying crazy ideas. There was no plan to create a commercial product when we started Postgres, and in one sense, that's one of the problems with Postgres. To use Fred Brooks' term, "it suffers from second system effect." Ingres was small, contained, and did one thing really well. Postgres was a can of worms. Every idea we could come up with was put into the system. Some of the ideas were formed by things that happened at the company. For example, because back in FADS, I stored the complete description of an application forms in the database - we did the same thing in the commercial

product. The problem is, if you fully normalize the description of a form, you've got to do 50, 60 queries to get all the data out to try and create the in-core data structure. So, the company built a compilation mechanism that would create an in-core data structure, and then store it back in the database. Consequently, you can access the form through tables, or you can fetch the pre-compiled version. In other words, you used queried the tables to get specific information about a form (e.g., how many fields there were, what the field labels were, etc.) and you fetched the compiled version is you want to display the form on the screen and display data. This mechanism worked if the front-end tools did the correct thing, and if nobody updated the tables externally. Mike and I understood that this mechanism was very valuable, the notion of pre-computing a query and storing the results; and so an elaborate set of features were put into Postgres to support caching of query results. We also allowed functions to be stored in fields in a database record because that was the mechanism we needed to implement support for the recompilation process, the mechanisms we had understood by virtue of what we'd done within the company. We would see what was going on at the company and then we would come back to the university and say, "Okay. We're free to do anything here. Let's go really try and do it and see what we would end up with."

Grad: Creativity seems to be a significant aspect, seeing the world a little differently and then coming up with a way of making it work.

Rowe: Yes. Yes.

Grad: Was this primarily mathematical or conceptual? What did you think of it?

Rowe: In some sense, I think of it as like language design. It's an art and there's not a perfect answer. There are many answers, so you make choices and they have consequences. Some choices are good and some are bad. We were trying to solve specific problems, and when we faced a problem, we then said, "How could we go about solving it?" And we had the confidence and experience to say, "We can change anything anywhere." We would try and figure out where was the best place to put a particular function. Mike and I used to argument about whether something should be done in the front-end or in the back-end (i.e., database server). Unfortunately the solution always was: if there was some leverage to be had by putting it in the back-end, Mike took it. If it was something he couldn't do anything with, I was stuck with it. In 1986, I published a paper showing how an object-oriented data model could be implemented on top of a relational database. That was early Postgres. Mike and I went to a conference on object-oriented systems at Asilomar. Mike talked about Postgres, and then I got up and talked about what we called a "shared object hierarchy" implemented in a front-end connected to Postgres. Several people said, "Gee, Larry, you're fixing Postgres so that it looks object-oriented, without having to be object-oriented." And I kept saying, "Well, it's a reasonable to look at it." As a result, on the ride home Mike and decided to add an object hierarchy and

methods to Postgres. Over the next three to four months, we designed the object model for Postgres and published a paper describing it at VLDB in 1987.

Grad: Your working relationship with Mike during this period of time continued to be effective?

Rowe: Oh, very effective and very close. We stayed close until he left Berkeley. Geographic proximity and the fact I was working on multimedia rather than database topics is what changed our relationship.

Illustra

Grad: The company, Illustra, was that the company name or was it the product name?

Rowe: It was the company name and the product name, so what happened then was that when Ingres was sold, I was able to get out of the company almost immediately and Mike had to stay as a consultant until his stock could be sold. Sandra Kurtzig's company, ASK [**A**ri and **S**andra **K**urtzig), bought the company, and almost immediately she started saying, "Oh, you're the professors. You're going to be thrilled to teach in ASK University." Mike and I looked at each other and went, "You've got to be kidding." She didn't really want us that involved. The buyout was a cash deal. I had not sold any stock or bought any stock in the prior six months, so when the deal was done, I was able to sell out completely. Mike had sold stock three or four months earlier and so he couldn't cash out right away. By this time, 1990, I was really spending my time on multimedia topics. In late 1990 or it might have been early 1991, Mike wanted to start what became Illustra, and he asked me if I wanted to participate. I didn't want to because I was tired of doing front-end tools for databases. I'd done two systems at the university (e.g., FADS and Picasso) and two systems in the company (e.g., ABF and Windows 4GL). I knew the solution was to develop portable tools, and that wasn't what they were going to do at Illustra. So I declined Mike's offer to participate in Illustra. I also declined an offer to join Forte which was started shortly thereafter for the same reason. Forte was founded by Marty Sprinzen and several other people from Ingres. They built a portable version of Windows 4GL that was very successful until Sun bought the company.

Grad: How about Gene Wong? Was he still active with you all at that point, or had he drifted into other things?

Rowe: Oh, no. Gene stayed involved with Ingres right up to the end as well. We were very close and continue to be close to this day. I see Mike periodically when he comes out here. I don't see him as much as I used to, but I see Gene all the time.

Grad: So it ends being financially quite rewarding to you?

Rowe: We did okay. But, I actually did better with Inktomi.

Grad: Is that right?

Rowe: One of the things I learned was that if you want to make money, invest in startups before they get their venture funding, essentially angel funding. Sitting at the university, I just looked for opportunities, and because Mike, Gene, and I had done this, everybody knew we had a lot of experience with starting companies. If students or faculty were interested in starting companies, they'd come ask us, "What advice do you have?" And they'd come in and we'd look at the opportunity and give them advice, and then at a certain point, if it looked good, I'd say, "Well, gee. Do you mind if I buy some shares?"

Grad: You had the financial ability to do that?

Rowe: I could, but it wasn't a lot of money. For example, Eric Brewer, who had been an undergraduate at Berkeley and had taken classes from me, was hired at Berkeley as a faculty member -- and he was two doors down from me -- and he came and asked me about how to start companies. I gave him some advice. And then, at the appropriate point I said, "Can I invest?" And he said, "Sure," and so I made an angel investment in Inktomi. Now the one thing we learned about Ingres is that when you go public, it's a great experience, the stock goes up but you don't sell because you think it's going to go higher, and so eventually, it starts down and then you might sell. So when Inktomi went public, and it was the Google of its day, I kept going to Eric and saying, "Eric, you should sell. Eric you should sell. Eric you should sell." And he would tell me in completely rational terms why that was just the absolute wrong decision. I started selling and selling and selling, and so I actually made as much or more money from Inktomi than I did from Ingres.

Technology Transfer

Grad: I wanted to go back and let's close off on the Ingres part of it and then look at a few other things you're doing. You've continued from there. That was the first real case where you took a technology and moved it in to a commercial venture. Do you believe that the universities provide an effective spawning ground for technologies that can be transitioned and commercialized?

Rowe: Absolutely. I think the wonderful thing about a university is you really have the freedom to go do anything. You can try ideas that would be hard to get support for in a company, and you can also, depending on the persistence of the people involved, work on

something for many years. There are people who spend 6-10 years working on a hard problem and they make a significant breakthrough.

Grad: Let me pursue that because one of the most difficult things in almost every corporation has been technology transfer. One wonderful example, of course, is how long it took IBM to get the relational database systems out even though they were the first to conceive and develop it. It wasn't until the 1980s that they really had a commercial product. A similar thing happened with the reduced instruction set computers, the RISC machines. My question is because you can go to various other places with your ideas or start your own company, does that make the technology transfer easier for the university?

Rowe: That's part of it, but there's a second part, which is the students. Here's the big difference between a company and a university. Let's take Ingres as an example. Ingres had a series of Ph.D. students who were trained in relational databases who went out into the marketplace and were involved in creating products and/or companies using relational database ideas. IBM San Jose had great people, but there was a limited number of them and they weren't constantly flowing through the organization. Now, that happened later when there was a lot of demand pull, but for example Jerry Held was a Ph.D. student, one of the first people that worked on Ingres, and he was the designer and key person on the Tandem database system. Bob Epstein, Mike Ubell and Paula Hawthorn were three students that graduated and founded the database machine company Britton-Lee. Subsequently, Bob formed Sybase with Mark Hoffman. And then, I believe Mike Ubell joined them at Sybase.

Grad: Your point is that this flow of very bright young people with the new ideas enables a spreading out that doesn't happen within the corporation.

Rowe: That's right.

Grad: That's very fascinating. Are many universities effective in this way?

Rowe: Oh, I think so. I absolutely think so. Database development in the 1970's and 1980's period around San Francisco was amazing. I suspect it was what the Detroit area was like back in 1910-1920 with the growth of the auto industry, or what the Los Angeles area was like for the airplane industry and the defense industry from the 1950s into the 1960s. You get that that made it more effective. But, I think young, bright kids with good ideas and funding trying out new ideas is the key. And some do it within companies and some do it by starting companies on their own. One of the nice things about the Silicon Valley, is it has a culture of supporting that kind of activity.

Grad: Meanwhile, while this is all going on, did you get your tenure?

Rowe: Yes.

Grad: And then you get promoted, at some point, to becoming a full professor.

Rowe: To full professor was six or seven years later. I got tenure in 1981 so it would have been 1987, 1988 when I was promoted to full professor.

Grad: Let's wrap up this aspect and then go to the other things you've done. Hearing your views on the difference between the university environment and the industrial research environment is fascinating to me because I was at IBM Research and saw their problems. I would guess that there may be a half dozen universities who have generated this kind of newness, this kind of creativity in the computer software field. I'm sure in biotech there are other universities that have done the creative work in that area.

Rowe: Sure. Sure. But there's a reason Berkeley is one of the world's most famous universities. And there is a reason that MIT, Stanford, and Carnegie are as well. They are universities that have done science and technology transfer. Some of it is scale, you've got to have a large enough faculty and a large enough amount of money to support people to go do the experiments; and some of it is the taste in the research ideas. Some universities become very theoretical. Berkeley, for whatever reasons, was a very practical place and we tried to build real systems and use them, and that really had a big impetus on things being produced out of there.

Funding of Ingres

Grad: The other element is that you, Michael and Gene were successful at getting government funded research grants. Yet you went to a business, VC funding approach because there's no easy way to get grants for that commercialization unless you can get government as a buyer or something, right?

Rowe: Yes, but selling to the government is real hard. We learned that often. We understood there were different places to go to get money. It just seemed like the easiest one to do was to go to the VCs and so we talked to VCs.

Grad: Have you gone to VCs again?

Rowe: I've taken ideas to the VCs and been turned down, so I didn't start another company with VC money, but I did start some with angel funding.

Grad: Lest I forget, how much was the total amount of money you raised in that first round and how many rounds of financing did you get?

Rowe: Oh, it must have been five or six rounds. We were constantly starved for money to fund growth because we were always chasing Oracle.

Grad: Trying to grow to catch them probably affected your profitability and your ability to self-fund?

Rowe: Oh, absolutely.

Grad: So the VCs drove you. Is that an accurate statement?

Rowe: Well, it was more than the VCs, it was also the marketplace. It was clear that this was a growth market and if you weren't competitive, if you weren't growing, then customers were going to look at you and go, "Oh, you're not going to survive. We'd better go with a bigger vendor."

Grad: So you had no concept of a niche market then.

Rowe: Oh, we understood niche markets. We understood them very well. We talked about them all the time.

Grad: But you didn't feel that you could survive in a niche market versus the broad market.

Rowe: This was one of the problems when you compete with Larry Ellison. There was no niche market when Larry Ellison is in town because he would take whatever market he wanted, and he then he does take every market.

Grad: Apple had a place to hide. You had no place to hide.

Rowe: Exactly.

Grad: That's very significant.

Rowe: And frankly, if we'd adopted the tools strategy, we probably could have done that but that would amount to walking away from a substantial part of the competitive success of the company. You're not going to walk away from what made you, so that was not a real choice.

Grad: You weren't involved after the ASK purchase?

Rowe: No. I didn't have anything to do with them, although I was tempted to call the folks when they restarted Ingres, but I haven't talked to them.

Grad: That's what I was wondering. You didn't come back in when they did?

Rowe: At one point I was tempted to call them. I did talk to some of their support people at a show and found out a lot about what was going on, but nobody called and I had many other things to do.

New Directions

Grad: That's what I'm going to spend the next few minutes on. Tell us what sort of things did you work on after that? You speak of semiconductors. You speak of multimedia?

Rowe: Well, one of the things that happened doing databases is I started to see all sorts of interesting applications of databases, and working with a colleague in EECS Dave Hodges, we were working on software to improve semiconductor manufacturing. At one point we got involved with developing some training materials, and the problem was the following: I had computer science students who didn't know anything about semiconductors and we were trying to build applications for semiconductor fabrication. So I needed to teach them about semiconductors. I had students who were coming to us from the semiconductor community who didn't know anything about computer science, so there were things they had to learn about software. We were using Picasso, and we were looking for applications. I said, "Let's try to build a hypermedia system to teach people about semiconductors so that we can train the computer science students to be ready to go to work on semiconductor manufacturing applications." So we built a hypermedia system. We built a course made up of text and image nodes that taught the basics of semiconductor manufacturing. Berkeley was at the time videotaping classes for continuing education students. So I said, "Why don't we get the videotapes and try and make them accessible?" And so we took some of the tapes, edited them, created a laserdisc, connected a laserdisc player up to the system, and we had a hypermedia course for teaching people about semiconductors.

I had a student working on a master's degree in computer science with me from the education school who did a study on the course, to see if folks learned using it. We were amazed to find out that the semiconductor students loved the course because they learned things about industry, and the computer science students loved it because they learned things about semiconductor manufacturing. And, all the students loved the video material. The course was very successful and some of my colleagues asked, "Can we put this into our classes?"

Unfortunately, it was going to cost $20,000 for the work station. We only had one laserdisc which had 70 minutes' worth of material. We understood the desire to get all the lectures online and I'd seen something that some people at Apple had done where they pressed 13 laserdiscs, and the way you played with the hypermedia course is, you'd push a button on something, and if the disc wasn't in the reader it would say, "Please insert disk #4." The student would have to take out one laserdisc and replace it with another. And so, very quickly I realized that we could digitize and put this material on a computer disk. We can stream it across the network and play the material without having to constantly switch laserdiscs. And that's what really got me interested in multimedia streaming.

Grad: Creativity versus implementation skills on your part. How do you do it?

Rowe: I think the important thing that a researcher has to have is a vision for where you're going and figuring out what's the right hill to plant the flag on. If you put the flag out there, and you have smart people working with you, run for it.

Grad: Your skills? Do you see where to plant that flag?

Rowe: I think I can see where to plant flags.

Grad: Do you see the path to how to get to the flag as well?

Rowe: That's one of my faults. I don't plant the flag far enough. Sometimes I will tend to plant it closer because I won't plant it beyond the top of what I can see how to get to, and so that will tend to limit things.

Grad: You seem though to have been able to come up with solutions to fairly complex problems in many of these areas. These were not simple things that you worked on. Or do you see it as pretty much straightforward implementing?

Rowe: Yes. I think the hard thing with that is, once you see the solution, was it hard? Well, no, there is the solution. It must not have been very hard. And that's a bad thing to say, I know. But I've dealt with other people where that's been the case.

Grad: Do you feel that way about yourself?

Rowe: I don't think I'm the smartest guy at the table, and I know that my work has been significantly improved with the interactions that I've had with my colleagues. I don't know that I would have been nearly as successful if I had gone to another university because the quality of

the faculty wasn't as good, the environment wasn't as good, the students weren't as good, and so, yes, I'm very much a collaborative person. I think as a team you do better than having a single super star.

Grad: Is that social skill of yours of particular value in these cases? Were you able to work with people that others may not have been able to?

Rowe: Maybe. It's certainly the case that probably the childhood experience of moving made it easier for me to interact with people. There was an early point when I was at Berkeley, I was going to a psychotherapist and I had kind of the standard lack of self-esteem, but I learned a lot from that interaction and it served me very well when I was advising students because I would see those things. You asked earlier about did I get criticism from my father. I can name ten students that I had those discussions with, because I learned those sorts of things. The experience at Ingres, hiring, firing presidents, dealing with strategy and that sort of thing, makes it easier for me to understand how you operate in a bigger company.

Grad: What drives you, or are you not driven?

Rowe: I am and I'm not. I'm sure I have a push-pull personality. I get excited by interesting problems, opportunities to try new things. One of the things Gene Wong and I used to do was meet for lunch periodically. I'd stick my head up every three to five years and ask, "What should I do next?" He said to me something once that I really think is true. He said that you want to find something new to work on because it will be interesting, you will learn new things, and learning new things is something that keeps you vital and growing.

Grad: You don't express the views that the typical entrepreneur has expressed, money driven, power driven. I don't get either of those two things from you.

Rowe: Well, I certainly have paid attention to the finances, but Mike and I figured out pretty early on that we were going to make enough money out of Ingres that it was going to radically change our world. One of the department chairmen at Berkeley, George Turin, made the comment that if you make $5 million that will change your life; if you make $10 or $20 million, it won't change your life as much as the first $5 million; if you made $100 million that would change your life; if you made a billion dollars that would change your life. We understood we were going to make on the order of $5 million we thought -- although as it turns out we didn't--and so Mike and I thought okay, we should stop thinking about making money; we should start thinking what we want to do, what would we like our world to be like. And so we made decisions based on that basis.

Grad: Power? I don't hear any sense of: "I got to run things; I got to be in charge of things." Am I missing something?

Rowe: Well, I have trouble when somebody tries to tell me what to do.

Grad: That's the other way around.

Rowe: Yes, and that's something my wife says about the faculty members at Berkeley -- that people don't understand -- is she refers to my job at Berkeley as Larry Rowe, Inc." Her point was that you may be a faculty member, but in fact you're running a little business. You have to raise funds, you have to fight to get space, you have to hire people, you have to publish papers, you have to go out and give lectures and be famous, and so you're running your own operation, but they don't tell you what to do. You can do anything you want but at certain periods they evaluate you and say, "Have you crossed the threshold of being of acceptable quality in terms of teaching, research, and service?" So, I've been very lucky to live in an environment where I don't get told what to do, which as a researcher is wonderful.

Grad: We're going to have to close soon and of course we've left out so many things, the amount of work you did as we just barely got in to the multimedia thing, and we didn't talk much about your webcasting work. You've started some other companies. You've been an angel investor. The good news is we have a lot of this in materials that you have written up and with your permission we would like to reference some of that directly from your oral history transcript.

Rowe: You're welcome to use all of it.

ACM

Grad: You played a very active role in ACM, I gather, over the years, in a number of the SIGs.

Rowe: Yes, I did.

Grad: Did you find that rewarding and or did you feel it more of a duty?

Rowe: It was a duty but rewarding, I think is what I would say. I was involved with ACM when I was an undergraduate. I was a student member when I was a sophomore because I had a Teaching Assistant who encouraged me to join, and so I joined. And then over the years, I would go to conferences and when it came time to publish papers, we always published in ACM

SIGMOD. That was our research community. And then when I switched to multimedia, I switched to SIG Multimedia. In the late 1990's SIG Multimedia got into trouble because it is an interdisciplinary field, and it doesn't have a core set of participants the way the database community does. SIG Multimedia got into financial trouble, and they were looking for someone to take over who could be trusted to keep the organization financially solvent and who would maintain the high quality of the conferences. I was at a stage in my career where I could agree to do it. Pretty much when I took over, SIG Multimedia was destitute, and if we hadn't been able to do something to fix the finances, it probably would have been terminated. It was obvious what needed to be done, and I went in and just said, "This is what we've got to do to survive." And people supported the plan and we were able to get the finances back in shape and still retain program quality. I'm proud of what we accomplished there. I did at one point run for ACM Council although I didn't play the game and so I was not elected.

University Roles

Grad: There's a sequence in this kind of thing, same thing at the university. You took on certain roles there.

Rowe: Right. Well, I would have been excited and was certainly interested in possibly being a department chair or a dean.

Grad: Why didn't that happen?

Rowe: Some of it was politics and some of it was my own inadequacies. I opened my mouth and said things at times I probably shouldn't have; that's just one of those things that happened.

Grad: Do you feel disappointed in that, Larry? Is that something you feel that you wish had happened?

Rowe: Yes, there's a part of me that does, but I have to say that I retired in 2003 for good reasons. One was that all the funding was lost. Multimedia changed and became something different. And the California state budget was in real bad shape. I knew that things were going to get tough at the university. I didn't have money to continue with my research, and so I had to lay off students and staff. I was perfectly happy being retired until the folks at FX Palo Alto Laboratory asked, "Why don't you come and manage the lab?" They first approached me with this offer in 2002 and I wasn't interested. But in 2006 I was looking for something interesting to do, so it all fit together.

Grad: Larry, I'm going to close. Thank you. It was a wonderful interview and thank you for your time.