Oral History Interview with

Teofilo F. Gonzalez

May 10, 2021

Via Zoom

Conducted by Jeffrey R. Yost

Charles Babbage Institute

Abstract:

This interview was conducted by CBI for CS&E in conjunction with the 50th Anniversary of the University of Minnesota Computer Science Department (now Computer Science and Engineering, CS&E). The interview begins with early biographical discussion and education, and then completing a degree in Computer Science at Instituto Tecnologico y de Estudios Superiores de Monterrey A.C., Mexico. Professor Gonzalez was among the earliest cohorts of Ph.D. students in the young Computer Science Department at the University of Minnesota. He worked under Professor Sartaj Kumar Sahni and discusses him as mentor, as well as work as a TA from Marvin Stein and association with other early faculty members through work or courses such as Professors Bill Franta and Allen Hanson. The interview also addresses Prof. Teo Gonzalez distinguished career at University of Oklahoma, UT-Dallas, and the bulk of his long career at University of California, Santa Barbara. He discusses his trip back to Minnesota after 15 years to give a lecture and how Minnesota and the department changed. He responds to a number of questions about the evolution and scope of his research which includes design and analysis of algorithms, approximation algorithms, message dissemination, job shop scheduling, and other areas.

Keywords:

Instituto Tecnologico y de Estudios Superiores de Monterrey, Computer Science, University of Minnesota, Penn State University, University of California, Santa Barbara, Approximation Algorithm, Design and Analysis of Algorithms, Job Shop Scheduling, and teaching philosophy.

Gonzalez: Hi.

Yost: Hi. How are you? If you're ready, I'll just begin with some questions.

Gonzalez: Yes, I don't know what you do, what is your process, but—

Yost: Do you have any questions before we get started with the process?

Gonzalez: No, I guess, you will ask questions and I will try to remember things.

Yost: Exactly.

Gonzalez: 50 years ago, or something. Maybe more than 50 years ago but I'll try my best. I've been trying to think about that time and trying to remember some things and stuff from that time.

Yost: And I'll also ask questions beyond Minnesota to cover your whole career. Ok. So, my name is Jeffrey Yost. I'm a historian of science and technology, focused on the history of computing, and I'm director of the Charles Babbage Institute at the University of Minnesota and I'm here this afternoon, May 10, 2021, with Professor of Computer Science Teofilo F. Gonzalez. May I call you Teo?

Gonzalez: Yes, Teo is much better.

Yost: Ok. And I understand you were born in Monterrey, Mexico. Can you tell me what year you were born?

Gonzalez: Yes, I was born in 1948, and Monterrey is a very industrial city, is the industrial capital of Mexico, so my father worked at different corporations. At the end, he ended up working for a Mexican-American company; they made bricks for furnaces in industry. He was in charge of labor relations. My mom was a teacher, and then she got married and had four kids, I was the youngest, and then in her 40s, she picked up golf and at some point she became one of the top golfers in Mexico.

Yost: Oh, wow!

Gonzalez: Women golfers in Mexico. Not too much competition there but—

Yost: Still, impressive.

Gonzalez: Yes. It was impressive.

Yost: What were your interests growing up both in school or outside of school?

Gonzalez: Well, I, initially, I wanted to study mathematics, but my brother steered me away from that and I decided I'm going to major in mechanical engineering with an operations research minor. And I liked sports, but it wasn't that much of, I wasn't too good at it, very good at it, I was ok playing golf—but I was terrible at soccer. I had an unusual bring up, bringing up in Mexico because my parents decided to send me to an American school in Monterrey for elementary school. My parents wanted for me to learn the language so that I could communicate with the Americans that were either starting companies or representing US companies in Mexico. And so, we had a soccer team there, I was the captain, but we used to lose terribly because the American kids had never played before so they were not good at it at that time. Now it's different. And the Mexican kids were also not good because we weren't going to those typical schools where you play soccer beginning in kindergarten. So, I did that for six years, then they send me to a Spanish speaking middle school and then they decided to send me to Canada to Windsor, Ontario for a year. I finished ninth grade. They put me in twelfth grade and my mathematics was pretty good at that level. I was able to come up ahead. So later on, when I came up to the states, I thought that "Oh, gee. I'm a mathematical genius!" But as it turns out, it wasn't the case. And then I went to junior—to high school, in Mexico, two years of high school in Mexico. And in my second year, I took a programming course. So, programming course in high school in a third-world country in the late 60s, that's kind of hard to understand, how did that happen?

Yost: Right.

Gonzalez: So this high school, in fact, right now, they're kids who go to high school and do not take a programming course, they may not be even be available in their high schools, but this high school was associated with the Technological Institute of Monterrey, which was, or we want to believe was the MIT of Mexico, certainly not at the same level but we were able to do all of these extra courses and learn things that normally kids would not be learning. In fact, this was around what, 1966, 1967, I don't think there were too many kids or adults that knew computer programming at that time.

Yost: What language were you exposed to, FORTRAN?

Gonzalez: Oh! Well, it was called FORGO. It was FORTRAN-to-go, which was interpreted, not compiled, and it's really very, very fast. And there wasn't a major in computer science so I decided to go into mechanical engineering with a minor in operations research, and in my second year, I took a programming course, the school required a programming course for majors, engineering majors, and I did very well in that course. And by that time, they had opened a major in computer science called, 'Ingeniero en Sistemas Computacionales', and I changed to it. It was not that easy to do that change. For one, people did not like the major because they were thinking of people studying computer science to be just glorified typists. And I remember some of my operations research teachers saying, "If you get a degree in CS, you will only be able to work for three or four companies, and that's it because nobody can afford computers." But they ended being wrong. So I changed to the major, and the guy who was my teacher, he was the chair of the CS Department, and he was in charge of computation center and in charge of the major, so I wrote some programs for him, to analyze surveys and things of that sort. I became a computer operator for the night shift twice a week and then I taught some courses, that's a different time, you could not do this at the University of Minnesota 50 years ago, right? But in there I taught a statistics course, and then I taught a programming course for business majors and for grad students in the MBA program. There weren't too many people to pick to teach those courses, so that's why they assigned me. So, I graduated after two years and it was a total of four-and-a-half years in

college, and, oh, let me go back. When I told my dad that I wanted to change majors to computer science, he was not happy. It was like, "Mechanical engineering you can get jobs in all these industries and you can do very well. Computing, who knows what that is going to be." Luckily for me, my brother, he was older than me and he was a business professor at the Institute, and he knew the people in charge of the CS program, so he said, "Dad, computing it's fine." And that's how I started in computer science. My professor, he had been a visiting professor at the school of business at the University of Minnesota, like five or six years before then, so he would talk about it. And the other thing is that during my college senior year, the Institute acquired a CDC machine, a 3300 CDC machine. So, I became familiar with the CDC machines, and, oh, yeah, that came from Minneapolis and Minnesota.

Yost: Right.

Gonzalez: And that paved my road to the University of Minnesota. So, I finished college in January 1972. I was 24 years old when I finished my undergraduate degree. That is because I had to repeat kindergarten because it had to be in English and I went a year to Canada which I lost in Mexico, but I was kind of old at that point. I was older than all the people that I was taking courses with. So that was in January and they gave me a teaching position at the Institute, so I taught a bunch of different courses; COBOL and FORTRAN, and I did some consulting because some of the local companies had also bought these CDC machines. I wrote some programs to analyze surveys that they would give to people. One client was a brewery, and my brother was working for them then and he was directing it. It was pretty sophisticated analysis, it was factor analysis, which is component analysis and clustering, which we did not invent but we were among the first ones to apply it. These tools became popular in the 2000s and stuff like that. So, we were on the right track. I wasn't doing really theoretical work, but just sort of applied work so they would ask people, "Oh, gee, what do you like from this beer, is it the taste, is it the color, this or this other thing," and then we grouped people answers and try to analyze the data to understand the market. The market analysis portion of this work eventually became my brother's Ph.D.

Thesis at MSU. When I tell this story to my students, they ask, "Oh, so you worked for Corona and introduced it to the US?" and I said, "I wish I would've worked for Corona!" because it became very popular in this country. But, no, this was for another major brewing company in Mexico. So, at some point in 1971, I decided I should go on and get my Ph.D. in computer science.

Yost: Was ITESM one of the first universities in Mexico to offer a major in computer science?

Gonzalez: Oh, yes, it was the first one to have a major in computer science, and the other universities followed years later. It's a private university; people in there can do almost anything they want to do. Open a new major in a new field—right now they have so many different majors, they now call my major computer science and technology. They jump into new things really fast. But it's a pretty good university. We're considered to be the best one in Mexico though people in Mexico City do not agree with that.

Yost: Did you apply multiple places, or had you decided you wanted to come to Minnesota?

Gonzalez: Well, yeah, I had friends and my brother also had friends who have been students at different universities. I had a good friend that went to Cornell, to the CS Ph.D. program there and another one that went to Oregon and another one went to Case Western and—

Yost: That's where I got my Ph.D., Case.

Gonzalez: Michigan State. Oh! Ok. Houston, and my brother, he was a business Ph.D. student at Michigan State, so I'd been there, I'd been to University of Michigan, and because of my CS professor, I heard about Minnesota, I decided to apply there. So, I applied to about four or five universities, so—after looking at the courses, current courses they were offering, I chose Minnesota. And also because of CDC was headquartered there so maybe there are a lot of connections, joint work happening there. So, people told me it was cold, but I said, "Gee, how cold can it be?" I lived in Windsor, which is on the other

side of Detroit, so you know they're not far from each other. I didn't think there's going to be much climate difference. I was surprised later on but it wasn't too bad. I enjoyed the winters. I learned in Minnesota that the Fahrenheit and Celsius scales coincide at -40.

Yost: Yes, you adjust if you live here. I went to college at Macalester and then went away to Case Western Reserve University for grad school and came back to Minnesota. So, I've been here about 25 years braving the winters. Speaking of the industry and Control Data, I helped out on a public television documentary that's on Minnesota computing called *Solid State*. I'll send you the link to that. You might find it interesting.

Gonzalez: Yes, I will take a look at that.

Yost: It goes back to the early post World War II days with ERA and then the engineers leaving ERA to start Control Data and Cray Research and probably a number of things that you're familiar with and then takes things to the near present. Obviously, we don't have as much of a presence in the industry as we did with Control Data, Honeywell, Cray now but—

Gonzalez: Yes. Those CDC computers had a hardware design that was well ahead of IBM. Sorry go ahead.

Yost: But IBM Rochester is smaller than it once was but still is in existence and Lawson Software became Infor, it was taken over, but there's still some IT employers and then of course, the logistics work of some headquarters like Target and Best Buy who have a lot of IT employees. Former IT also established tech competencies and finance that influenced med tech, Medical Alley here. So, can you tell me what were your first impressions of the department in computer science at the University of Minnesota?

Gonzalez: Yes, the biggest thing from the department was that—and from the University as a whole was the availability of computers. You could walk to five or six different buildings, and there's a

computer in there where you can put your cards, it will process your code and it will print out the results. That to me was surprising. I mean they had them in the, I lived in Middlebrook, so they had them in there in the school of business, there were a couple of places there. There were several in main engineering. Then there was Fort Lauderdale where the supercomputer was, I think it was a 7600 CDC and that was open 24 hours a day, wow! It's like; this is Disneyland for programmers. In the department they had these TTY machines, teletypes things that you could download your program on a tape, a paper tape, and read it again like interactive typewriters. In the computer graphics lab you could point a pen-like wire to a screen and the program would react to that. That was very, very different from the world I knew, and my impression then, I mean, well "This is America, right? This is the States. It should be the same thing in Michigan should be the same thing in here and there and everywhere else." But after being here for a while, I realized that it took many universities decades to catch up to that level of having these computing devices all over the place. So that, I was really very impressed. The other thing that I was impressed by the department was that, that made me decide coming here was, that yeah, they were teaching stuff that I thought I knew such as linear and non-linear programming, numerical analysis and stuff like that but they were also dealing with newer stuff like artificial intelligence. There was a course in that, and I was really interested in that when I came to the states. I mean, it was a really promising area, right?

Yost: Right.

Gonzalez: So, it attracts everybody. They had programming languages courses, they had simulation, computer simulation, operating systems, computer graphics and stuff like that. It was new stuff for me. I was really interested in that. So, when I got to the University, to the department, I talked to Professor Munro, who was the graduate advisor then. He was a very nice fellow. And so, he sends me to talk to some other professors and then they were telling me to take numerical analysis and stuff like that and it's like, "I know that stuff! I want new stuff." So, needless to say that, no I really didn't know it, but I

thought I knew it. So, the first year, I took some of the classical courses like the stuff that I knew like linear and non-linear programming. And there was a lot of new stuff in there that I'd never seen before. And I think I took also computer graphics and data structures courses. Data structures was from; I think his name is Patton: P-a-t-t-o-n. He was the head of the computer center before and computer graphics from Giloi.

Yost: Oh! Peter Patton.

Gonzalez: Yeah. And what other courses…oh, with J. B. Rosen, I took the course on linear and non-linear programming. He was very well-known for his work in non-linear programming. Gradient Projection Method that's his, his baby. So, it was really interesting. And I took an operating systems course from Boyd which had some scheduling problems which in my operations research courses in México I've seen some of that material. And then I took a computer organization course and/or assembly language, I don't know exactly, from Professor Frankowski, and I did very well in that course. So, he recommended me to be a teaching assistant. That was a really great opportunity for me. That opened many doors and that was great. And also, it provided some funding which really helped. But my first day in the CS department, it was like, I was thinking of the professors in there as being my colleagues, since I was a professor in Mexico, right? They were viewing me a grad student, which, that's what I was, right?

Yost: Right.

Gonzalez: But, and after that I wasn't too happy about that but that's how things work, right? So, I made some friends in the dorm, some Hispanic friends, there were about five or six, and I met a couple of grad student from the department. Basically, two Israeli students Baruch and Uri, actually I was more friends with Baruch. And both of them had master's degrees in either mathematics or operations research, so they were way ahead of me. But I was able to defend myself because I had an undergraduate degree in computer science even though it didn't included everything, but I was very

aware about programming and different languages and so forth, so that helped me defend myself, you know. They are good at that, but I am good at these other things. That helped.

Yost: Roughly how many fellow Ph.D. students were you going to school within the department?

Gonzalez: Well, in the fall of the second year (1973), we took the comprehensive exam which, you know, that is the first hurdle that you have to pass and I remember that they said that, "Oh, we have changed the standards. We are making it much harder than before." So, scary, scary, right? But we were about maybe eight or ten students taking it, but it was for masters and Ph.D. students. And the people that pass it at the Ph.D. level were the two Israeli students, and Korean student Chul Kim and me. So, I was really scared that summer, so all the summer I studied really very hard for that exam. My schedule was at 4 p.m., I would go to the library in main, main engineering, take out some books for the night and then go play tennis, and then stay up all night and then at 8 am, I'd come back, return the books, go to sleep, and then wake up around three or so and repeat this process all over again because I didn't have the money to buy books. I had to borrow them, but you could only borrow them for the night or two hours during the day. So, we took the exam and what I remember is that four of us were the ones that passed, and I don't know if other ones were actually taking it for the Ph.D. or not. After the exam, Baruch, Uri and Kim, they have already selected their advisor, Ph.D. students' advisor, and I had no idea what I was going to be doing. It's like, oh, whoops, ok, I passed, now what? So, luckily, I was assigned to be the TA for the data structures course of new faculty member, fresh new faculty member that came from Cornell who was Professor Sartaj Sahni and that work very well because it was my introduction to him. We both like data structure so we will talk about that. And he gave me some problems to look at. He gave me a couple of papers, including his Ph.D. Thesis, he gave me a copy of it. And the first thing I remember when I looked at it was this guy was a year and a half younger than I was! So, it was shocking to me. How does this guy already have a Ph.D.?! Look where I am? I'm really way behind. So, we started working together and things really worked well. I started looking at a clustering problem, which was not

exactly the ones I have looked at in Mexico but related, so that's how I could relate to it. The idea was to come up with approximation algorithms, fast algorithms that produce solutions quickly and close to optimal. So, the first thing was to come up with an approximation algorithm, which took me a few weeks to do that. Then we were able to generalize it to other versions of the problem for which we can generate an almost optimal solution. These problems were known to be computationally hard. That is, there are no known efficient algorithms to solve them to optimality. All the algorithms take exponential time, the ones that are known. And that's still true. So, his next question was, "Ok, let's find problems that are difficult to approximate. This is finding a solution close to optimal is as hard as finding an optimal solution." And after some discussions and stuff like that, we came up with one such problem and then we extend that to many other problems. We submitted this to a conference. Actually, Sartaj submitted to a conference because I had no idea what to do with the paper or anything. And it was a very prestigious conference. It was accepted and it was very well taken. So, in fact, even today, after almost five decades, we get quite a few citations on that paper, on that result. And so that was the first paper and it was really great. We eventually published it in the top CS journal at that time. So after that, I started having a little more confidence and things were working really well and we continued working we worked on some other problems called the flow shop and job shop, and as a result of that, we came up with something we called the open job shop problem, which nobody studied it before and that has had many, many applications since then, and also that's a paper that has had many, many citations even today. The problem has applications in many different areas, like in communications and in all sorts of other fields. That came out very, very well. So, things were working very well without any plan whatsoever because, I just came here, my advisor wasn't even at the university. He joined and I was lucky that I ended up being his TA working and working for him. I remember that I went to his interview talk and it sounded to me interesting what we was doing because it was related to what I had studied before in certain ways though much more organized and computationally related to many other

problems I've seen before. So, the second year, I was also TA of Professor Stein, Marvin Stein, and for some professor who was teaching the programming languages course, so I got to know many different professors. And I remembered that year I took the simulation course with Bill Franta and he gave us an assignment to use a statistical package to check the statistically accuracy of our results, I don't remember the name of the package, and we could actually do this with that package or we could write code for it. So, it was the Kolmogorov–Smirnov statistical test if you're doing any data analysis you've seen it—

Yost: Yes.

Gonzalez: You've seen it?

Yost: I'm aware of it.

Gonzalez: Good. Ok. So, I remember, I was thinking, "Well, I'm going to write code for it and then run it with this package and look at the results and see how they match. Should come out the same, right?" So, as it turned out, no, the results were different. My program was generating different results than the package and I looked at the code over and over, up and down, top, down, left to right, every possible way, and then I realize, "Yeah, it is correct!" There's something wrong with the package so I went running to Bill and after he looked at it he said, "Oh, yeah, yeah. You're right. Your program is correct." So, we sent a note to the people in that developed the package so they would fix it. But by looking at the code over and over and over, I started thinking about the problem and I came up with a better method of solving it. Produces the same result but is much, much faster. So, that was another sort of surprising result because people had thought that it was impossible to do anything better than the old algorithm. Though we never received many citations on that paper, but we really liked that result. We came up with some approximation algorithms for that problem and so forth. So, it was a wonderful time being there and doing research with different professors and of course with Sartaj. With Sahni we worked on a

scheduling problem together with Ibarra and I took a course from him to, and that might have been in my third year or so. So, things really worked. If you asked me when I was in Mexico, "Gee, you're going to get your Ph.D. in three years." I would've said, "Forget it." Not even I would think that that would happen. My best estimate before coming to the States was 5-7 years.

Yost: That's very impressive.

Gonzalez: It, well, when you have a very talented advisor, and he's working on brand new problems, that were in a new branch of the traditional theory. So, it was a—we're finding new paths. And so, I was really very fortunate to end up in that situation without planning, without even thinking that it was a great situation. But that really worked very, very well.

Yost: Anything that stands out in your memory about Marvin Stein who started the department?

Gonzalez: Yeah, well, I was his TA and actually he challenged me to do things other than just grading of the papers. He said, "C'mon. Come up with some problems for the homework and for the tests." So, I came up with some problems. Normally in computers, you have the binary notation and we use decimal notation so that binary is just zeros and ones and decimal 0 to 9. And they would tell students, "So, ok, transform this number from decimal to binary or binary to decimal." Or to transform decimal to base sixteen (IBM) or octal (CDC) so then I came up with problems. "Oh, translate from base three to base five from base six to base three." And the students were really surprised. They were not too happy with that. But he (Stein) was very supportive, and said these are reasonable problems that you came up with—but he was a very nice, very nice fellow. Really enjoyed being his TA. And so were all the CS faculty, really nice. Leavitt, I didn't take any courses from him, but he was one of those people that you say, "Gee, this guy's a great guy. I really like him." And even though he has some challenges, he was able to live his life without any issues. That's a great example. Allen Hanson, he was the AI guy, and I took a course from him. He was very personable, very nice to person. I remember looking at many different

programs in his class. There was one called ELIZA which you communicate, you have a conversation with the computer and stuff like that. So, he would talk about that in class.

Yost: Right. I studied that, ELIZA's history, of course.

Gonzalez: And chess programs and stuff like that. He gave us an assignment and so I came up with a program to play the Chinese checkers game, when everyone else was programming the traditional games, so I did this other one that was very different. He really appreciated that it was not tic-tac-toe and was different from other things that everybody was thinking about. J. B. Rosen was, of course, he was the big guy there early on. He had a strong research reputation. He came from Wisconsin, he had the reputation, a very smart individual, and even after many years, he came to California, he kept on doing research, it was great to see that happening then.

Yost: So your dissertation was entitled, "On Finding Approximate Solutions to Some Problems," I think you've already gone into that some but do you have anything else you want to say in summarizing your dissertation research?

Gonzalez: Well, it, in some sense it followed the lines of what Sartaj's vision was but it was different problems, different techniques and so forth. That opened many doors for me, including a career that spanned for 41 years. It was a big splash in the sense that a lot of people heard about the results and they're quoted them in books and so forth, so that was a great, great introduction to the research community. My plan was initially to come to the States, get a Ph.D. and go back to Mexico, like my brother did and like most other people I knew in Mexico. But Sartaj started encouraging me to apply to universities in the US, so I applied to universities then I just kept on living in that system for 41 years, that's great. It opened big doors for me.

Yost: When you were at Minnesota as a graduate student, were there certain faculty members in computer science that influenced you in thinking about how you wanted to teach and influenced your teaching philosophy?

Gonzalez: Well, yes. There was a guy who came from Wisconsin and he might've been, during my last year, I don't remember his name. He was working in networks and stuff like that, but he came out with some homework assignments that are really challenging, interesting and challenging. I mean, as opposed to what other people were doing like solve problem five in chapter nine. This guy was very creative with his assignments and I kept that mentality throughout. My teaching also follows Sartaj teaching and also some of the other professors like him, the simulation course with Franta, there, he would look at very interesting problems and assign those and go over the material in different ways. So, I would say most of the teachers were great, were very good. And they did not make things very easy but also, they did not make it too hard. So, my philosophy was, has always been to challenge students, to make it just a little bit harder than what they would expect because then they solve it and they would feel, "Great! Awesome!" Now you have this program or now you solve this problem and that's great! You learn something out of it and if you couldn't solve it then, you could see the answers, and, ask yourself "How come I couldn't solve this? It's so easy, right?" But it's not that easy to come up with solutions but that's a way of learning. Throughout the years I spent a large amount of time preparing interesting quizzes, homework and tests.

Yost: And you went on the job market and got a position at the University of Oklahoma, is that correct?

Gonzalez: Yes, that's correct. I interviewed, I think a couple of places; University of Rochester and Oklahoma University, and I got offers from both places but Rochester they wanted me to teach very theoretical courses and I was not there. I came from a very practical world, and I started doing some theoretical work. So, I came from the applications rather than from being a theoretician and so forth. So,

and also, I didn't have too many published papers then. I mean, I had papers but they had not yet been accepted for publication. So, I went to Oklahoma, and after a few more results, again, Sartaj encouraged me to apply to other places and I moved after a year. Also didn't help that you have tornado watches almost every week or so. It was not fun—

Yost: Right. And at that time, I would guess that Oklahoma did not have the computing facilities of a Penn State or University of Minnesota?

Gonzalez: Yeah, it was a very tiny department. Though it was interesting because 10 years before that, they decided to invest a lot of money to come up with better core memories. So as soon as they had all of that, core memories disappeared. They spent a lot of money and it went down the drain. So, it was a big mistake for them. After that they were very careful. And also, at that point, computer science was being taken by electrical engineering, so it was combined into one and that combination didn't—I wasn't too happy about that. Penn State was a better-known university and department, and almost similar football team. There's not too much difference in that.

Yost: My father was a professor and vice chancellor at the University of Nebraska when I grew up and they were a big rival of Oklahoma in football.

Gonzalez: Oh, right. Yes, it's a big thing there. I could never get a ticket to a football game at OU or PSU. It was already crowded. I would go and play golf during their games because nobody was playing golf. I was the only one in there. So, yeah, after that year, I moved to Penn State. And at that time, it was between the University of Maryland and Penn State and I decided for Penn State. Perhaps it would've been better going to University of Maryland, I don't know. I would have been closer to the source of CS funding. That's the way that it happened.

Yost: Can you talk about getting your research program established at Penn State and efforts to get sponsored funding?

Gonzalez: Yeah, at Oklahoma, I came up with some new results, and then I went to Penn State and kept working on that. And there were a lot of theory people in there. Many more than in Minnesota, yeah, many more than in Minnesota. So, I work with several people in there, and it was interesting. I wrote an NSF proposal with Professor Donald Johnson, and it was funded, to study some algorithms for some preemptive scheduling problems. And so, it was an interesting time there because there were very few full professors and very few associate professors. Most of us were assistant professors. So, everybody was trying to come up with new stuff, new results and it was very interesting working there. I met lots of interesting people including this other professor that I worked with a little bit, actually he was an associate professor, John Bruno. And during my second year, he moved here to Santa Barbara and in fact, that essentially helped me come to Santa Barbara later on. But State College is a small town and if you're single it is limiting, so it gets very hard. The faculty parties, when we invited somebody for a seminar, they got to be a chore because you meet the same people, you talk to the same people two or three times a week, that's just too much. So, it was a small town and lots of people had left, even after I left, a lot of people kept on leaving, and that was a problem in there. It didn't help that the university budget wasn't passed on time by the legislators most of the time, and they were always issues in there. But I met many interesting people in there and I got to do a lot of interesting work there.

Yost: You moved from there at the end of the 70s to a very large city in Dallas at UT Dallas, correct?

Gonzalez: UT, Dallas. Yeah, but actually first, I went to Mexico for a year. I went back to my university in Mexico. I left Penn State, and went back to my institution. I was teaching a course, one course per quarter at Penn State, but I was teaching four courses in Mexico in four different areas, so I guess I learned a lot. And after a year, I went to University of Texas, Dallas, which was very different than all the other places in the sense it only had a graduate program in computer science. There were no undergraduates at the university so for my first two years, we just teach graduate courses. And you were there doing research almost all the time. Things kept changing little by little there as we started

having undergraduates for their last two years (juniors and seniors). It was fun teaching the undergraduates there. I got to study different problems in there. I worked on some clustering problems, and I came out with an algorithm that, it's now heavily cited still after 40 years. So that was a complement of the work I was doing before. So, we were four faculty members and about 30 adjuncts teaching all the courses, so it was challenging. I was the senior guy there. I was an associate professor, and we were part with of the statistics and mathematics department. It was very small, no more than 10-12 people, so that created some friction and made it difficult. Now the department has changed—actually, when I was there, we became the Computer Science Department. We separated from the others, but for me, that caused problems because I was spearheading that process and you don't get too many friends from the other departments after doing something like this. So, after that point, I decided to move to Santa Barbara. I had interviewed in Santa Barbara before and finally I decided to join the department. It was small, there were four, or six, professors, and then that year, four of us came, so it almost doubled in size. What I remember from then is that when I came to Santa Barbara, I came to the United States because in Dallas we had mainly foreign full-time students. I mean most of the full-time computer science students were, I mean, they were grad students, so they were foreign students, so it didn't look like I was in America, but that was different in Santa Barbara. We had many domestic undergraduates and actually the Ph.D. program was with electrical engineering, so it was very, very small but it was a good environment, interesting people. John Bruno from Penn State was here. The department changed a lot as we hired more faculty members.

Yost: On an NSF project I did on the history of computer security, I went out to Santa Barbara to do an oral history in person with Richard A. Kemmerer.

Gonzalez: Yes, I saw that, that interview. Yeah, he's a very interesting character. Actually, I met him at Penn State because he came to interview at Penn State at some point before he joined Santa Barbara.

And we had offices next to each other for many, many years. We interacted quite a bit. Not research-wise but in many different aspects of the department. Apparently, he did very, very well.

Yost: Apparently yes a major figure in the cybersecurity field, you sure have a very beautify setting.

Gonzalez: Oh, yes! [I am now referring to my background image in our Zoom meeting that shows a big field followed by the ocean and far behind some mountains in the Channel Islands.] This is my backyard. I say 'mine', but I do not own it. I'm a co-owner, but I am only a Nano co-owner, just a little grain of dirt I own. That's part of the University all of that property you see.

Yost: I looked at the video of the drone. There's a link on your site, personal or profile page, to the drone flying over Santa Barbara. It's quite striking.

Gonzalez: But you know what, you get used to it like you can get used to anything. You get used to this stuff. Do I notice the ocean every day? No, I don't. It's like background noise. But, yeah, the weather is good, but the snow and change of seasons and stuff like that is missing.

Yost: So, I thought I'd just go through some of your major research areas and if you have anything you'd like to say about them—

Gonzalez: Ok.

Yost: NP-hard approximation problems.

Gonzalez: Ok. Those are the ones; those are the first results with Sartaj. Those were the problems that are computationally hard to approximate, and finding an optimal solution is as hard as finding a good suboptimal solution so that means that getting very close to the optimal is as hard as finding the optimal. And sometimes you cannot ever get very close to it, you are going to end up finding solutions that are very far from an optimal solution. That's in the worst case. Of course, there are many problem instances for which you can find very fast an optimal or good suboptimal solution but in general, there

doesn't seem to be an efficient algorithm that for every problem instance it'll find a near optimal solution. And that was a big result, and we got lots of citations out of that, even after almost 50 years.

Yost: And you've mentioned Open Shop scheduling. That's the Job shop schedule?

Gonzalez: Yes, well the job shop is a more general problem. The Flow shop is a little bit more restrictive and the Open shop is another version of the problem. Essentially, think about a car repair shop that it has three different stations where in one station maybe they change the tires, in another they fix the engine and the other, they fix something inside the car. So, you have all of these clients coming and "Oh, I want to do, I need to do this work. It'll take five hours in station one and two hours in the second one and one hour in the third." So, how should you order this? How should you do these jobs in such a way that you finish all of them, let's say in one day or in one week or something like that. And there are versions of it that say, "Well, once you start fixing the engine, you cannot do anything else until you finish it." And the other versions say, "Well, you can fix the engine for 20 minutes, and finish work on the interior for 70 minutes and then continue with the engine." So, it's now a classical problem, and it arises in communication and networks, and there are many, many different applications. We didn't think there were so many but with time, people have discovered them, "Oh, yeah, actually this problem arises in this place and in this other place." People have studied some variations of it before us, but they never really just studied our problem. I still work on versions of it, trying to come up with some results that have evaded me for many, many years.

Yost: I interviewed Nobel Laureate Harry Markowitz who did some work in that area at the Rand Corporation, Job Shop and simulation, he invented Simscript.

Gonzalez: There were many flow shop and job shop papers before we work on these problems. The new twist for us was studying them from the computational complexity point of view.

Yost: And clustering?

Gonzalez: Clustering, that's a really fascinating problem. That has lots and lots of applications. So, you have objects, let say. Think about books. Or think about webpages. You want to combine them in such a way that similar things belong together. Pages that are similar belong together. Books that are similar belong together. And, of course, librarians have done this for years, but they do that by hand. But in here, you want to do this automatically. For example, webpages. There's no way you can do that by hand.

Yost: Right.

Gonzalez: The problem is finding good algorithms to do this, to combine things that are similar to each other very fast and generating good clusters. Of course, there's some similarity, or dissimilarity measure. So, you combine objects in such a way that you minimize let's say the distance between objects inside clusters and so forth. So there are many versions of the problem, and people have studied them in the past, so I looked at the version in which you want to minimize the maximum distance of objects that belong to the same group. So that the maximum distance between books or pages is the same cluster is minimized. I came out with a very simple algorithm that in multi-dimensional space, you have data where you have many different properties, clusters objects quickly. You can cluster them without even looking at all the data, provided that the data satisfies certain properties. And I showed that my algorithm was best possible. Nobody can come up with something that is better than my algorithm unless a very difficult problem can be solved. And that has found a tremendous number of applications. Right now, in biology, or biological sciences it's applied a lot. So maybe you have all of these people with all of these properties, and you combine the ones that are very similar to each other together and perhaps try to identify interesting properties of the whole groups. Or people that have the same opinion about things, very similar opinions, you group them together and try to see why is that? So, of course, I look at the problem from the algorithmic point of view; you give me the data and I do the grouping. But other people look at, "Well, what should the measure of similarity or dissimilarity be? If you look at two

webpages, well, let's say that both are advertising a stove, and one sells it for ten dollars and the other for ten thousand dollars. Well, should they be grouped together or not? Or one is 30 inches, the other is 30 and-and-half inches, so what's the difference, right? And that in itself is a science. So, there are lots and lots of applications and lots of different algorithms. And mine, because it is very fast and best possible has found many applications.

Yost: In the web-era, I can imagine there are all the more important applications.

Gonzalez: Yeah. and now I'm getting a lot of citations in biology and I have no idea what they're doing, but it's just interesting to me.

Yost: What about wire routing?

Gonzalez: Oh, ok. Those are essentially, "boring" problems because you route wires, but these are important problems that arise when you are designing these computer chips so you have different modules that are placed in different places on a computer chip and you need to run a wire from here to there to connect these components in order to for the chip to function correctly. But I mean, there are millions of these objects in a computer chip, and you are trying to find the way to do that. And of course, there are many different objective functions and there are many different rules. Like for example, wires cannot cross, right? Because then they are going to be electrical issues and oops, it's a problem. But sometimes you can go to another layer, before crossing it, and how do you do that in such a way you minimize the total area. And other criteria needs to, well, to minimize the delay of the signals going from one place to the other. So, you don't want really long wires because that will take quite a bit of time for a signal to go from one place to the other. So in chip design is where all of these problems arise. I got into these type of problems when I was in Dallas because the University was next door to Texas Instruments, and, of course, I never got to do any work with them, but that was my way of studying

things that are useful in the area, the area where we live. I worked with two very bright Ph.D. students (Lee and Zheng) on these wire routing problems.

Yost: And minimum edge length partitions?

Gonzalez: Oh, those are kind of fun. It's a problem that I started with one of my students when he was in Dallas and then he came with me to Santa Barbara. He was one of the first Chinese students that came to the States. He came in 1980. There were not too many students from the People Republic of China in the US then, and he was very, very smart. So, when you're doing these placements of components and wire routing, you want to lay them in such a way that the length of these partitions that you're defining is not going to be too large. And we came up with many different algorithms for that problem, and some were faster than others but did not generate as good solutions as the others. And we came up with different techniques to solve those problems. And, of course, they have some applicability in industrial design which was one of the areas that I worked in the 80s, I was doing a lot of scheduling problems, approximation algorithms for scheduling problems in the 70s. Then in the 80s, I got into a lot of these placement and wire routing problems. And then in the 90s, I got into all these communication-type of problems, which were the multi-message multi-casting problems, and of course, some computational geometry problems along the way. And then after that in the 2000s, I just start working in many different things. Of course, my work is not practical in the sense that you can just sell it to Microsoft, and they will just use it directly, but it's applied work. If somebody were to have to solve our problems, they will be able to solve it using our algorithms. Whereas, for example, there's another school of thought, they do theory and they just come up with algorithms that might not be practical, but they are happy with them. They are good. And that is like, well, the problem is computationally difficult, and I can get solutions that are very good, but it will take millions of years to come up with a solution for a particular problem. These types of work don't satisfy me and they don't satisfy some of the more established researchers. It's not theory for theory purposes but using theory in applications. Though the

more practical people will say, “Hey, all of you guys are theoretical.” The theory people look at me and say, “Oh, yeah. You’re practical.” So, we’re somewhere there in the middle.

Yost: Did you get involved with some consulting along the way?

Gonzalez: No, I tried to get involved but that was difficult and, for example, some of my type of things, I was looking at the problems from the computational point of view rather than from the applications point of view. And some of my electrical engineering friends that fall into that electrical and computer engineering category are actually working in industry-type problems, rather than my more abstract type of problems. The way I looked at things is that, well, I’m looking at things that are theoretically interesting. There are some potential applications, but other people just look at the actual applications and other people just look at the theory. And what has happened is that in the 70s, in Minnesota, we were the practical guys. Not the theory people, the practical guy, even at Penn State. And all of the sudden, after a few years and decades, I was doing similar things, and I became a theoretical guy, I’m a theory person because the whole world became more practical, it just kept moving and moving and moving to more practical things, which is a good thing.

Yost: With regard to Minnesota, do you think that was just more of the inclination of the professors there or do you think a major factor was also the computer industry within the Twin Cities?

Gonzalez: Yeah, I think the computer industry had a great influence on the department. In fact, I was reading some of the interviews that you did with the different faculty members, and they were involved in quite a bit of consulting.

Yost: Bill Franta especially.

Gonzalez: Yeah, and actually he left the University and started his own companies and stuff, and stuff like that.

Yost: Right.

Gonzalez: And that's great! And there was a lot of that but, in the part that I was with Sartaj, there was little of that, though, he did much more consulting later on with the different corporations but it's more academic type of research.

Yost: One thing I was really struck by when looking at your CV was how many collaborations you have with so many impressive research scientists throughout the world, and can you talk a bit about collaborative work and kind of your drive to do collaborative work with others?

Gonzalez: Yeah, it's—I've gone through many different phases. I work with colleagues and with people all over. And perhaps my greatest collaboration is this handbook on approximation algorithms that I edited, in there I have, there are like 250 different authors and about 80 different chapters and all of that was done through the internet, and it's like, "You want to work on this? You want to do this?" Stuff like that, and that was easy. And, at the beginning, all my papers were joint papers, especially with my advisor and other faculty members. That was great. And then sometime at Penn State and at Dallas, I began to write things on my own, just by myself. And I ended up with about I think one-third of my papers are single-author papers, and the remaining are joint papers. But if you look at the typical faculty member now, all the papers are joint papers, and papers might have something like five or ten authors or something like that. I don't have anything of that—

Yost: Sometimes even more.

Gonzalez: Right! Sometimes there are lots of coauthors, which it's fine. In biology, that's a typical thing. But what happened was that for example in Dallas, we had a few Ph.D. students. Here in Santa Barbara there were some Ph.D. students, but you had to support them. The University did not provide enough support for them, as TAs, for example. It took years for them to qualify for reduced tuition or some sort of university support. So, for example, these days, in fact for the last 20 years, the only way you can

work with a student is if you are supporting them, have a grant that actually supports the student. Where, for example, in Dallas, we had lots of students and the tuition was low. They could be a TA and you could just work with them. That was easier. So, it became harder, and harder and harder, though there were some people who had something like 10-15 different Ph.D. students they are supporting them by some big grants and that's great. I don't think I could do something like that. Organizationally, it's difficult, but they manage to do that. My co-authors at Penn State were faculty members. I did not collaborate with any students. In Dallas, all of them were my Ph.D. students, and I had several then. And then in here, I have had about five or six that stayed for four or five years. So, I did a lot of collaborations with these guys. And it's fun working with students. I work the same way as Sartaj was working with me. It's let's look at this problem, let's look at this restrictive version, let's try to generalize our results. Let's try to do this, and this and this other in a very friendly one to one environment, rather than—the way things work now is go and get the result then come talk to me, then I write my name on the paper, things like that. No, I cannot possibly do things like that. It's like, let's get a result, let's work on this. Let's try to improve this. Do this, let's do this other thing. A more personal interaction. In Dallas and the first few years at UCSB I was the CS faculty member with the largest number of Ph.D. students, but in more recent times I was among those with the fewest number of Ph.D. students.

Yost: Can you tell me about your time in the Netherlands?

Gonzalez: Oh, yeah, that was fun. That was in 1990, and my wife and I went there. We didn't have any children at that point, so it was a fun time being in Europe. I met this guy Jan Van Leeuwen, who was a Penn State faculty member. He just came as a visitor for a year. He was really very well-known in Europe, so he was there, and I decided to join him in there for that sabbatical year. So, we were there for about seven, eight months, and it was a fun time. It's a different world in the sense that, you wake up at, you go to work at 8 or 9 and it's dark. You come back at 5 pm and it's dark. It's kind of like, "Gee, I work very hard and it's not very different than in here." But there were lots of interesting people there,

and I got to work with a couple of them. And at that point, they were organizing this big research group in theory that cover all over Europe and they had people from the Netherlands, they had people from England, they had people from Germany, France and Italy and everywhere. And it was nice attending their conferences, they were doing a lot of very different research in many different areas, and I got to meet a lot of really famous people. It was nice giving talks at several different universities. Also, it was nice there being free in a sense we don't have any children. We don't have anything to worry about and traveled all over Europe, we visited my wife's brother and sister that live there. I got to do some interesting work there with a couple of people who some were not known at that time but then became really famous over the years and people, it was easy to get along because everybody spoke English, so that made it simpler rather than going to France or some other place, it would have been hard. It's too bad I couldn't have other sabbatical years like that. At Penn State and Oklahoma, I didn't stay that long. Texas, they don't have sabbaticals. And here at the University of California, yeah, they have those sabbaticals, and that's really very useful. And here everybody gets sabbatical no matter what, and that's great. What happened, the later years, we had five children and there's no way we could travel with all of them, so my sabbaticals were here in Santa Barbara. I think your Zoom is frozen now.

Pt 2.

Yost: So, sorry for the network glitch. Could you tell me a bit about how computer science and—

Gonzalez: You froze a little bit in the middle.

Yost: My question is how computer science at UCSB evolved in your time there from the time you arrived to the time of your retirement a few years ago.

Gonzalez: It changed considerably over the years. I mean, at first, we were an independent department but the graduate program was with electrical and computer engineering and after a few years, we got our Ph.D. program and it started making a big difference to recruit more students. So initially we had four faculty members, then four of us joined. And the theory component was strong. Then in the 70s—sorry, in the 80s, we hired people that were in other applied areas, for example, databases, vision, software engineering. And some areas became really important part of computer science. The database industry is humongous. There was a lot of work in that. We started hiring people in many different areas, not just in some specific areas. So, by the time the 90s came, we had more faculty but still we did not have as many faculty as other departments. For example, we would be trying to hire one or two people a year, whereas, for example, at UT Dallas, one of my students had moved there, and one year he was hiring ten new faculty members. They were interviewing like crazy. The University of Minnesota (CS) also grew a lot by that time. And actually in ’89, I went to give a talk to the University of Minnesota, and my objective was to get Sartaj to come here. And we had been trying for many years. That wasn’t working. So, he came with this plan to hire three people from Minnesota, and then I had a meeting with another faculty member that also wanted to come here. Unfortunately, what happened to us was that we didn’t get Sartaj to come here. He went to University of Florida, they beat us. But that’s the way things work. But we started hiring more people. One year we hired a set of students, three or four, in parallel computing and we got a nice parallel computing machine. The four people were, let’s see, one from Berkeley, one from Rutgers and two from Stanford, and we were jumping into that area. One of them, one day he decided that he wanted to go to this little start up in the bay area called Google, and he was employee number eight there, and he’s still there. So, he has done really, very, very well. Very smart guy. Very, very creative. And this was a first for us. People were not leaving to go to industry before. In this case, he went to this little start up that did really very well. Another of these faculty members, he went to, became a faculty member at MIT. And another one started his own company

here in the area. And that was a big change. And that was a positive change for this area. He has done really very well. His start up, he started a couple of companies that have done very well. The university adapted, so now it's very common to have faculty members that have their own startups and then maybe leave for one quarter or two quarters and then they stay here for another one or two quarters and keep on doing this. We also have had Ph.D. students and other faculty members with their own startups, and that has worked really very, very well. So, the whole orientation has changed. And in the past five or six years, we have moved, the department has moved, as I am still sort of part of it where I am Emeritus, into areas of machine learning and artificial intelligence and stuff like that. And that has been a big substantial change, more recent change. Dick Kemmerer did very well hiring a couple of guys in computer security. It's a very, very hot area, and they have some startups too. So, the orientation of, I mean we used to be faculty who were teaching and doing research through grants and stuff like that and now it's very different and there's a strong entrepreneurship component. People have started companies and they have done well and sold them and stayed in the faculty and that has changed because, I mean, that has changed the way we're viewed by the students because it's like, "Oh, yeah. They are doing something practical." And there are a few companies here in town, maybe there are about eight or ten that have been started by our students and faculty. And not only CS has done this, but also the College of Engineering students and faculty. There are a lot of people that have started their own companies and done very well. One that came out of the students in engineering was this one called Inogen. They sell these little things that produce oxygen and older people can carry them on their side and they don't have to carry those big tanks and stuff like that.

Yost: Right. I've seen those.

Gonzalez: It's done very well. It wasn't something that, it wasn't computer science people, but it was people from other departments. But that's how we have changed significantly. The number of CS students that we had has gone up and down, up and down, up and down and we used to have many in

the year 2000. I was the undergraduate advisor and I had my hands full with six, seven hundred students. And then the numbers came down. And now we have been limiting them. But recently that number is increasing. The trend is that there will be many, many more students. For example, Berkeley has thousands and thousands of CS majors, and I think we are going that way. It's difficult in computer science because of all of these programming assignments and stuff like that, our courses do not scale very well. For example, data structures courses, I normally had like 30 students, and that was manageable. But at some point, I had something like 100, 120, and that was difficult to handle. In Dallas I had a grad course with about a hundred students once, and most of them were foreign students. So that's the trend. Many more students and we're increasing the number of faculty now. I think we're close to maybe 35 or 40, which is a big number for us. Minnesota probably has many more. Dallas for sure has probably about 60 faculty members so we're trying to grow in that direction in order to be able to compete with all of these other places, but it's tough. Another big change is that when I came, the number of grants and the amount of money that faculty was bringing was very, very small, and that has grown exponentially. Our people are doing very well. One of the reasons is that they are working more in applied areas so there's much more money available. There's money from corporation, Google, for example, has given some money and a bunch of other companies. So that's the change. We still teach all of the traditional courses but then there are many new ones, exciting courses in different fields like data science, machine learning, etc. One thing that changed a lot was that when I came, in every department, we were doing our research only with people in the department, and the University has always pushed us into doing joint research with people in other fields. So that is growing a lot. I was left behind in there. I didn't move into that direction, but it has worked very well for a lot of the faculty. And it makes a lot of sense if I would have done some of my research with some people that were closer to the design of computer chips, perhaps we could've come up with other interesting results and interesting practical work. But there was this division that was happening. And the division, not here but everywhere, started

because at the beginning of computer science, we wanted to create our own field, so it's like this is what we are doing, push out everybody else. And now, it's like, yeah there are a lot of applications in there, and there are lots of people there doing that and we need to work together.

Yost: Yes.

Gonzalez: —so that transition—

Yost: The Internet of Things, and everything.

Gonzalez: Yeah, all of these things. We have had some great students and some of our undergraduates are really very talented. We have sent them to get their Ph.D. at different universities. And one of our more famous ones, she became a professor at the University of Maryland. She's was there doing really very well and then she moved to UC Santa Cruz and doing really great. So, 20 years ago, very few of our students went to very good universities to be professors, and now we're seeing more and more that are joining program in different places. Another big change that has happened in the past maybe 15-20 years is that now we are also hiring in this other instructor series. We have the professor series and we have the lecturer series. And in that series, they have the assistant, associate and they have the full professor and their main goal is to teach. And that's another big change that has happened.

Yost: At Minnesota we have teaching faculty in Computer Science as a different track as well.

Gonzalez: Ok. Yeah. Some pluses and minuses, but everything has pluses and minuses.

Yost: Part of your response anticipated my next question and that is did you ever return to Minnesota and you mentioned that in 1989 you came back and gave a talk. Can you talk about how you saw the department had changed when you were visiting Minnesota, in what ways was it different from before?

Gonzalez: Yeah, I came in '89, and I joked in my presentation by saying that it was my 15 year checkup, after being out of for 15 years, they were checking me up to see if I was able to continue with my degree

or they were recalling it. There was a new building for computer science that was huge. There were lots of faculty members and lots of research activity in many areas. And the University was different. They had a nice hotel there, associated with the University and stuff. So that was nice seeing how things had changed One of my nephews was at that point working towards his Ph.D. but in Management Information Systems. So, I went around with him. I went to Middlebrook Hall, which is where I was living my first year and it was like, "What are these kids doing here? I'm supposed to be here." There was much more research activity than when I was there. And there were many students and faculty members, there were faculty which later on I met at some other events. The amount of research activity and the number of Ph.D. students had grown tremendously from my time there, I mean, we were four Ph.D. students and maybe about ten faculty members and now I don't know what the numbers are but there might be like at least a hundred Ph.D. students or more. We have about 100-110 Ph.D. students here, so it's probably larger there.

Yost: I don't know the exact number of faculty, but I think it's about 60.

Gonzalez: Yeah, ok. And in many different areas. There's a faculty member in Dallas that moved to Minnesota but then he moved elsewhere. He went to somewhere in California later on. There was much more research activity in Minnesota and really very nice facilities. I didn't see the computer facilities, but I image they are being kept at a very high level. I also went and visited my host parents, which, actually, the first week that I was in Minnesota, they assigned me to a volunteer family, a young couple. Both had graduate degrees in Chemical Engineering and worked for 3M, and I stayed with them for about a week or two. It was interesting chatting with them. Also, it was nice talking with J. B. Rosen. I had dinner with him, and it was very interesting. The good news is he didn't remember me, but he was very, very nice. And it was interesting talking to him at that point. We talked about my research using linear programming on some problems (he taught LP in the course I took from him) and also about why it was not possible to use it on other problems. He might've been close to retiring so he was thinking about

moving somewhere else at that point. There was lots of interactions with different corporations and lots of interesting work going on at that time. I think I talk to some of the, not too many of the new faculty members I did not know from before but the few that I talked to were doing really good work.

Yost: Before we conclude, are there any topics I haven't brought up that you'd like to discuss?

Gonzalez: Let's see, not, well, every time that I meet somebody from Minnesota, I say, "Minnesota is a wonderful place. The best place I ever lived, including Santa Barbara, including anywhere else." I remember, I tell people, "My car would stop working and somebody will stop and push it and will make it work." Here, you go to some parts of LA, your car breaks, and yeah, people will stop but they will not stop to help you. So, people were really very, very nice in Minneapolis and in Minnesota. It was a really friendly environment. The foreign student office was really very helpful with all of us foreign students to help us adapt to the environment. And there were lots of activities and things and things of that form. And the welcoming that we got at the beginning, I mean somebody even went to pick us up at the airport. They picked me up at the airport and took me to this host family and stuff like that. That was really great. I mean, I'm not so sure we do those things these days. Well, if you have a thousand new grad students you cannot do that.

Yost: Right.

Gonzalez: 10, 20 or 50 students, you can handle that. But it was a really fun time. And it was really fun remembering all this stuff which from day to day you don't remember. It was a good time, very good time for me. it looked like, I don't know if I said this earlier, but people were telling me, "Get a Master's degree first because is tough in the Ph.D. program," and stuff like that, but things work out really well for me going directly to the Ph.D. program, so it was a pleasant surprise. A very, very pleasant surprise. Though everywhere that I've been it's a pleasant surprise, most of the time, if not all the time.

Yost: Well, thank you so much for taking the time and congratulations on being such a distinguished doctoral student graduate of the University of Minnesota and having such an amazing career in so many different areas too. Contributed to many different areas of computer science, and I really appreciate you taking the time out this afternoon, early evening now here. And the process is I'll send you a transcript and then you'll have a chance to edit anything before we share it.

Gonzalez: Ok, great. Yeah, it was fun doing this thing, just remembering that stuff. It's good memories, I mean—

Yost: Yeah, a lot of people at the start of an interview say, "I don't know how much I'll remember," but then it all just kind of comes back once they start talking.

Gonzalez: Yeah, yeah.

Yost: So, ok. Well, take care and have a good evening.

Gonzalez: You too and thank you very much. Bye.

Yost: Bye.

Addendum: I forgot to mention many things, but an important one is my participation in ABET, the accreditation body for computer science and engineering undergraduate programs. For the last 15 to 20 years I have volunteer as program evaluator, team chair and CAC Commissioner. The goal is to improve undergraduate computing programs. We evaluate programs for possible accreditation. We visit universities and talk to students, faculty and administrators to evaluate their programs. I visited at least one university every year and the whole Commission decides on more than 100 programs every year. One learns a lot from these visits as we review their processes for continuous improvements, courses, funding, facilities, etc. Right now we are also defining the accreditation criteria for Cybersecurity and Data Science programs.

I think it is important to point out that back in 1972 the department was the Computer, Information and Control Sciences Department.

My other activities that have lasted for more than 15 years are: Eucharistic Minister (Catholic Church), AYSO soccer referee, BSA (boys scouts) adult volunteer, motorcycle rider and now bicycle rider.

My best job has been at home being a husband and raising five children. My career as a CS professor and researcher for 42 years (including one before coming to this country) was very enjoying and rewarding in so many different ways.