Computer History Museum

Oral History of Moshe Zloof

Interviewed by:
Burton Grad

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Moishe Zloof

Conducted by Software Industry Special Interest Group

Abstract: While working at IBM Research in the 1970s, Moshe Zloof developed Query by Example (QBE), a database query method created for use with relational databases. Over the course of his career at IBM Research, Hewlett-Packard, and various startups, Zloof expanded and further developed QBE as well as applications related to the graphical query language. In this interview, recorded at Computer History Museum in Mountain View, California, on September 27, 2007, Zloof briefly describes his early years in Iraq and Israel, followed by an overview of his years working as a software researcher and his forays into entrepreneurship and tech startups. The discussion includes the reasons QBE was never aggressively pursued as a commercial product and the tech startup climate in Silicon Valley during the dot com crash in the late twentieth century. Zloof concludes with a description of his current work.

Burton Grad: I'm Burton Grad, and I'm interviewing Moshe Zloof. The date is September 27, 2007. This interview is being sponsored by the Software Industry Special Interest Group, which is part of the Computer History Museum. This interview is taking place at the Computer History Museum in Mountain View, California.

Upbringing in Iraq

Grad: We normally start with family background: where you were born, things of that sort. Moshe, why don't you tell us a little bit about where your family was and where you grew up.

Moshe Zloof: I was born in Baghdad, Iraq, which everybody talks about nowadays. I was part of a Jewish community, which is really 2,500 years old. We're the oldest community that stayed very pure in terms of our religion. I went there to Allianz French School at the beginning. Then we emigrated to Israel when I was 12.

Grad: You were born in 1938 I believe?

Zloof: I was born in 1938, right, so it was during the war and things were scarce. I grew up there. I got almost to high school and then we moved to Israel.

Grad: You were born in Baghdad?

Zloof: In Baghdad, right.

Grad: What did your father and mother do while they were there?

Zloof: Well, my father was quite famous there. He was a contractor, and he contracted big projects for the British company called IPC. It was basically a British petroleum company in the north, all those places where you hear now in the news: Mosul, Kirkuk, down in Basra. He built for them houses, installations, power houses, and stuff like that. Also, he built a couple of bridges, so he was a big contractor.

Grad: A big general contractor then of major projects.

Zloof: A big general contractor. My mom was basically at home. I am the youngest of four children. I have a brother and two sisters older than me.

Grad: During the war you were in Baghdad?

Zloof: The second World War I was in Baghdad, yes.

Grad: You were very young then. Was it something that affected you much? Were you aware of what was going on at that time?

Zloof: No, I wasn't aware. Actually, there was a time where they thought that Hitler, I mean the Nazis, were going to come, so we flew to Iran and stayed there about three or four months because my father believed it was safer. Then we went back after the Al Alamein victory, because then it pushed the Nazis back for a while.

But I only was aware of the scarceness of things, like paper and notebooks to write. It wasn't that easy to write, to had a notebook. Pens were very scarce. I remember that I had to use the pencil all the way down to its one-half an inch. <laughs> But otherwise it was okay.

Family Move to Israel

Grad: When the war was over, you still stayed there and your father still continued to run his business in Baghdad?

Zloof: That's correct, yes. Then in 1947, which was when Israel was created, they started giving us really a hard time. I mean the Muslims because they felt the Jews were like a fifth column. Therefore, most of the community decided to leave, and they all left to Israel. There were about 130,000 people. Most of them left to Israel, and we were part of that.

Grad: Your father had to basically give up, close down, sell the business. What was he able to do?

Zloof: It was frozen. In fact, we had so many lands. Actually, the land where Saddam Hussein had his castles, that's the area that we had land. It's all gone now, so it's unfortunate.

Grad: How much older were your brother and your two sisters?

Zloof: My brother is three years older than me, and my two sisters are five years and nine years. The two sisters were already married, so we moved to Israel when I was 12.

Grad: That's a big family move then?

Zloof: Yes, it's a big family move.

Grad: Did your father have brothers or sisters that also went?

Zloof: Oh, yes. I mean, the whole community came. My father had brought his parents, my grandfather from both sides. It was a big change for all of them, and the older they were, the more difficult that was to accept.

Grad: Now obviously you didn't speak Hebrew.

Zloof: No, I didn't.

Grad: I gather your family didn't either.

Zloof: No, right. We had to learn. For me, it wasn't that difficult. But for my mom, for example, she went to this special school called ULPAN. My dad, after a year he was fluent in Hebrew really, and he started another company.

Grad: He was able to bring enough money out that he was able to function, at least keep the family?

Zloof: Yes, we got some money out, but maybe a couple of percentage of what we had. Still we could manage until my dad was on his feet again.

Grad: Where did you go in Israel when you moved? What part of Israel?

Zloof: We moved to a place called Ramat Gan, which is really a suburb of Tel Aviv. Gan means park in Hebrew, because it was really hilly and had lots of parks.

Grad: What was it near? Was it on the coast?

Zloof: Near Tel Aviv. Tel Aviv is on the coast. Ramat Gan is farther inland, like more to the east of Tel Aviv.

Grad: Toward Jerusalem?

Zloof: A little bit toward Jerusalem. You can look at it that way.

Grad: Now the war was over at that point in time, and there wasn't any fighting going on at the stage when you all moved to Israel. Was it all over?

Zloof: Yes, the Israeli war was over, but because of that, there was nothing to eat. In fact, we were very happy because they gave you coupons for clothes, and I remember we got only two shirts and two pants every year. There was no fashion shows and stuff of that nature. It was khaki and everybody lived with that. Even shoes, you had to prove that your shoes were not repairable. <laughs>

Grad: That was a very dramatic change in your lifestyle, coming from a very affluent family.

Zloof: Exactly, yes. On the other hand, you had the spirit of a new country, new achievement. It was a different time. Many people remember those times as the best times, as opposed to now when you have plenty and you can eat as much as you want and dress as you want.

Grad: We have a very good friend who was a Holocaust victim who went to Israel around the same time. She went to a kibbutz, and she remembers that as being a very special time in her life.

Zloof: Right, right, right.

Grad: Now you're going to go to school, but you don't know the language.

Zloof: Yes.

Grad: Is that a problem?

Zloof: I went to school, and when you have no choice, you learn it very fast. You have other kids you have to communicate with. Although I knew French and English, they didn't know it, so I had to communicate in Hebrew. You learn very fast.

Grad: Did you speak Arabic?

Zloof: Yes, I spoke Arabic at home.

Grad: You had three languages then that you knew as a child?

Zloof: That's correct, yes. Then I learned Hebrew. And the Hebrew became really my first language in a way.

Struggling in Reading, Excelling in Math and Science

Grad: Were you able to transfer from schools without going backward in spite of the language difference? Were you able to continue your schooling in pretty much the same fashion?

Zloof: Yes. In a way, it was awkward because in Iraq I was ahead, so I was 12 years old, but I was really like in high school already. When we came to Israel, they placed me according to my age. For example, I already knew algebra and geometry and so on, but they placed me in a grade where they hardly had multiplication. I excelled in those areas, but I did very badly in Hebrew of course, until I learned the language.

Grad: Did you just learn it by being there?

Zloof: I was like all others. I was just put into a particular grade, and after a year, they spoke Hebrew fluently.

Grad: Any special interests during high school, areas that you enjoyed? Did you excel in math and science types of things?

Zloof: Yes. Okay, I have to go back to Iraq.

Grad: Okay.

Zloof: When I was at school in Iraq, my parents skipped me a class because they were bragging. They had a big club and they were bragging; everyone was bragging about this child—like he's three years old and he's already in high school. You know how it goes. So, I went from kindergarten to second grade without any preparation, so from second grade to

maybe seventh or eighth grade, I did very badly. I couldn't read. I had a tremendous amount of insecurity, and my self-confidence was very low because I was looking at other kids that were reading. Nobody really told me that was because I really wasn't in first grade; only later it came back to me. I used to think I'm really that bad, and my dad was an autocratic, very controlling person. He was basically just looking at my grades, and my grades were very bad, so I always suffered.

When I came to Israel, however, I went to high school and then suddenly a new life started with me because I started having interest in physics, geometry, math, and all of that stuff that wasn't there before, that I didn't excel in before. In a year I became almost the first in the class, and I started teaching. That's how I start tutoring, because I started charging to tutor other kids in math and physics and geometry and all that stuff.

Grad: So, you were a young businessman even then?

Zloof: Yes, I was. <laughter>

Grad: How about your brothers and sisters? How did the transition affect them?

Zloof: Well, my sisters were already married, so they didn't really study. Maybe one of them went to a kibbutz. Actually, my older sister was in England because she married a guy from England when he was in Egypt and they moved to England, Manchester. My mom actually went to England first before she came to Israel. My older sister stayed in England, and she never learned Hebrew. Only recently she went back to Israel and she's learned a couple of words, but she never knew Hebrew. But the other sister did I think go to the Technion. She reads and writes Hebrew.

Grad: Your brother was almost out of high school though if he was three years older.

Zloof: Yes, my brother was almost a senior in high school, and he went to the Technion also.

Use of Abstractions and Visualization

Zloof: Then I finished high school. I skipped a couple of classes because I learned many things in Iraq. I was actually the youngest student in the Technion. I was 16 years old when I got in, and of course I was also very small. I'm short now, but I was shorter then and very thin. When I went to the Technion to register, they told me. "It's not over here. It's two blocks down the road." They sent me to the high school. <laughs>

Grad: You entered Technion in 1955. Were there any things you were doing? Were you making radios? Were you doing any of that kind of thing with electronics?

Zloof: Oh, yes. I actually built a radio when I was in high school. I have pictures of that. I was interested in all that science stuff.

There is something very important that I'm going to mention. I really didn't do much in Iraq, so I was mostly very lazy and tried to get by because I didn't know the language. I couldn't read, I couldn't write, so I really had to get by in different ways. I used to daydream all the time, and I was trying to find abstractions. That's how it started. I like analogies, so when we studied physics for example in high school, they taught it in a different way. When we studied physics, it was one year you learn mechanics: motion, masses, forces, and stuff like that. Second year you learn electrical stuff. Third year you learn fluid mechanics. What I did in a way is the way they are teaching it now; I was trying to see the analogy. For example, harmonic motion—I can see a pendulum is harmonic motion. You can see like a tube that is U-shaped and you have fluid inside that goes in harmonic motion, and you have a circuit with a capacitor and also harmonic motion. Suddenly, it struck me that they are all coming from the same principle.

All my life I was always trying to find abstractions that make something that applies to many, many different areas.

Grad: Did you see those as visual abstractions or as mathematical abstractions?

Zloof: I saw initially visual abstractions. Again, because I couldn't read then, the visual became more important. Actually, now that I am working on new stuff, I'm trying to see whether I should really point fingers at my parents because they skipped me a class and screwed my life, or vice versa, it was a blessing in disguise. It's kind of interesting.

Grad: An unintended consequence.

Zloof: Right.

Undergraduate Years at Technion

Grad: Let's talk about the Technion. What did you major in when you were there?

Zloof: I started as a civil engineer, because my father was a civil engineer. In fact, what I really wanted to study was mathematics, which I did later in Berkeley, mathematics and physics. But in those days, people always said, "Mathematics? What are you going to do later, be a teacher?" That's why I went to the Technion to study engineering. That was the "in thing" in Israel. If you marry an engineer, it's as if you've made it.

I started with civil engineering, and I didn't like it the first year because there was nothing there theoretical. I switched the next year to mechanical engineering.

Normally, after high school, you had to go into the army. But there was a program, which still exists, by which if you passed certain physical exams and psychological exams, like you are fit to be an officer, then they allowed you to go to the Technion to get a degree and then go to the army. In the meantime, you have to go to the army in the breaks. So, every year, I went for like two months to the army.

Because I was 16 years old, I didn't go to the army until I was 18, which meant I was already a junior in the Technion. That's why I became an officer later; they saw that I was already two years in the Technion, and they let me finish. Of course, I had to pass all these exams, but they let me finish the Technion, and then I went into the army.

Grad: What were the special courses you most enjoyed while you were at the Technion? Were there special projects that you worked on that you remember?

Zloof: I did mechanical engineering. In those days it was the steam engine, so I had to design a steam engine, turbines, the Carnot engine. I specialized in heat transfer later; the last two years was heat transfer, air conditioning, all of that stuff. Frankly, I didn't like it too much because it wasn't very theoretical in those days. It used to be all empirical.

Grad: So, it wasn't a lot of the modern mathematics?

Zloof: No. In fact, my TAs (teaching assistants) used to be old guys from Germany, like in their 80's. You calculate something with all the formulas and so on, and then you come and you say, "Okay, I got three-quarters of an inch." They go, "Oh, no, make it an inch." Just like that because they didn't understand any of the math. <laughs> They had experience, real-life experience with mechanical stuff.

Anyway, it was only later that I became more and more interested in the theoretical stuff. Again, I was interested in mathematics, and I was very good in math. There were special courses in math in the Technion—building bridges, calculating all the trusses and the forces, and stuff like that.

Grad: I'm trying to get to the point that the visualization, the ability to see these things, was that an important part of what you got out of the mechanical engineering. Sometimes it was kind of visual. One's an abstract visualization and the other is concrete. Doing a bridge, they're specific.

Zloof: Yes, no. This really didn't help me. In fact, I didn't like it. In a way I was miserable in Technion, although I got summa cum laude when I finished. All the things that were theoretical I did in no time at all, and the things that you have to sit down and actually do blueprints of, like a

cross section of a turbine, it really didn't excite me. But visualization was always with me because I couldn't read, so I had to do it in a different way. I was always imagining stuff.

Grad: By this point in time, had you learned to read successfully?

Zloof: Oh yes, definitely. Of course, I did, but I wasn't a reader. My brother used to read books. I never read a single book until I was 12 or 13. That's why I think on one hand I missed that, but on the other hand I developed more my imagination, thinking about stories and stuff like that.

Grad: Did you retain or work on your language skills in English, French, and Arabic during that time, or did you focus on Hebrew?

Zloof: I actually lost the French, because nobody spoke it in Israel. I basically was into Hebrew. We studied English, so I retained that, and Arabic I spoke at home. In fact, I speak Arabic now with my wife, but this is a different type of Arabic.

Many people don't know that the Jewish community in Iraq developed their own language because they were really isolated; they didn't want to mingle with the Arabs and the Muslims or the Christians, so the language became like Yiddish. Yiddish was really a different version of German, so this was a different version of Arabic.

Grad: It wasn't the Arabic that was spoken by the general population in Israel?

Zloof: Right, it wasn't the Arabic, but of course you can understand it. Different dialect and lots of Hebrew words. It's similar to the Yiddish in Germany—I mean in Europe.

Grad: This wasn't really the Sephardic language then. This was really the German-based Yiddish?

Zloof: No, the Arabic wasn't German. I was just trying to make an analogy.

Grad: Oh, another analogy.

Zloof: I was trying to make an analogy to explain why Yiddish grew up from the German language: there were close Jewish communities and they picked lots of Hebrew words from the Bible and they put it in their language. That's how Yiddish was created in a way or evolved.

Israeli Army

Grad: You graduated from the Technion, and you went into the army?

Zloof: I was in the army, right.

In the army, first I went through the officer's course, like West Point here. The first eight months is very, very difficult training. I mean not like now where they call them Chocolate Soldiers. In those days it was really very hard because you had to train without water, carrying 50 kilos, which is like almost 100 pounds on your back, carrying the second World War machine guns. Those were very heavy, and I was very, very kind of frail.

Grad: You were still slight? You were still smaller?

Zloof: Yes, very small. Somehow, I went through it, with my determination. Then I worked in the headquarters of the mechanical stuff, the tanks and so on, and I actually worked in ammunition. My job was with a group that was trying to create bullets that are not harmful, basically plastic for when you train. Of course, there were always bullets like that, rubber bullets that you shoot and so on, but there weren't any bullets for bigger calibers. With bigger calibers, even if it's rubber, it can kill, so we had to devise or engineer something that will be big, and it will hit the target but still not be harmful. That was kind of the thing that I worked on for two years. Then I left and I had my own company, as you know.

Grad: Let's get to there in a minute. You stayed in the army until 1960. Were there any armed conflicts during the period of time that you were in the army?

Zloof: No. In fact, it just happened that I never really participated in any war.

Grad: You missed them.

Zloof: I missed them, yes. I was in between. When I was actually in 1956, during the first war with Egypt, I was already in the Technion and they didn't draft me.

Grad: You were still very young.

Zloof: I was very young. I was still 16 or 17.

Early Career in Israel

Grad: Now you've graduated. You have your degree, and you've finished your service in the Israel army. What do you do next?

Zloof: Again, it really depends on a person's character and nature. Maybe because of my dad, that he was too controlling, I didn't want to work for anyone. I didn't want to work and have a boss that tells me what to do. Joel Birnbaum [at IBM much later] was my boss for many years, but he let you do whatever you want to do, as you know.

So, I had an opportunity to have a company in construction, so I borrowed money from my sister's husband and then I started contracts with municipalities and government to do small jobs like pipelines and drainage and sewage and stuff like that. Then it grew. I worked for about three or four years until I got to a point where I started being bored.

Grad: You had built a reasonable sized company during that period of time?

Zloof: Not very big. Maybe 50 employees, and they were mostly Arabs from the neighboring towns. I got many contracts, and I made money, and then I lost money until there was a time of like a depression a little bit in Israel, so I kind of started looking at myself there. That's not the way I want really my life to progress.

Grad: Where were you living then when you were running the construction company?

Zloof: In Ramat Gan, in the same place.

Grad: You went back to that?

Zloof: Right, right, right.

Grad: Were you married at that point in time?

Zloof: No, no, no.

Grad: You were a single man running your own construction company?

Zloof: Right, right.

Grad: You did that for quite a few years?

Zloof: Until 1965 or 1966. I don't remember exactly.

Grad: You say here 1968. Did you keep it going that long, or did you leave before that?

Zloof: No, actually I left. Did I write 1968?

Grad: Yes. Doesn't matter, keep going.

Zloof: Yes, it's 1966 actually.

Graduate School in Berkeley

Zloof: In 1967 I moved to Berkeley. I started my MS (Master of Science) degree in 1967.

Grad: What made you decide to leave Israel? What made you leave family? This was a major change for you.

Zloof: Yes, it was a major change because I didn't want to stay working as a contractor. At that time, I realized it takes some time for people to realize what they are good at and what they really want to do in their lives. Now probably it's easier. Like I'm teaching my son, who is 21, to really understand himself better. At that time, I was just jumping from one thing to another without really focusing.

In 1966 I was 28 years old. Suddenly I started looking at myself saying, "Is this what I really want to do with my life?" My answer was, "No, I want really to do research. That's what I'm good at, that's what I thrive in, and that's what I want to do." So, I sold everything, cut all the strings, and applied to MIT, Berkeley, and other universities. Of course, the Technion was always considered like a really topnotch school and I was a topnotch student in the Technion, so I was accepted in all the places I applied. MIT to me was much more structured. My sister was in Israel, and she married a graduate. Actually, the first graduate that came to Iraq that was an Iraqi went to MIT to get his master's degree, and he was very conservative.

Then they told me about Berkeley. I said what about Berkeley. It was the hippie time, long hair, barefooted. I said that's exactly what I want. <laughs> So I picked Berkeley and it turned out to be a good match. They didn't really care how you write things. I'm totally disorganized, so as long as you write it correctly, it doesn't really matter how it looks.

Grad: Had you been to the United States before that?

Zloof: No, no. I'd been to Europe because we had an exchange program. I went to Holland, and I worked in Holland for three months in a paper factory.

Grad: Why did you decide the United States rather than England or France or someplace else?

Zloof: Oh, because of Sputnik. The United States put billions into the space program, and my thing was mathematics and trajectory. I went to applied mechanics, which is really trajectories and space and so on. You could get scholarships. They were pumping scholarships into the system. So, I came to the United States, and I immediately got a research assistant and scholarship, and then I got a TA assistantship. It was very, very easy for me. Also, many people were going to America, because that was the in thing in those days.

Grad: Were your English skills comfortable? Were you good at English at that point in time?

Zloof: Yes, I was quite good. I didn't know the technical terminology too much, but I caught it. I mean there was no problem for me at all to start my MS degree at Berkeley.

Grad: Okay, so you come here. What is your MS degree in?

Zloof: It's the same thing, it's applied mechanics, which is really the theoretical part of mechanics. It's like applied mathematics in a way. It's like when you look at materials and you try to see the formulas and the mathematics that govern the material, like spasticity or elasticity and stuff like that.

Grad: Was the mathematical training you had gotten as part of your undergraduate work good enough so that you didn't have any problems in switching over here to Berkeley?

Zloof: I had no problems at all. Actually, I got A's right away.

Grad: So, you got a Master of Science in applied mechanics?

Zloof: Right.

Doctoral Work in Applied Mechanics

Grad: What did you do next?

Zloof: I took all the requirements for a PhD, and then I started my thesis. When I started my thesis, they were trying to do cross discipline, that was the beginning of cross discipline. So, you have applied mechanics, in which you learned all the math, and they were trying to apply it to many different practical areas.

The first project that I took as a thesis topic was pulsating stars. It sounds crazy, but really, we were trying to say, "What are the mathematical formulas that are governing the pulsating of the stars?" You have to assume the atomic explosions and lots of things and see whether it really pulsates. That's the first thing I worked on. I didn't get any results. It didn't work out because I was basing it on somebody else's work that we finally proved wasn't really correct.

I spent like a year doing that. Then I met my wife, and we got married.

Then I switched to the heart, which is really a mathematical model of the rhythms in the heart—you know, why the heart has rhythms. Basically, I worked on the disorder of the heart. There are people who have heart rhythm disorder; they have something like called arrhythmias, and there were many, many different theories based on the medical tests. For example, the EKG, echocardiogram, at that time it was the in thing; that's the thing that they measured the heart with, and they gave you a diagnosis. This guy discovered what they call blocks, meaning at one point you have a beat, a beat, then it skips a beat, another beat, beat, skips a beat. There are blocks that are one to one or are four to five, which means every five one or two are blocked and then another one comes.

There was also something called a Wenckebach phenomenon, which is very interesting. What happens there is that the rhythm, the EKG itself, gets bigger and the next one gets bigger, longer in time, and the next one gets even bigger and then you skip. Then you start all over again.

What I did basically, I first understood was going on with these rhythms, and I created a formula that shows that with one parameter, if I've changed the parameter, all of these phenomena come, which means if you touch the nerve that's going down. Later on, they verified that in animal hearts: if you touch the nerve and you kind of press it, it is equivalent of changing my parameter, all those phenomena will occur. We actually had a paper in the sixth congress of cardiology, me and my professor. It was quite a success. But then of course I got a job at IBM.

IBM Research

Grad: So, your doctoral thesis is accepted, and you now are thinking about what you're going to do next. Did you apply to many companies?

Zloof: I didn't apply actually—again laziness or whatever you want to call it. There were companies coming to campus—IBM came to campus, General Motors came to campus, Dupont came to campus. I just registered there on campus. It's kind of funny because in those days people always looked at these companies as the enemy—you know, all the hippies and the whole trend. IBM or Dupont, these are the big industry, conglomerates.

So, I went to the IBM interview and I told my wife, "You know, they liked me." The guy who was the head of the mathematics department in Yorktown Heights liked me talking about the stuff I did and so they invited me to Yorktown Heights.

I wasn't serious. I told my wife, "Let's go anyway. We are getting a free trip." <laughs> I go to Yorktown Heights and I see everybody there with jeans. <laughs> You know, I mean you were there. They tried to give Yorktown the spirit of a university, remember?

Grad: Yes. You had graduated in 1972?

Zloof: 1972, right.

Grad: You got married in 1971, I believe. Is that correct?

Zloof: Right, right.

Grad: You went to New York and to Yorktown Heights for an onsite meeting?

Zloof: Right, onsite interview.

Grad: Did you meet Joel Birnbaum at that time?

Zloof: Yes, and we clicked. The story is that when I got my degree, I was really feeling very good, very up and maybe in fact a little bit cocky. I came to Joel Birnbaum in the interview and he said, "Do you have any questions?" I said, "Yes, I have problems working in my office. I never worked in an office." In fact, in today's medical stuff, they all call me definitely ADD (attention deficit disorder) because I could never sit in one place.

But he said, "How do you work?" I said, "Well, I drive and I take notes and I just write." He said, "Don't worry, I do the same thing," because remember he was living in Long Island and dictated on the phone when he was driving. So, he said, "Don't worry about that." That's how I clicked really with him.

Jewish Dialect of Arabic in Iraq

Grad: Just to interrupt for a second, you had spoken earlier about a dialect of Arabic that was used by the Jewish community in Baghdad and in Iraq I gather. Did that have a name?

Zloof: Actually no. There was a guy at Columbia University who wanted to write a thesis on that language, and he basically proposed to go to Israel and investigate, because they couldn't

believe there was another language which has a different dialect, so he came to Israel. My grandfather was retired. He had just come from Iraq, and he was very happy to talk all day, so he sat down with him. I remember the first tape recorder that I saw; it used to be with a wire, not an actual tape. So, he was taping him all day, and this guy, amazing, after about six months he could speak the dialect fluently. Then he went back and he wrote a thesis about it.

Grad: Isn't that interesting?

Zloof: Yes, very interesting.

Grad: When we think about Yiddish, we think about the German variety or we think about the Ladino, which is the Spanish version.

Zloof: The Spanish, yes.

Grad: We'll head back to the main discussion, but that's an interesting side story.

Selecting Projects at IBM Research

Grad: Okay, you hit it off with Joel. You had been living in California. Was that going to be something of a problem for either you or your wife to move?

Zloof: Not really. We were following the job. I also was interviewed at Dupont, and when they realized at Dupont that I had an interview in Yorktown Heights, they said, "You are not going to come back here." <laughs>

Interestingly, General Motors was there also. I talked to the guy at General Motors and told him ideas that I had for cars that actually later on they were all implemented in cars. I don't have time to go into it, but the guy wrote me a letter of rejection. He said, "You are too smart for us." <laughs>

Grad: Oh, that's funny. Okay, so the intellectual climate and the physical climate and the way people worked at Yorktown Heights was a very positive direction for you?

Zloof: Exactly, very positive, because I could see myself there. I could see people were very loose and very important also. I mean, you were there. At that time, there weren't all these different areas established yet. Basically, Joel told me, "Walk in the corridors, and if you cannot come up with an idea, come see me." Nowadays you come in and all your work is in compilers maybe—we want you to work from this to this. That didn't fit my style.

Grad: What range of research was Joel responsible for? Do you remember what he was covering?

Zloof: Actually, when I got there he was on staff. Later he became the head of the computer science department, and when he did, I became his assistant because I was reviewing projects, similar to what you were doing. When you came, I actually stopped, but when he first got the job, for about a year or a year and a half, I was his assistant, reviewing the project and summarizing it for him.

Grad: What do you mean by reviewing projects? Give me an example.

Zloof: Like a compiler project. I go and I listen to what they are telling me, the entire group.

Grad: This would be someone within Research who is proposing to do a project. Is that what you're talking about?

Zloof: No, no.

Grad: Was this people in the other divisions?

Zloof: No, no. If there was a project, they have to give it a review. You remember Gomory [Ralph Gomory], right? Joel has to go to Gomory and say, "Here is a project. This is what they are doing in that project." It's one page. I had to go and basically look at everything, what they are doing, and talk to each one of them.

Grad: Sorry, I asked my question wrong. Were these people at IBM Research?

Zloof: At Research, yes.

Grad: There wasn't other projects in other divisions?

Zloof: No, it was at Research. We were trying to understand what they are doing so they can later on say, "Shall we cancel it? Shall we redirect it?" or whatever. There were many projects of that nature. All the projects actually—some of them were in hardware and some of them were in software.

Grad: You had very broad exposure to all the work going on at IBM Research then, didn't you?

Working in Robotics

Zloof: Yes. However, my first job there was really as a mechanic—the robot, the mechanical assembler.

Grad: What is that? Tell me about it.

Zloof: Actually, this was the beginning of robotics, which is different from a regular programmed machine. There was automatons in those days in factories, where a machine does certain things, but we were trying to program it. In other words, you program it, and the program activates that hand, the mechanical assembler. Basically, the whole idea was to try to build something that you can program, and every time it does something else.

Grad: Did you have a particular application in mind when you were working with that robot?

Zloof: No, they were just trying to do it in general.

Grad: It was just a generic thing?

Zloof: Yes. For example, one of the things they did was to pick up eggs. That's a very tricky thing. There was no vision involved. In fact, what I'm doing now is in a way all these ideas that I learned there. I'm applying it to what I'm doing now in the brain.

Grad: We'll come to that later.

Zloof: Yes, we'll come to that later.

Grad: How long did you work on this robotics project?

Zloof: I worked part time on that, and part-time on how to make computers easier to use. I worked like half and half. When I came up with QBE (Query by Example) later within the same year, I stopped working on the other one, but I had a couple of patents on the mechanical assembly.

Grad: Oh, really?

Zloof: Yes. Actually, this is kind of interesting. Remember the Rubik's Cube?

Grad: Yes.

Zloof: Okay, what I came up with for the degrees of freedom for a mechanical assembler was almost the same mechanism as was inside the Rubik's Cube. The Rubik's Cube you could turn

this way, that way, that way. I'm not talking about the colors. At almost the same time, I actually had a patent on that. Anyway, that wasn't really my thing. I mean I wasn't very excited working on that project.

Prompt for Query by Example

Grad: In 1973 you started working on programming ideas, computing?

Zloof: Yes, that was the mission that Joel gave me. He said, "Think about how to make computers easier to use."

Grad: That general a statement?

Zloof: That general a statement. Then of course I started using my imagination. I remembered that in Israel I worked in public projects. We had to bid on those, like now you bid on projects, on jobs. When we had to bid, we had to fill out all of the items: how many items, how much each cost, blah, blah, blah. You are filling out a thick thing like that, and then you multiply and add, multiply and add.

Grad: You're talking about a thick stack of papers. You had to fill up all the tables and do the calculations?

Zloof: Right, do the calculations, and finally you get a number. Then when they open it publicly and your number is the smallest, you get the bid. Because of my laziness, it used to be horrendous work. We used to hire people, temps, for a week or two just to multiply and add and so on.

When I got to IBM, they told me to make computers easier to use, and that came back to me. If I'm doing all of that, why can't I just give an example of that and the machine will do the rest? This is interesting to explain. I said, we used to have tables. I'll have an electronic table. If say a person has a salary and commission, then you want to create another column that shows salary plus commission. We used to have to add it, multiply it and add it. In my work, it used to be like a number of items multiplied by the price and then add it there, total, then subtotal, and all that stuff.

Basically, I said, why can't we just write an example of that: S for salary and C for commission C, and then I write S+C. Then the system has to go and calculate and run that entire database.

Grad: Instead of actually writing a procedural code, you just wrote an example of the procedure that should be followed.

Zloof: Right, right. That was really the beginning of programming within objects of business. This was like five years before spreadsheets. In a spreadsheet, the first initial spreadsheet, you may have thousands of records, and there was no local intelligence. Later on, they extended it to a database.

In other words, you have to write something and then it sends it to a mainframe and brings back the results. Therefore, in order for it to go through 2,000 or 10,000 records, it takes time. That's why I'm writing a query. In QBE, S and C and S+C and then send it to the mainframe. Bring it back and see the results.

When spreadsheets came, that was another object that is really not a table. It is really like a grid, which means every cell can be different. There's no uniformity. There of course they use the PC. The PC has local intelligence and local programming and processing. There of course you just want two cells, a cell A and a cell B, and then you get A+B. You didn't go through an entire database, you just went through that cell, and that's why the PC could calculate it very easily. That is why it was interactive. That was the first interactive thing that you did, right?

Of course, QBE was also interactive, but it had to go to the mainframe and come back.

Grad: That's a very interesting point, and I want to explore that with you a bit. First, where did you get the name Query by Example? How did you come up with that?

Zloof: That's a very good point. I was in a project. We created a small project under Joel called Programming by Example. The idea there was that you write a program, at that time in PL/1 or Fortran, and the system will learn from whatever you're programming and abstract it to a higher level. That was very difficult to do.

Grad: Like an adaptive programming kind of thing?

Zloof: I don't really know what they were trying to do. It's like you are giving an example of the program, and it abstracts it. In other words, I could immediately tell that doesn't work because you cannot go from low level to high level; you cannot go from something that has detail to something that doesn't have detail. The opposite is true. You can have something abstracted. In QBE I'd just say I want this, this, this, and then the system wrote the program for you, but not the other way around.

Grad: An inductive approach?

Zloof: Right, an inductive approach, which never works, because it cannot cover the entire world of programming. When I was working there, I came up with this idea. I said, "Forget about general programming. Let's just do database." That's how the idea came about.

QBE Language Development

Zloof: Peter DeJong was my manager at that time. He works for Microsoft now. He was really a very fantastic guy. He promoted me through the entire process, and he basically introduced me to relational databases. See, you have to have luck sometimes too. Timing is important.

While I came up with this idea, Codd was the father of relational databases. He was working on the relational model. A relational model is really tabular, so it fits. There was a tremendous match between what I was saying and what Codd was doing. That's why when I came up with QBE and when I went and gave a talk, he said it was a breakthrough. One of the letters that he wrote says this was really a breakthrough in the relational database area. That was kind of the beginning of it.

Grad: Now you have this idea: write in a table form sort of one line that describes the process of procedures you want to follow.

Zloof: Either one line or two lines or five lines, yes.

Grad: As a result of that, the entire table, this could be applied and done automatically with programming?

Zloof: Right.

Grad: Now you're in Research, and you're working on this. You have Peter DeJong working with you. Are there others, or is it just the two of you?

Zloof: Initially, it was the two of us, but later on it was a small group of like five people.

Grad: You had the idea, the concept. What did you do next?

Zloof: Yes, this is a very important point that you are bringing up. I want to make sure that people who look at me realize that it is not that easy to go from point A to point B. When people see that, it depresses them. For example, when I was a kid, I learned that James Watt looked at a kettle and saw the top of the kettle and that the steam comes up and moves the top. Now suddenly you have the steam engine. It's like going from the kettle to the steam engine; there is a whole process you have to do, and people like to abstract that.

Remember the Compaq computer? The story goes that the guy—I don't remember his name, Rob something—went to dinner with venture capitalists and showed them his idea on a napkin. Then suddenly Compaq became the biggest PC manufacturer.

The point is that there is a process. You come up with an idea, but then you have to work very, very hard to make that idea actually work.

Grad: What was the process you followed?

Zloof: There were many, many different avenues to the process, dimensions I am calling it, to the process. First, you have to make people understand and then like it. If they don't like it, then you move into something else. Many people come up with something, and they get a hold on it and they never let go. That messes up their lives.

Because it was such a novel and clean concept, I got a tremendous amount of response from many, many different people, especially from the academic community. Then the next thing I did is I tried to basically make the language complete, because it's nice just to write this but there is something in mathematics called "completeness," which means you can write anything that you want to get from the database area, you can write a statement for. That's not that easy. It's like you have joints and intersections and unions and all of that stuff. You have to kind of together make it really complete. Because I can do this to get this information, but I cannot write something to get that information.

QBE System Development

Grad: Let me interrupt just a second. The applications you were thinking of were query-type applications?

Zloof: No.

Grad: I'm trying to get the connection to the name you chose.

Zloof: Oh yes. It was basically querying a database. You have a database and you want to query it.

Grad: That was the application you were envisioning, because people wanted to query a database in a variety of ways.

Zloof: Right, a variety of ways. So, you have multiple tables that have data, and you want to query them, link them, and so on. That's how it started.

But then the name really worked against me because query means query: query by example. But then we made the whole system. In other words, these things that I was showing you like merchandising through query by example, it's a whole relational system that people can use to run their businesses.

Grad: In some sense, the name limited people's vision of what the market or opportunity might be.

Zloof: Not limited. I think later on we'll talk about the divisions in IBM.

Grad: No, but I'm talking about as far as it would make me think of certain kinds of applications, but not of others, not of a full application system.

Zloof: Yes, right. It makes you think that it's an interface that you can only query, that you cannot create tables, you cannot do security. We had all of that.

QBE Prototype and Testing

Grad: Okay, let me stay with your process. You had the idea, and you're now working your way through. You're actually designing and programming a system to handle this. First, you have to decide what the languages are and the capabilities, is that correct?

Zloof: Yes, first I personally did the language: the completeness of the language, how it works, its syntax, and so on. Then we had a small group that actually implemented a prototype.

Grad: What did you implement, and what language did you use?

Zloof: We used PL/1 at that time.

Grad: And a large mainframe computer?

Zloof: VM computer, right. We had something to demonstrate, and we started using it. After a couple of iterations, we started using it in Yorktown Heights.

Grad: Did you write any manuals to describe the language?

Zloof: Yes, we did manuals, and we supported about 100 different applications.

Grad: Let's go to that next. I'm trying to understand it, because you're doing a good job here telling us the process of going from an idea to something that can actually be used by other people.

Zloof: Right, exactly.

Grad: I am trying to make sure we cover all the bases. How did you test the thing, for example?

Zloof: The process really was iterative. We built something, and we started using it in our own small group. It was slow and all of that stuff, so we rebuilt it so that we could support people at Yorktown. Many, many different applications in Yorktown needed QBE. Let me give you an example: expense accounts. They wanted for every week the summation of all the people who work for every manager, grouped by sets, and all of that has to be there. We implemented all of that, and they used it.

Grad: Some of your testing initial examples and work cases were within the Research Center itself?

Zloof: Within Research, right. People who did manufacturing, small manufacturing in Yorktown, like experiments with chemical stuff and so on. They needed to know what's the run, all the different chemical compounds, and when they run it, what's going on there. It's similar to what people today use spreadsheets for.

Grad: You had some real examples. You tested it?

Zloof: Right.

Initial QBE Commercial Product

Grad: Now you've got a running program that you're reasonably satisfied with.

Zloof: Right.

Grad: What happens next?

Zloof: Okay, now we tried to push it to the divisions.

Grad: This is what, about 1974 or 1975?

Zloof: That's about the 1975 timeframe. Of course, I continued to do more things, not only query but also security, concurrency control, a definition of the tables, all of those things that you need for a real system, basically to make it complete as a database management system.

Grad: Now you have an operating system running under VM. Then what?

Zloof: We started looking for people who would actually make a product out of it. Of course, in those days, it would've taken years. In fact, that's why they picked SQL and System R to do it, and it took a much longer time. We basically packaged it as what they called IUP (Internal User Program), and it was part of Palo Alto. It had lower priority because it wasn't really the mission of IBM.

Grad: These were type 3 programs? That's the original name for those?

Zloof: Type 3 programs, right. We built that for them, and they interacted with us. We built the code, but they packaged it as a product.

Grad: So, Palo Alto took that, even though you were working there in Yorktown?

Zloof: Yes, right, Palo Alto. We used to come here a lot.

Grad: You say Palo Alto. Did you mean San Jose or Palo Alto?

Zloof: Now it's Santa Theresa, but it used to be across the street from the HP on Page Mill Road. Anyway, we wrote the code, but they packaged it as a product, and they started selling it. We had about 100 customers, large customers, including Bank of America, to aid management.

Interestingly enough, the Japanese got very excited over QBE and OBE. They translated all my work into Japanese. Because again it was visual, they could relate to it. They couldn't understand SQL So we had about 100 customers in Japan itself.

IBM Sales and Promotion of QBE

Grad: Was IBM selling this or giving it away?

Zloof: No, they were selling it.

Grad: They were getting money for the use of the program?

Zloof: Yes, but of course very minimal. At that time, it is very important to note that at that time IBM wasn't in the applications business. They really wanted to sell hardware, so they gave applications away either free or they charged minimally, and they didn't really care for it too much.

Grad: It was not really sold then through the regular sales force in any volume. These were sort of individual situations that people were aware of?

Zloof: Do you mean how did they promote it?

Grad: No, how did a customer even know it existed?

Zloof: I don't know. They did their own promotion. They had customer service. They went to customers and said we have this thing. Whoever used it said, "Wow, this is unbelievable. It's going to change the way we're running our business" and so on.

But because it wasn't strategic, the real game was really System R. We had that meeting. They were trying to push DB2 to the divisions as a replacement for DL1. This became really the thrust: SQL/DS first and then SQL on MVM

IBM Push for System R

Grad: I'm going to stop you for a minute for clarification. IBM had a very major database management system called IMS, which is a hierarchal structure.

Zloof: Right.

Grad: At this point, the people in Santa Theresa were working on System R. System R was an outgrowth of the Ted Codd work on relational databases with a language called SQL.

Zloof: Right.

Grad: I'm just trying to clarify. That became the main thrust of the people in Santa Theresa, to get System R into the mainstream as a product to do relational database management. Is that correct?

Zloof: That's correct.

Grad: QBE was a different implementation and not SQL-based, so that was not their mainstream of support.

Zloof: That's correct, but QBE came first. The first relational system in the market was QBE, and as Codd mentioned, this was also the purest in terms of adhering to the relational model.

Grad: I'm trying to understand because I know that this limited marketing affected the breadth of acceptance of QBE.

Zloof: Right, it was limited marketing and also limited support. We supported it in Research. As the domain of customers grew, we couldn't support it anymore.

Grad: Santa Theresa never picked it up as a product?

Zloof: As a product, no. Never picked it up, again because their thing really was System R and they were trying to do DB2 at that time, replacing IMS. All of that stuff was going on.

System R versus QBE

Zloof: The main thing is that, when I look back, we were two groups: we were in Yorktown and there was SQL and System R. We were all the time clashing, because it's like competition. Competition is very healthy, and they had lots of task forces to see which is which, and so on. But really, they won.

There are two main reasons why they won and they are standard now. SQL is a linear language. It can be very easily embedded in IMS, embedded in PL/1, embedded in Fortran. Take the data from SQL and plug it back into whatever you want to do. QBE was strange, two-dimensional, graphical: you don't know what to do with it.

Also, they had a much bigger group that were all scientists. Our implementation was really done like ad hoc, but they had many people working on every aspect of the implementation because they wanted really to replace IMS. That's also why we were slower than they were in terms of speed and so on. That's why Codd was complaining about them all the time; they weren't pure relational for a reason, because they wanted to speed up the process, and they wanted to have performance.

 For example, to give you a very simple example, we had something called PDOT, which means give me that column with a restriction. When you say PDOT in relational, it should really eliminate all the duplicates. Eliminating the duplicates is a tremendous task because it has to create an index and very, very complicated stuff. When SQL says Select, which is the equivalent of PDOT, they keep the duplicates. You see? It's a tremendous difference, so you are comparing apples to oranges. You say PDOT here versus Select here.

Grad: They're not equivalent?

Zloof: Not equivalent. But if you say select unique, then it means apply the index. You see?

Grad: Let me just ask two questions, and then we'll move ahead further. The mathematical work that Codd did, was that work you could understand personally, or did you need an interpretation?

Zloof: No, of course, it's mathematics.

Grad: You understood the mathematics?

Zloof: Of course, yes. I actually taught it afterward. One of the major principles in mathematics is the set—set meaning there are no duplicates. He was very angry because they bastardized that, but I understand why. They were competing. The people who did IMS wanted to pooh-pooh them: that's a new concept, relational. They would say, "Relational is just a toy. It cannot really work on many millions of records." If they had to eliminate duplicates on millions of records, it would take forever to process. So, they did all the tricks to make it fast, and one of the tricks was to avoid the elimination of duplicates.

The other trick was domains. He fought it for a long time, the concept of domain, because when you define a table or a column, you have to declare, for example, money, like dollars; you say this is a domain of money. It has to check whether it's part of that domain, which means again it is checking. It has to do extra checking.

Grad: Is that like a data typing kind of thing?

Zloof: It's a data typing, right, but it's more complicated because it has hierarchy. I don't want to get into that. But we defined the domain. That's why he said, "It's the purest. Moshe had the domain concept."

Grad: Let me ask one other question, and then we'll move ahead. IBM had been using products like a report program generator, RPG, which were really visual things, not linear languages. Did you have any connection or knowledge of those when you were doing this work?

Zloof: No. I had no knowledge, but it was a connection. I'll tell you what they are; they are not really general, like they programmed a particular form. In a way, it's very similar to what you do now. It's like it went back to what it used to be. Now you have a form. When you go to the internet and you order a ticket or whatever, you are going through a hierarchy, and that form is programmed for that. Okay, it wasn't a general thing. We tried to do a general language.

Grad: But RPG, you could write a lot of parameters, yes?

Zloof: Yes, within limits. We tried to do the most general thing you can have.

Grad: So that was not a direct successor to RPG thinking or anything? That's what I'm trying to understand.

Zloof: No, it wasn't a direct path.

QBE System for Business Automation

Grad: You in effect went so far. You had a certain number of customers, but you couldn't get the support that you needed to make it a regular program product or to move it to get the number of people to keep working on it.

Zloof: Right.

Grad: At what point did you decide this wasn't going to make it as a product and start working on something else?

Zloof: When I was working on QBE with the customers, I moved on to do OBE (Office by Example), which is really like Microsoft Office, which is really combining a word processor, database, spreadsheet all together.

Grad: But there were no PCs at that point to speak of.

Zloof: No, it wasn't PC. Again, we did it on VM. Then when the PCs came, I started pushing for QBE on the PC.

Grad: I see. Let me stay with that time period though. I have a note here that you worked on something called System for Business Automation.

Zloof: Right.

Grad: What was that?

Zloof: This was something that we worked on because Peter DeJong has a tremendous background in business. We worked on a system using the QBE concept to run businesses. It was never implemented. In fact, a paper was accepted to the *Communications of the ACM* at that time called the "System for Business Automation." I worked with Peter DeJong for a while on it, and then it became too complicated for my mind, it became too complicated. Then we left it and I went into OBE.

Grad: You speak about word processing and so forth, but the structure you speak of in QBE is essentially a table type structure.

Zloof: Right.

Grad: How does word processing fit into that kind of model?

Zloof: The idea was that one of the concepts of QBE is called "example element," which is really like variables: you put in, as I said, a variable S, a variable C, then S+C. But these variables can also work on other objects. For example, if you're writing a letter, you say Dear X, and then X is linked to a database that has a column of names. If you run that program, if there are 10 records, it's going to produce 10 letters that say Dear Henry and so on. Then, you can write "Dear X, this is to inform you that your salary is Y" and whatever. We are placing the mail merge, placing word processing into the word processor itself.

Graphics is the same way: you can have X and Y graph, and you have a sample of a graph that says "_____ bar graph" and then you write X in the bar and Y in the bar. All of that was implemented.

Grad: You extended it beyond essentially numeric or name type recognition to other kinds of things?

Zloof: Yes, it was linked to a database, word processor, and many different kinds of graphics that you have now.

Grad: You were working on that for a period of time. A few years?

Zloof: Yes, I worked on it for a few years until the 1980s.

Grad: Did you implement that also in PL/1 under VM?

Zloof: Right. We implemented it in PL/1 under VM.

Grad: Why were you using VM? What was the advantage of VM from your standpoint?

Zloof: It was easier to implement.

Grad: Why?

Zloof: I don't know. I'm not the programmer, so I don't know. MVS was much more complicated, and we didn't want to get into that.

Grad: Were you using VM as a time-sharing system?

Zloof: That's correct, yes.

Grad: So, it's really VM/CMS?

Zloof: VM/CMS, right.

Grad: Its successor was VM/370, or whatever they ended up calling it.

Zloof: Yes. Then when the PC came, I started pushing for QBE on the PC.

Grad: That's at a later point in time?

Zloof: A later point, right, in 1983.

Office by Example

Grad: I'm trying to stay with this time period. Were there any other projects you worked on during that 1976 to 1980 period other than Office by Example? That's a pretty big project.

Zloof: Yes, that's a big project. No, I didn't. Office by Example of course, and we were supporting the customers.

Grad: You were still supporting QBE?

Zloof: Yes, we were still supporting it. Many people stayed with QBE after I left IBM. They didn't want the halt to the systems because they were running their business.

Grad: But IBM Research was actually supporting it, it wasn't supported by a product division?

Zloof: No, no, no. By the way, that was the only product that went from Research to the customer. Nobody else did that.

Grad: In 1980, you're still at IBM Research in Yorktown Heights?

Zloof: Yorktown, right.

Grad: And that was your principle project. What was the most difficult part of OBE, do you remember in terms of implementation?

Zloof: It was performance. Triggers, for example: the system used to wake up in the middle of the night and when something changed to activate the trigger, the trigger woke up the system in the middle of the night to do something. In the morning, you see all the forms and so on. This

was ahead of its time. We had all the things that you really want to do—triggers, email, word processor, spreadsheets—all together, but it was very slow.

Grad: Did you publish papers during this period of time on these things?

Zloof: Yes. OBE was published in the *IBM System Journal*, and they were in many other publications. I have here all the list of names.

Grad: You'll give us those?

Zloof: Yes.

Grad: Did you patent anything in QBE or OBE?

Zloof: No. At that time, they were saying you can't patent an application, you cannot patent software. When I left IBM actually, I wanted to buy the system from them, but you know the lawyers and all that stuff, they wouldn't allow me.

Limited Adoption of OBE

Grad: You just did a prototype?

Zloof: Right.

Grad: Apparently, you never were able to get the prototype running at the kind of performance because you're using mainframes, using other things.

Zloof: Right, right.

Grad: That would really make it a major project.

Zloof: Right.

Grad: Even though with QBE, you had 100 customers, you might have had more.

Zloof: Yes.

Grad: With this one, it never reached that kind of stage where you were comfortable.

Zloof: Right. This one needed a tremendous amount of marketing, because you're not marketing a database. You're marketing something much bigger than that, and in those days, people couldn't understand why suddenly you have a database and spreadsheet at the same time. They did it separately.

Grad: The idea of a "suite" comes in much later.

Zloof: Yes, "suite" came much later.

Grad: What happens in 1980?

Zloof: I was doing OBE, and I was invited all over the place. Keynote speech here, keynote speech there, and invited to something there. I went all over the world practically. Then Joel Birnbaum left and the politics started.

Grad: Joel left IBM Research.

Zloof: Right.

Grad: In 1980.

Zloof: He went to Hewlett Packard.

Grad: You say the politics changed at IBM Research at that point?

Zloof: Yes. I wasn't getting the tremendous support I used to get from Joel. Joel used to fight for me. Again, there was the whole idea of us competing with System R; it was escalating more and more and then I saw the PC coming. I could see I was missing the boat, and then the spreadsheet came on the PC.

Grad: Right.

Zloof: I don't want to say that I could have come up with it, but it affected me because that's also visual. It affected us a little bit. All of that brought us to a point. Actually, I wanted to leave and I got a fantastic offer form a company in Oregon. I almost wanted leave. I got a fantastic offer to start a subcompany. Then Gomory wouldn't let me go. He matched the offer and showed me a good salary—that's between you and me.

The point is that I couldn't go to Oregon because I saw the weather wasn't that great. I went there once, and I saw fog the entire day. I said, "I'm not going to spend my life there." I got a

fantastic offer, and Gomory gave me such a raise; it was unbelievable that he matched almost what they were offering me there, and that's why I stayed.

QBE on the PC

Zloof: When I stayed, I had requirements. One of the requirements was I wanted to have a bigger group, and I wanted to implement QBE on the PC, so we started implementing QBE on the PC.

Grad: The IBM PC isn't announced until 1981 or 1982?

Zloof: Right, 1981.

Grad: Were you using IBM or using some other PC at that point?

Zloof: No, we were using IBM. In fact, when it came out, we started using it right away.

Grad: This is 1981 or so?

Zloof: Right, 1981. Then it went from 1981 to 1983 or something. Then we pushed it, and there was a division in England that was very much interested to support it.

Grad: Was this Hursley or someplace else?

Zloof: No, not Hursley. Some divisions. Hursley was research.

Grad: Research, okay.

Zloof: No, a division. I went there, and we had talks. They were very much interested to do it, but again, the politics got into the game. They were saying "SQL is our main thing."

Grad: By that point, SQL/DS I think has been announced.

Zloof: SQL/DS has been announced, right.

Grad: And DB2 came shortly after that, I think.

Zloof: Right. They didn't want to "dirty the ground" with QBE, I think. That's what I started to feel, the pressure. That's why I decided to leave.

Grad: Let me ask you a couple of questions about people. Did you work with Chris Date during this period?

Zloof: Oh yes, definitively. He had a whole chapter on QBE in his book, and he was one of the promoters from the very beginning of QBE. He actually promoted all the other stuff that was not the Query itself, but security and authority all of that he put in his book. Date was a tremendous supporter of my work.

Grad: But that wasn't sufficient to change the business case that was being made for these other products.

Zloof: No, right. They didn't really have a say in the business either.

Grad: Now you say you "implemented QBE." Was it released? Was it made available to customers on the PC?

Zloof: No. As I said, it was being used. I used it myself after I left IBM, I used it at home for running the business of my company, but they wouldn't accept it. Basically, we got lots of resistance from everybody to get it on the PC. Part of the reason is because they made deals like with Microsoft and Lotus; that's their business. Maybe they made a deal to say, "We are not going to have any interfaces, any applications running on the PC except you guys." It could be. I'm not sure about it.

Grad: At that point in time, did IBM ever release any applications on the PC?

Zloof: No. Lotus always. Microsoft was taking over at that time. Remember the relationship with them. They never released anything on the PC at that timeframe.

Grad: Did you continue working on OBE during that period of time or not?

Zloof: Yes. We had two groups, and I had about 50 people. We had a group of 10 people working on OBE and on VM. The groups in fact were in two different locations and working on the QBE on the PC. Again, it's not really just Query but the entire system.

Grad: That was the name you were still using.

Zloof: Yes, because the name was very popular.

Grad: Sure.

Zloof: Everybody knew what that was.

Grad: And you continue to support the QBE users during that period of time?

Zloof: And supporting QBE users, right.

Grad: Were you the manager of this group?

Zloof: Yes, I was the manager.

Grad: People were reporting to you?

Zloof: Right. I was a second-level manager. I had a manager reporting to me.

Grad: How many people did you say you had total?

Zloof: About 50 before I left.

Grad: That's a very large group to have in Research, isn't it?

Zloof: Yes, it was two groups. I was the manager of the two groups. That's the deal I made with Ralph Gomory to have these two groups. But then of course, with the resistance and so on, I started thinking of leaving. I said, "I'm going to miss the boat."

Actually, I did miss the boat, because at that time, all those small companies, even Microsoft wasn't that powerful. Ashton-Tate wasn't powerful, and they didn't have too much marketing power. I thought this is the last thing I could do. I can get out, implement a nice system of QBE and database management system and push it to the market. Do you want to talk about this?

Reasons for Leaving IBM Research

Grad: You decided to leave IBM at that point?

Zloof: Right.

Grad: Is there anything else before we move on? You had a nice career of 13 or 14 years.

Zloof: Right.

Grad: Thirteen years at IBM, I guess it was.

Zloof: Yes.

Grad: Who was your direct manager or the director that you reported to?

Zloof: When I left?

Grad: Yes.

Zloof: George Fan. Remember George Fan? He used to work for Gomory. He was great. He was a great manager.

Grad: There wasn't a problem as far as personal relationships?

Zloof: No, no. Actually, he was better than Joel. Almost like Joel, he left me to do anything I wanted. He actually applied for me to be an IBM Fellow. In fact, if I hadn't left, in another year they would probably have approved me to be an IBM Fellow.

Grad: But you were getting frustrated with the fact that all the things that you had worked on weren't getting into the marketplace.

Zloof: Exactly.

Grad: And you had this entrepreneurial spirit.

Zloof: Yes, exactly. When I look back, many mistakes were done because of egos or personalities—you never know what. For example, we could have done a fantastic job of implementing QBE, the entire QBE, on top of SQL or on top of DB2. In fact, they did something called the QMF (Query Management Facility), which was the QBE interface to DB2.

Grad: This was later on though, after you had left the company?

Zloof: No, when I was there, they implemented it. In fact, they used to come all the time to ask me about the syntax and about this and about that.

Grad: Oh.

Zloof: Yes, so there was QMF, but again it died because it was an application on top of DB2.

Grad: And it wasn't being pushed.

Zloof: It wasn't being pushed, right. It was like another "pimple" on top of DB2.

MM Zloof, Inc.

Grad: I want to leave the IBM days. You leave the company. What do you do when you leave IBM?

Zloof: I left IBM. Two people who were managers in my group joined me, and we created the new company called MM Zloof, Inc.

Grad: This is 1984?

Zloof: Right.

Grad: Where did you locate?

Zloof: Actually, it was the beginning of 1985. This was between Poughkeepsie and Yorktown. We rented a place. We hired about five people, so we were a small group. We worked on, again, implementing more than QBE, because it was forms and reports and that stuff.

Grad: There were no restrictions about you using the ideas or concepts of QBE?

Zloof: No, but we didn't use the codes. I could have used the code, but then there would be litigation, maybe. We never touched the code because I didn't want any troubles.

Grad: So, you wrote new code. Do you know what language you used to write that new code? Do you remember?

Zloof: Yes, Basic.

Grad: You used Basic. You were designing it to run on the PC under MS/DOS at the time?

Zloof: Right, right. However, as we went along. those other companies became very powerful.

Grad: What other companies?

Zloof: Companies like Microsoft, Ashton-Tata, and those guys. So, it's not that you just come up with a product. You have to also market it, and those companies were very powerful. Also,

there was another product called Excel Paradox, which copied QBE from A to Z on the PC. in fact, they have me on their commercials, that it was created by Dr. Zloof. That's one of the things I wanted to show you. They implemented the QBE on the PC.

Grad: This is during that same time period?

Zloof: Yes, during the time that I left.

Grad: But now you're implementing your own product.

Zloof: Right.

Grad: But they went ahead. Did you support them?

Zloof: No, I didn't know about them. One day they used almost exactly my wording when I said "Easy to use. Programming within the forms" and so on, but they did a tremendous job.

Grad: My memory is that Paradox was funded by Ben Rosen.

Zloof: Ben Rosen, exactly, and then he supported it.

Then they sold it to Borland, and it became "Paradox in Borland" and Borland supported it. Again, I was pushed from all sides, and those companies grew.

Grad: They're big, and you're small.

Zloof: I'm small and there was already something in the marketplace supported by Rosen and all the big guns, so we couldn't go further. Knowing me, I don't want to repeat the same thing in this new product. When you're in research or you're enamored by new functionality all the time, you want to do it better and better, and you miss the boat. You don't know how to cut and say, "This is the line."

Grad: You don't freeze early enough.

Zloof: You don't freeze early. All of those forces came together and finally we had to fold.

Grad: Had you marketed the products though at all or not?

Zloof: No.

Grad: It was just still "under development."

Zloof: Still under development, and it wasn't working in fact. We were working on the spec for three years.

Grad: You kept increasing the spec.

Zloof: Yes, I kept increasing the spec and so on. Finally, the company went down.

Sale of MM Zloof, Inc. to Ashton-Tate

Zloof: However, I was so lucky or whatever. I basically sold it to Ashton-Tate for $3.5 million. They didn't really get much except me.

Grad: But that's worth $3.5 million, easy.

Zloof: Well maybe, I don't know. <laughs> I paid all the investors and so on, all their money back, at least that.

Grad: Where had you gotten money from?

Zloof: I got the money primarily from family and friends, which I will never repeat, although I gave them the money back. I went through hell when the company folded, and I had nothing.

Grad: You speak of "family." Had your family stayed? Were your parents still alive at this point? Were they living in Israel still?

Zloof: No, my dad had passed away. My mother was still living in Israel. My brother was in Israel. Family here is primarily the family of my wife. They were all well to do, so this guy invested $100,000, the other guy $50,000, and so on.

There was also a guy who was my neighbor who I really didn't know much. He used to work on Wall Street. One day, he was passing by and I said, "Why don't you come in for a coffee." He said, "What are you doing?" I said I was doing this product thing. He said, "Show me," so I showed him a demo of OBE, and he took out his checkbook. He wrote a check for $100,000: "Moshe Zloof, $100,000." He signed it and gave it to me. He said, "You do the calculation, how much I should get in stock."

Grad: That's wonderful. That's a wonderful story. That's really great. This was while you were still in this area near Poughkeepsie, along the Hudson there somewhere.

Zloof: Right. Yes. I was living in Dobbs Ferry. I used to commute.

Grad: You were commuting back up. Is it around Cold Springs, that area or farther down? Do you remember the name of the town?

Zloof: I don't remember. It's like another 15 miles from Yorktown Heights, north. Yes, you go on the Taconic.

Grad: So, the company is basically going out of business.

Zloof: Right.

Grad: How did you get in touch with Ashton-Tate? How did they know of it?

Zloof: Oh, that's another story.

Grad: Tell me.

Zloof: There was a guy who used to be marketing Lotus. Lotus 1-2-3. How did I get to him? He came once to Yorktown Heights to see QBE and OBE and so on. Richard Duffy was his name. We became friends, and then I didn't hear from him. When the company folded, I wanted to look for him. I called Lotus and they said, "He left the company, and we don't know where he is."

I don't know how finally I got to him. He was in Hawaii at that time. He basically said, "I'm tired of working." He was making good money. He became like a hippie. He went to Hawaii, got married to a Hawaiian girl. He said, "I don't need any money."

So, I called him and I said, "Look, I have this and I want to sell it. I don't know what to do." He said. "Well, let me look." He started calling people he knew. I went to Borland, and Borland at that time was in negotiations with Paradox. They were just trying to find out what am I doing. They didn't really care for me, and I could feel it. Then I went to Lotus—I don't remember.

Finally, I got to Ashton-Tate. I remember Richard Duffy called me and he said, "You have a meeting with Ashton-Tate." I went to Ashton-Tate, and I talked to the vice president of marketing, and he got so excited about this. He said, "We want it now." Blah, blah, blah. Then we started negotiating. I basically was selling nothing except me, but they had a nice program, and it's really working. It was written by Bricklin. You know Bricklin developed the spreadsheet?

Grad: Dan Bricklin.

Zloof: Yes. Dan Bricklin, right. After he did VisiCalc, he had his own company called Bricklin Demo. Are you familiar with that? Anyway, it was a product with which you can write demos, so I did a demo, but it looked "interactive." I told them there's nothing behind it, but they can see it.

Grad: They could see how it would work if it was working.

Working at Ashton-Tate

Zloof: Finally, when I joined them, I put QBE under dBase, which was very important.

Grad: Yes, of course.

Zloof: I did something there important. That was worth their while, their investment.

Grad: Was coming back out to California a plus for you at that point?

Zloof: I wasn't very happy about that, but my wife was because we went to Beverly Hills, where all of her family lives. We had to buy a house in Beverly Hills. I had a hard time there because we had to compete with all the neighbors and with her family. It's not that easy, especially with all of those people on ego trips in Beverly Hills. <laughs>

Grad: It was a difficult personal change for you?

Zloof: Yes. Also, it was like I went from people who were very technical, professionals, to deal with people who are really businessmen. It's not that easy to talk their language.

Grad: For you, working for somebody else in a non-research environment, it had to be somewhat difficult.

Zloof: This is a very important point because in a non-research environment, I die. Joel, I think, is the same in a way, a little bit like me. I cannot keep up with the schedules. All of the things we did, it was ad hoc, all the time ad hoc. It was like, you have a date, and if you don't finish that day, the product is not going to make it. That type of pressure I was never under, but I started learning that pressure at Ashton-Tate. All the people there were developers. They talked in terms of bits and bytes. This "pointer" and this and this. I couldn't communicate with them, so it was a very hard time for me.

Grad: They bought your company, and you went to work for Ashton-Tate.

Zloof: Right.

Grad: Who were you reporting to there?

Zloof: I was reporting to Ed Esber. Actually, I was reporting to Bill Stowe, who was vice president of technology, who reported to Esber. You know Esber?

Grad: We have done an interview with him.

Zloof: Oh, really?

Grad: It is on our oral history website. What was your title when you were at Ashton-Tate?

Limited System Integration at Ashton-Tate

Zloof: It was chief architect. This is the concept that actually put them down, because they were in dBase, which is database. It is very important to know a company's mission statement. I used to think a mission statement is nothing—it's just words. But their mission statement was, "We want to be number one in the software industry." They didn't say, "We wanted to be number one in database," because they had the whole database in their bag. They were dBase, and everybody was using dBase. No one had any database in the PC except dBase 2.

Grad: There were others. rBase was there.

Zloof: dBase was the major product.

Grad: It **w**as the largest one.

Zloof: When Esber came, they said, "We are going to be the best company at beating Microsoft and Lotus and so on." So, what did they start to do? They started to buy companies. They bought a company to do graphics. They bought another company "MultiMate," which was in Hartford. They bought another company, and the worst thing is they let them stay there. They bought another company like "Spreadsheet" here in California.

Grad: SuperCalc or something?

Zloof: SuperCalc. They were all over the place, and dBase was in Pasadena. They were fighting each other. Of course, when you create two groups they fight, always because it's "our culture" and "their culture."

The thing they didn't understand that was very fundamental, is this: if you have an engine like a mechanical engine and you plug in the transmission, you have only one interface: engine-

transmission. When you plug two software systems, it's like millions of things that you have to attack. It's not one thing, and therefore it never works really.

Grad: Even though they had the pieces of a suite, it couldn't work as a suite.

Zloof: Exactly, that's why they all fall apart. They were all suites from Ashton-Tate. MultiMate had a suite, and other companies had suites. It never works because you get from one product to another; you are carrying the baggage of the bugs in that one with the bugs of the other one.

The only one that succeeded was Microsoft. Why? They bought PowerPoint, which was really something outside, but the suite itself was Microsoft's. The same place, the same people, and that's why you have total uniformity when you go from one thing to another. Cut and paste, all of that. Tremendous uniformity. All the others fell apart, and I knew that.

Grad: You join Ashton-Tate in 1987. You stay until 1991.

Zloof: Yes, the beginning of 1991.

dBase Programming Challenges

Grad: You did actually implement a program called Data by Example.

Zloof: Right. Picture programming on top of dBase. We called it dBase booster.

Grad: What was the idea of that?

Zloof: I have another interface that is graphical, that translates into dBase.

Grad: In other words, you would use dBase to carry the database.

Zloof: Right.

Grad: It was a new product to do the Query and so forth.

Zloof: Yes. You see, they didn't have any graphics, so if you wanted to do something you had to write a dBase code, so we had something on top. What you do graphically, you fill out a form and then it translates not into SQL, but into dBase because that's their main product.

Grad: Did it sell significantly?

Zloof: Yes, but you see the problem is this: dBase 2 was really a nice product because it was done by the creator of dBase. Then dBase 2 grew and became dBase 3. Basically, they started getting inputs and requirements from customers, thousands of customers, so they used to put patches, because they had something to get out, but they didn't have time to do it right. It wasn't "object oriented" so they started patching here, patching here, patching here, so it became like a big monster. A monster with 15 heads, so it became more and more difficult to do anything new. If they did something new, all the bugs will come out in all the other places; right? It became very difficult for them to add anything new.

Grad: When you did Data by Example, that was on dBase 2. Did you ever do it on dBase 3?

Zloof: It was on dBase 3.

Grad: That was a very kluge system.

Zloof: Right, it's very kluge. This is what happened: with all due respect to Esber, Esber came there when Ashton-Tate was on the way up, and when he came there, it went up like crazy. He really was a marketing person. He didn't understand code and dBase and all that stuff. He thought he did, like his marketing savvy, so he called the guy who did the Basic dBase 2 code. I don't remember his name; he's a very famous guy. He basically told him, "You, people like you, they're a dime a dozen. It's the marketing that's important.". The guy left, and he took a couple of other people with him.

Basically, they didn't know anymore which is which. They brought people, and they didn't know because the code was written ad hoc, kluge, no documentation. If you want to find something, my God! It's like you're looking at a biological system. What kind of drug do I take to remedy my foot? It became like a biological system. You don't know what is going on. You have to do it by "simulation and response." That's the only thing you can do. It became very difficult.

That's why when they got dBase 4 out again in a hurry, because all the customers were waiting for it, it fell apart. Bugs, unbelievable bugs. It fell apart, and they started losing money. That's why they sold it to Borland eventually, and I was in the midst of all that. They didn't care about my work either because they said, "We want to get the bugs out." That was their major thing. They got all these things like the word processor in Connecticut; and it killed them. All of those different products killed them because dBase was their major flagship.

Grad: Sure.

Zloof: Do you know how much they spent on it from their budget? Only 15%. All the rest went all over the place. This is like really a case, a classical case, of what not to do.

Grad: Yes, when you lose focus, it makes a mammoth difference. Did you work on anything else, as a principal architect there? Were there any other products or designs that you worked on?

Zloof: Yes, I worked on something called "Picture Programming," which is really again basically a continuation of OBE. We had it as part of research in a way, Picture Programming. We implemented a prototype, not part of dBase, on the side. That was again my research assignment.

Grad: That never was released.

Zloof: No, it never was released, and finally it was sold to Borland. I left because I knew it was going to be sold to Borland, and now you have two groups fighting each other. Bigger groups fighting each other, and many people left. I joined HP. I joined Joel Birnbaum again.

Integration and Communication by Example (ICBE) and Logic Plus Plus at HP

Grad: So, in 1991 you leave.

Zloof: Right.

Grad: How do you make the connection back with Joel and with HP? What do you do?

Zloof: Joel actually was such a nice person to me. I came to HP and said, "I need a job." He immediately sent me to all those guys. He became the head of the Research Division at HP. Joel came to HP to implement the RISC machines. Then when he implemented RISC, they gave him another division, which was partly research, partly development. I went there, and in order for me to get a job, he sent me to all those guys. They were all impressed by me, so they said to him, "What's he going to be doing?" He said, "It doesn't matter. He's a great guy," so I came there. I worked for him.

Grad: You did work for Joel again?

Zloof: Yes. In fact, from that point on I worked for Joel all the time. He left me alone, and after a while I came up with something called ICBE. Again, they got very excited.

Grad: What does that stand for?

Zloof: Integration and Communication by Example.

Grad: The BE stays there in the name.

Zloof: The BE stays there. Anyway, we created this. There was a guy who used to work for me at IBM: Ravi Krishnamurthy. He joined me, and we created another small group with like five or six people. We started implementing that again as a prototype.

Grad: Implementing?

Zloof: ICBE.

Grad: Is that related to the Picture Programming work that you had done?

Zloof: Yes. In a way, it's Picture Programming but with more functionality. He came up with another language called Logic Plus Plus. See, whatever I was doing, if it goes all the way down to procedural language, it's lots of work. If you have something in between that is like logic, then you can translate what you have into that. He was all the time in logic programming; he worked for many years after IBM in… What do you call that system? At Austin, Texas, there was this group created.

Grad: At IBM.

Zloof: No, not IBM. There was a group that was created purely to do research. They had this general, like a general in the Army, who was heading it.

Anyway, he worked there and he did that logic called Logic Plus Plus. It's a system, it's a language that you can use to write applications, and it translates into that. Finally, it goes to C++, so you have like an interface from here to C++. You have a compiler there from that to that.

Grad: You compile at the second level.

Zloof: Right. We compile it to the first level, and he compiled it to the second level.

Grad: QBE was operating the others. Were these all interpretive type systems?

Zloof: Right; it was interpretive.

Grad: They're all interpretive systems.

Zloof: Yes. System R later made a compiler.

Grad: I understand, but that was interpretive. That was one of your performance pieces, wasn't it?

Zloof: Performance, exactly. The machines were very slow in those days.

Grad: I'll go back a little bit. You knew compilers. Was there some reason with QBE you didn't ever try and create a compiler to get the performance you needed?

Zloof: No. There was no reason; there was only manpower. We didn't have enough people.

Grad: This wasn't a matter of not being aware?

Zloof: No, we were aware. We were aware; it was just a matter of people. System R had 50 or 60 people.

Grad: Okay. I just wanted to see if there was some technical reason why you did not.

Zloof: No, there was no technical reason.

Grad: It wasn't a matter of timing, of binding, or any of these kinds of things?

Zloof: No.

Picture Programming

Grad: When you say Picture Programming, explain to me what you mean by that.

Zloof: The idea of Picture Programming is very simple. When you write a code program, then you have to go and say, "Select this from there," whatever you're going through that program. The program is very long. The concept of Picture Programming is you want to capture in one picture the entire program, as much as you can. You have objects and linkages between objects and logic in certain boxes and so on, so you can see everything in one shot. If there is something more logical, you can click and you drill down; you can immediately see the drill down. It's similar to what you see now. Basically, the entire program is in a picture.

Grad: Let me probe that a little bit more. Is it tabular? Is it "flow-chart-like"? What does it look like?

Zloof: No, no. It is basically the object, the normal business objects like a table, a form, a spreadsheet.

Grad: How do you show the connections among them?

Zloof: With example elements.

Grad: Good, that's a good point. Tell me about it.

Zloof: You can make lines also, but "example elements" because lines become very complicated. In those days, applications were quite simple. Nowadays, applications are very, very complicated. Do you use eBay, for example? It's unbelievable logic there. You do this, something happens here. Ta-ta-ta-ta-ta-ta. That type of programming we will never try to emulate.

Grad: You were trying to do regular business applications.

Zloof: Right, business applications.

Grad: Let's stay with that a little further. You were trying to blend then? I'm trying to get the idea of how the picture communicates the connections. Within a table, I can see the examples.

Zloof: This is what I showed you before. If you are trying to do a mail merge, you say, "Dear X" and X is linked to the database. Then, "This is to notify you that your salary is Y," and send communications. Send to X or send to somebody else.

Grad: Doing it in a format allows you to show by example.

Zloof: Right.

Grad: It's not that you have to draw a diagram or a flowchart or anything?

Zloof: No. It allows you to show by example.

Grad: What did you implement that on? What system did you implement that on?

Zloof: Implemented in Logic Plus Plus, and then Logic Plus Plus goes down to C++.

Grad: It could run on any machine that ran C++?

Zloof: Yes, right.

Hewlett Packard Research

Grad: When you were at Hewlett Packard, were you specifically supporting their machines?

Zloof: No. We were independent. We weren't in that mode yet to really give it to the divisions because the divisions didn't know what to do with it. That's another thing. Hewlett Packard is a printer company in a way. No one really wanted to touch it.

Grad: That was so funny because HP had the RISC machines.

Zloof: Right.

Grad: They were selling fairly successfully at that point in time.

Zloof: Right. Right, it could have run on a RISC machine, but we were kind of doing it on … What was it? I don't remember the machines we used.

Grad: They had the HP 3000.

Zloof: Yes, something like that. I don't remember the actual machines.

Grad: Did you ever release it as a product?

Zloof: No. They gave us a hard time when I left. We had a company called Axemplary.

Grad: I'll come to that when I finish up. You were at HP for quite a few years, eight years.

Zloof: Right.

Grad: Were they any other major projects you worked on during that period of time?

Zloof: No, but I was trying to show many, many different applications. How it will look, and I did research for that. How it would look in ICBE.

Grad: Did you continue to publish during that period of time?

Zloof: Yes, a little bit. Like maybe three or four papers.

Grad: Were you continuing to give speeches?

Zloof: Yes. I was invited also to give speeches. I was in India. I was a keynote speaker. There were two conferences back to back. I talked to one, and then I talked to the other, back to back.

Grad: You were also an ambassador for HP.

Zloof: Yes. I was an ambassador for HP, right. Then again, I quit.

Grad: Reason?

Zloof: Again, because I didn't see any future. I didn't see implementation, and at that time, we had an opportunity to go into this new business to business. The Logic Plus Plus, business to business, and they offered us money, venture capital.

Grad: Who is "they"?

Zloof: Weiss Peck and Greer. They used to call them Weiss Peck and Greer. It's like a venture capital firm. They changed their name to Lightspeed.

Grad: But you left Joel. Was Joel still there at HP when you left?

Zloof: No, no, Joel had already retired.

Grad: Okay. Joel was no longer there when you left.

Zloof: Joel was no longer there. He was consulting, but he wasn't there.

Grad: Again, I'm trying to get this decision process. You're not getting anything out the door.

Zloof: Right.

Grad: So, some level of frustration in that regard. No one is telling you what to do but you're not getting the satisfaction you were looking for.

Zloof: Right, exactly.

Axemplary Software and Logic Plus Plus

Grad: You got the idea of having your own company. You started a new company, or did you go with somebody?

Zloof: No, we started a new company. Ravi Krishnamurthy and myself. We were the two founders, principals of the thing.

Grad: Logic Plus Plus, how was that a part of it? Was that something he brought? Was that part of the company, or was simply a tool? What was the relation with Logic Plus Plus? Was that part of the company or was that an outside product that you used?

Zloof: No. That's part of the company. Actually, we gave HP a piece of the company when we signed the transfer. In other words, this time it wasn't like when I left IBM. We bought the code, and the entire group left actually.

Grad: Did you get exclusive rights to the code, or were you just a licensee?

Zloof: No. Exclusive rights

Grad: Logic Plus Plus became your product?

Zloof: Right.

Grad: What was the name of this company?

Zloof: It was called Axemplary, with an A instead of E: Axemplary Software.

Grad: Where did you locate that?

Zloof: We were in Palo Alto.

Grad: How big a team did you bring out of HP?

Zloof: There were five. But then, I don't know, at one point, we had maybe 30 people.

Grad: What did you bring out of HP?

Zloof: As I said, the ICBE and the Logic Plus Plus.

Grad: And these were because ICBE converted to that?

Zloof: To Logic Plus Plus. We could write applications with it.

Grad: On any machine?

Zloof: Yes, on any machine. We wrote an application, basically. We had to focus on a particular area, so we focused on the area of business-to-business supply chain. We brought a guy who was expert in supply chain. For the whole year, they defined the interface: how does it look, all that stuff.

Grad: Let me go back. Your idea was to build an application that used the ICBE, the tools, which in turn, use Logic Plus Plus.

Zloof: Right. Exactly.

Grad: But it was the application you were going to sell.

Zloof: Right.

Grad: Not the tools?

Zloof: Right. Exactly. The application. At that time, tools were nothing anymore. The applications were the main thing. And the more you know the application, the better off you are.

Dot Com Crash

Grad: This is unfortunately in 1999.

Zloof: Yes.

Grad: At this point, what happens?

Zloof: We had one or two or five customers, something like that. I didn't get along with the venture capitalists for the following reason. There was a time where, remember before the dot com went down, their approach was to bring all the people together, create a big spiel, and sell it.

By the way, I invested $1.5 million from my own pocket, which was a big mistake. From my own pocket. And I lost it all.

Now, their approach was to just get people on board. So, they hired, for example, a VP of sales, before we had the product. VP of marketing, so they could go and say, "Hey, look." Then, boom, you go public or whatever. Then, the stock will go up. They sell, and they are out, right?

That's what they thought they were going to do. So, we started implementing. They pumped money into it. I mean, I put in $1 million, but they put in $30 million.

Grad: Wow!

Zloof: Then, a couple of other investors came in. But they were the major ones. And they made the mistake. One of the guys there was too greedy, and he wanted everything for himself. You see what I'm saying? He didn't realize that many things can happen. And then, we are going on, I mean, it was slower. The development was not as fast as. expected.

Again, because the guy was the visionary of the application, he wanted completeness, to put in every goddamn thing that they thought about, that the customer could think about. And again, it went slow. However, we started having customers. But then, the dot com came into it again.

Grad: This is the bust?

Zloof: Yes, the bust. Now, we weren't dot com. You know, totally, not dot com. But customers said, "If those people are all bust, what makes you sure you're going to stay here next year? Show me that you have enough money to sustain yourself another 10 years." Show me this. Show me that. It became very difficult to get new customers.

Grad: These were large customers you were going after primarily or small customers?

Zloof: Yes, large customers. One of them was—what's the name of the one that does diapers? That big company in Florida, you know? There was a tractor company. Yes, all biggies.

Grad: These were big accounts?

Zloof: Yes. Because a smaller company doesn't need supply chain management, you know? And even HP, we went after, but HP was not interested, because they had their own. But there were a couple of those. I started kind of decoupling myself from the company because I realized the management was not my strength.

Grad: What role did you have in the company?

Zloof: I was like a consultant.

Grad: You weren't president?

Zloof: I wasn't an employee. No, I was a CEO for a while, because they were looking for a CEO. They considered me a researcher, but I ran the company for a while. It was quite good, relatively speaking, quite good, without my knowledge of running companies.

But then, they brought in a guy who was totally stupid. I mean, he didn't know anything, with all respect. He didn't know anything about companies. There was a movie called "Being There." Have you ever seen that movie? "Being There" with Peter Sellers where, basically, you just sit and you don't say anything, and everybody thinks you are smart. That's how they got him. They got him because they didn't do research and he was sitting there.

Finally, I realized how he did all the wrong things. They didn't know what was going on with him. Anyway, the company went down. I, on the other hand, started this thing that I was talking to you about.

Grad: At some point, you transferred from being a CEO to being a consultant to the company?

Zloof: Yes, when I was a CEO, I was stupid also. They gave me, at that time, the option to have half the money in cash and half stocks. I said, "Don't give it to me all in stocks." I was invested $1.5 million. I got all my money as a CEO in stocks also. Then, everything went down. Can you imagine my shock?

Grad: Yes.

Zloof: That's how I started this new company, because of that shock. It was all a blessing in disguise.

Grad: Yes, that must have been a terrible emotional strain.

Zloof: Of course, yes.

Grad: So. you are a consultant. The company closes down.

Zloof: Closes down.

Grad: They don't sell the technology or anything?

Zloof: Nothing. Oh, they sold it for, I don't know, $100,000 to somebody in India.

Grad: What a waste.

Zloof: Yes.

Losing Money in the Dot Com Crash

Grad: So now, you need to make a living.

Zloof: Yes.

Grad: What do you do?

Zloof: Well, I did make a living. I mean, I am well off to survive. I didn't want to work with another company, as a consultant, because I wasn't going to have the freedom anymore. Basically, I said this chapter of my life in the computer industry is finished because I cannot contribute anymore the way I used to. You have to know your limitations. A new language is coming, Java and all, and I wasn't very familiar with these things anymore.

I was down for two reasons. First of all, the money; this was nothing what I lost in that company. I was super invested in the stock market, in the NASDAQ, and I lost millions of dollars. I mean, I don't have to tell you. More than the double digits in one shot. Not in one shot, because when the NASDAQ was 4,000, you say, "Well, it's 4,000 now. It's going to go up again." It went down, down to a point where I was almost bankrupt.

Grad: The money that you had that you were investing here, did that come from your having sold the company to Ashton-Tate and so forth? Is that where that resource came from?

Zloof: It was partly that and partly from my own dealing with the stock market.

Grad: You had increased your assets considerably over time?

Zloof: Oh, yes. I mean, in the millions. That's also why I left HP, because I said whatever I was paid, which was a big salary, was nothing compared to what I was playing with in the market. I used to wake up in the morning and be half a million dollars up or half a million dollars down. That tension, you know?

Grad: How did that feel? Did you get a high when it goes up? You should get a terrible depression when it goes down.

Zloof: Yes. Not only that, but you are stressed all the time because you don't know. You go to sleep. How's the market going to open? I was stupid to go on margins all the time, even when I was making millions.

In other words, this is another thing you have to know when to stop. It never occurred to me when to stop. I said, "Okay. How much do you need? Half a million? $5 million, $10 million, $15 million?" I was in those ranges. And then, suddenly, imagine $20 million. If we put it in 5% bonds, you can live like, you know?

But I wasn't in that mode. I was in the creativity mode. I started having my creativity toward the stock market, and the stock market is a game.

Grad: Yes.

Zloof: I thought, "I am now smart. I know what to do. I know what to buy. I know what to sell." That game was exciting me, like I'm creating. So then, suddenly, that's gone and the other part is gone, so I found myself in a total vacuum.

Grad: Very difficult.

Mind Visualizer

Zloof: Very difficult. That's how I started my new thing. Frankly, I went to, not a psychologist, but a therapist. I said, "Look. I cannot take it. I am totally stressed. It's not really losing the money only, but I don't know what to do now." We started talking. After two or three sessions, I could see he could not really help me because he could not go inside me. But he turned me around. At one point, he said, "What's missing?" I said, "Look. What I really like in life is to be creative. It's not the money. Money, of course, but I have enough to survive very well."

By the way, when you have enough to survive well, without reducing your standard of living, the rest is just ego, right? In fact, I don't want my kids to inherit $50 million. They have to make it themselves, so they can inherit enough to survive also. So, I don't need to show off anymore.

I said, "I am a researcher in nature. To do research and to create, that's what excites me." He said, "If that's the case, why don't you create something to help you get out of your rut?"

Grad: Wow! That's a brilliant comment from the therapist, isn't it?

Zloof: Right. In two days, I came up with this idea that now is becoming really, like, all over the place.

Grad: What do you call this?

Zloof: Mind Visualizer. You know your brain, right? The brain is not meant to explain your problems in the brain. The brain is meant to optimize all the neurons and all the stuff that's going on, all the activities that's going around. You cannot say to the brain, "Here is an event that happened to me." It's not in one place. What is consciousness? You don't know where it is, so you cannot use the brain as a visual vehicle to explain what's going on inside you. So how do they use it? What do they do? They write linear lines?

Grad: Who's "they"?

Zloof: Psychologists or therapists or whoever.

Grad: Okay.

Zloof: If I ask you, "What's your problem? Are you all right?" then we discuss it and you tell me, "I have this. I have that. You know, I suffer from my childhood. My father this. My mother"— whatever it is, right? Then, of course, you write it down.

I went to some of those therapists, psychoanalysts, who have people who are with them about 10 years. I said, "Show me the file of that guy." They cannot go back to it, because they don't index it at all. That person changes. For my own sake, I would just say, "Why am I suffering? Let's go through this."

So, I created the Mind Visualizer. Basically, it's a framework by which you can see events where they are, like a chronology. This event happened before that event. Past events, future events. Future events are your goals or things that you are thinking about.

Events have different colors. If it's an event that makes you happy, then it's yellow. If it makes you sad, it's red. If it's neutral, like an eventful lunch, it's blue. The idea is that these objects are moving all the time. Like, if somebody has a wedding, you'll remember the wedding, right? If it's before a divorce or after a divorce, they change color. Like, before divorce it's yellow and they're happy and so on. Then, they come all the time to our consciousness, from time to time. They come; they go back, right?

On top of all that, there are personality traits, your self-esteem, your prejudices, your self-confidence, your sense of purpose, your motivation. Everything relates to everything else. My model is a graphical, animated way to customize it for a particular person, so you can see what bothers you. What are things from the past that bother you? And then, linking all of that.

For many people, a sense of purpose is very important and affects self-esteem and self-confidence. Self-esteem and self-confidence are two different things, you know? Many people

lump them together. And motivation and incentive, lump them together. For example, I normally start with people from a sense of purpose because a sense of purpose activates all the others.

Nowadays, for example, if you go and you want to start an exercise program, they tell you, "Do this. Do this." But then they say, "You have to have the motivation to exercise. You wake up in the morning, and you say, 'Today I'm going to exercise'" or whatever. So, they give you special motivation to exercise. If somebody is on a diet trying to reduce weight, they talk about motivation in diet. The other guy wants to work. Motivation, how can I be better at work? You know, whatever. I'm combining all of that. Basically, I start by saying, "What's your sense of purpose in life. Let's work on that." That will give you all the motivations.

Grad: This is a visual tool?

Zloof: It's a visual tool. I have it on my computer. I can show you an example after we finish. But it's a visual tool that I set to customize for whatever that person has, all the problems he has. Then, we work on each one separately. And finally, all of them, as they get stronger and stronger, all your problems disappear.

Grad: It becomes more yellow?

Zloof: Right. Exactly. Basically, the center of your consciousness is here. You're influenced by past events—like me, why did I lose money? Why didn't I do this? Why didn't I do that? All of that coming in, right? I mean, even if you get a ticket. I just got a seatbelt ticket, $250, the second time. I should have had the seatbelt on. So, all of these things that happen to you, even during the day, they cycle for a while. The question is, how do you reduce its energy?

Mind Visualizer Implementation

Grad: Let me go away from the content. This is something you're doing on a personal basis with other people? Are you working with doctors? What are you doing with this?

Zloof: I worked a little bit with two doctors from Stanford. This is not official, but they gave me some of their patients that I worked with a little bit. I also have people who came to me that wanted to change certain things in their personality or they're unhappy or whatever, to raise their morale, to raise their confidence.

Specifically, in these cases, there are transitions. Like, I have one person who is retiring. A woman was working as a psychologist, and she is retiring. She's afraid of that transition. She's afraid that she is going to lose her confidence. She's afraid that her husband is not going to like her anymore. Also, some things coming from the past, you know. I worked with her, and she claims that in six weeks she's totally changed. That's a fast thing.

Grad: That's individually using your own tool?

Zloof: Right.

Grad: You are working one on one.

Zloof: One on one, at this point.

Commercializing Mind Visualizer

Grad: What are your thoughts?

Zloof: I'm in the process of creating a company called Mind Visualizer. What I'm trying to do is have some of these psychologists become Certified Mind Visualizer Instructors. I'm in that process. When they become certified, that means I'm teaching them all the concepts on how to deal with this. Then, they become the ones that are treating other people.

Grad: Are you expecting to get some kind of a license fee? What do you expect to get from this?

Zloof: There are two things. I want to package it as a tool that I can give to universities that they can use because that's what they want. Like, at Stanford they said, "If it's packaged, I will use it in our department." So, it becomes, how many users? It's similar to software products. That's one.

And second is individual therapists. They give me fees for whatever, for customization. I'll have people that I customize for them, according to whatever they are telling us. So, a colleague tells me this guy is afraid of this or that, right? We customize it for him. Then, next time he comes that's what I do. Every time they come, I embed whatever they told me before.

Grad: So, this is a software product, in some sense of the word?

Zloof: Yes, it's a software product. All of the input, we are not trying to change it. But the input that you are giving me, I'm entering it in a structured way.

Grad: So, there is an interpretation that the trained user would have to do with an individual patient. Is it a self-help thing that people could use on their own?

Zloof: Yes, you could use it on your own. Self-help, right? It takes only about 10 minutes to explain it.

Grad: You mentioned that you have a demo that you have on your computer.

Zloof: Yes.

Grad: Are you willing to donate a copy of that demo to the Museum?

Zloof: I am in the process of getting a patent.

Grad: Okay. After you've patented it.

Zloof: Yeah, after I patent it, or at least after I get the patent number.

Grad: That's fine.

Final Thoughts

Zloof: Yes, definitely. By the way, I not only have the model itself, but I have models that are focused on different areas. For example, when I give a talk to senior citizens, we focus on senior citizen's issues.

Grad: That's good. I'm going to bring this to a close. Family: you have children?

Zloof: Yes, I have two kids. One of them, the one that I talk to, she is 29 years old. She is in Los Angeles trying to make it in the music business, and she writes scripts also. Very talented, but you know it is very difficult to make money on that. I have a son who is finishing Stanford. He's a senior at Stanford. He got a job in the summer at Apple. They offered him a job for next year. He's also, kind of, high level. They gave him something that I would have liked to see: all their supply chain. You know, Apple deals with hundreds of customers and vendors.

He looked at it like at 10,000 feet. And he had all of these different things about how they interact with each other, how the process is done. He did a visual way to do it. They liked it so much apparently that they offered him a job next year.

Grad: That's terrific. Congratulations.

Zloof: Anyway, I am very happy with my kids.

Grad: I guess, what you're describing is that from the low point in 1999 and 2001, you've now reconstructed things for yourself. You feel the sense of creativity again.

Zloof: Right. Frankly, I believe that the senior years are the best years, if you can really manage. I mean, God forbid, I can drop dead tomorrow. I can have cancer and die. But if I don't, if I'm just healthy, I look at myself and say, 100 is nothing for me now. I am running.

Grad: You're starting to run. When did you start running?

Zloof: I started running three years ago.

Grad: You did a marathon this last year?

Zloof: Yes, last year I did three marathons. Two half marathons and one full, 26.2 miles. And I beat the numbers. I came up with a very good number. This year, I am training to beat my own numbers by 15 minutes, which is a lot; so there is no end if you look at things in a positive way and you do something about it.

That's my talk to the seniors. We are here at 70. We start going down, and finally then, we die. I mean, we will all die. Now, you can go like this or you can go straight. And one day you wake up and you are dead.

Grad: Or you don't wake up and you are dead.

Zloof: That's that, too.

Grad: Do you have any other hobbies or activities that you're busy with? Or does this use up pretty much all your time?

Zloof: No. There is a program that I'm writing. I have many, many different areas. I give talks about dieting. But I don't start from you want to lose weight because everybody has that. I say, if you lose it once, will you lose it again? In other words, if you lose it, I can help you not to gain it back. Because normally, 95% of the people, statistically, that lose weight very fast gain it back in one year or more. There's a whole physiology here. There's a hormone called leptin that if you lose too much, leptin starts and then, you start craving more. I don't talk about calories and stuff like that. You go read books about this. But I, psychologically, will not let you go back. I have a whole visual training: what to do, what to put in your kitchen. But it's all mental.

Grad: You're applying these concepts and approaches to it?

Zloof: Yes, I'm applying these concepts to many, many different areas. Kids transition from high school to college—my son went through that. Then, you start feeling you are a nothing, and many of them quit. So, I give a talk about how not to quit, how to foster creativity.

Grad: Sounds wonderful. It sounds like you've recreated your life.

Zloof: Oh, yes, but I'm enjoying it now, because I don't have the pressure of a salary or income or anything. If something comes out, it's great.

Grad: It'll be a plus, but you won't get devastated if it doesn't.

Zloof: Right, yes. I'll end up with something very important.

I have a song that's the philosophy of my life now. The song is called, "Row, row, row your boat, gently down the stream. Merrily, merrily, merrily, life is but a dream." I want to go through that song and explain. It says, "Row, row your boat." It means don't row somebody else's boat, and don't let anybody row your boat.

"Gently down the stream" means there is a stream and you are going gently down it. That means don't go against the current, doing something you don't like. If you wake up in the morning and you are stressed because you don't like it, do something you like. It doesn't matter whether it brings you more money or less money, but it is your going down the stream. But don't go faster, because you get screwed. That is what happened to me in the stock market. I went too fast; I could have gone halfway and now… And many people like to, like I did, talk to real estate brokers. They try to do too much, and then they get a break again. Too much is bad. Too little is bad. So again, "gently down the stream." And control your life, not somebody else's. Don't help anybody.

And "Merrily, Merrily, Merrily, Merrily, life is but a dream" means don't take it too seriously. Life is a dream, because when you are gone, it's finished.

That's my philosophy now in life.

Grad: That's a wonderful place to close. Thank you so much, Moshe, for a very interesting interview.