1. Early Life

ARJANG ASSAD: I'm Arjang Assad, I am the Dean of the Katz School at the University of Pittsburgh, and I'm here on behalf of the INFORMS History and Traditions Committee, interviewing Chuck McCallum. Chuck McCallum was at Bell Labs for 28 years, and head of its OR department for 18 years. So you have a lot to tell us about history. And we're going to start from the beginning with your family background, the early years, and go right through the educational process. Please, Chuck.

CHUCK MCCALLUM: Great. Pleased to be here. I was born in Tacoma, Washington in 1943. My father was a banker and my mother a bookkeeper, and they met at the Puget Sound National Bank in Tacoma, Washington. At age 10, the family moved to the suburbs of Tacoma, an area known as Lakewood, now even a city there. They didn't have any college education, but they were very active in the community. And in 1953, I guess it was, my father opened up the branch, the Lakewood branch of the Puget Sound National Bank, in a fast growing suburban community.

It was a fun place to live, on Lake Steilacoom. I was quite the water skier. I went to Clover Park High School there, and always took a lot of math courses. And I was very active in the band as well.

ARJANG ASSAD: So math was your strong subject.

CHUCK MCCALLUM: Math was a strong subject. I guess I was fairly good at most subjects, but math was the strongest. And I had very good instructors, and so that was very helpful. But I was busy with a lot of activities, especially band. In fact, the scheduling was such that I never had Western Civ or Chemistry, because it wouldn't fit in. Math was first, band was second, and then graduation and college prep courses third.

ARJANG ASSAD: And in the band, what did you do? Just out of interest.

CHUCK MCCALLUM: I played the clarinet. And was active in other ways. I was the drum major in the marching band, the shortest one they ever had. And the band president. Band was a lot of my life, and a lot of the people I hung out with were music people. Then I had the good grades, so I applied to a bunch of fine schools around the nation. And MIT gave me money, so I went to MIT.

I got there not knowing what engineering was, and kind of thought, like my friends, I was going to college. Turns out, an Institute of Technology is a little different. I didn't know what I was going to major in. I randomly got, as my first year advisor, a metallurgist from the Department of Metallurgy. My second year I had a geology professor as my advisor. And at the end of my sophomore year, you have to declare a major, and you did, so I backed into math. That was what I was good at and stuff.

Then my junior year, I took the concentrations of both pure and applied math, both of them. But at the end of the year really wasn't turned on by either one, and was wondering what I would do

next. And as fortune would have it, in my dorm, Burton House, I talked to a senior who was a math major.

And he was asking me what I was interested in. I said, well, I like math, like computers, economics, probability and statistics, psychology, maybe management or business, but not as an undergraduate. And he said, that's operations research. And I said, tell me more. I'd never heard of it, and it sounded interesting.

ARJANG ASSAD: You were interested.

CHUCK MCCALLUM: I applied to graduate schools on the west coast-- I was eager to get back to the west coast-- in different subjects, business schools at UCLA and University of Washington, Berkeley IE, couple others I think. And then at Stanford I was going to apply in operations research because I was told they had some there. But they didn't have a master's degree. So unlike the other schools, I applied there for a PhD, and they gave me the full ride. And now I'm a lot smarter, and so I would encourage my kids, if you want money, you apply for the PhD, not the master's.

ARJANG ASSAD: Now you graduated MIT in which year?

CHUCK MCCALLUM: MIT was 1965. I was there '61 to '65.

ARJANG ASSAD: And immediately went to Stanford?

CHUCK MCCALLUM: Immediately went to Stanford, not knowing what operations research was. A lot of my fellow students there had some idea. What's surprising to me now is that MIT had a long history in operations research, an OR center going back into the 50s. I was totally unaware of it. I didn't seek it out, and none of the professors told me about it, so I missed it entirely there. But alas, if I had known, I probably wouldn't have stayed because I wanted to get back to the West Coast.

ARJANG ASSAD: I understand.

CHUCK MCCALLUM: And so I lucked into MIT for undergraduate, I lucked into Stanford-- money was the driver, I guess. But it was a really wonderful choice. It's a wonderful school. I learned a lot. I had very good experiences there.

2. Graduate School at Stanford

ARJANG ASSAD: So tell us, if you can recall, some of the maybe influential teachers you had at Stanford, or any particular influences on you.

CHUCK MCCALLUM: Oh sure, there were lots of them. I guess it started off with Alan Manne in my beginning linear programming course. You have to remember I didn't know what OR was, and I remember that was a fall semester, like first real OR course, and he writes on the board,

OR: the science of decision making. And even today, that's my favorite and nice concise definition of OR.

But I didn't know any more than that. So I didn't know all the other subjects and stuff. They were laid out to me one at a time. I guess if I had taken like an introductory OR course with a Hillier and Lieberman text in undergraduate school, that would have been nice. But I learned the major subjects a whole--

ARJANG ASSAD: Individually.

CHUCK MCCALLUM: One at a time, yes. The second year I had Fred Hillier as an adviser. Alan Manne had gone off to India, I think, on sabbatical for a year. The first year I took mainly stochastic courses, but the second year, I got more involved in the deterministic, non-linear programming and such. I guess George Dantzig came my second year there, and then he brought Dick Cottle as well.

And I gradually got involved and more interested in deterministic stuff, and so chose Dick Cottle for an adviser. But there were lots of good instructors there. All had their different quirks and such. I remember George Dantzig, I took just one course from him, in integer programming, but I audited some of his other courses that I'd already taken. And it was interesting.

He'd sometimes come to class late, eating some yogurt, open up *Linear Programming and Extensions*, and write on the board. And sometimes have to correct a lemma, you know, that wasn't quite true as he wrote it on the board initially. But it was really worth the price of admission. Because his stories-- so many different stories that had been retold in so many different ways, and his discoveries, and working with Phil Wolfe, just phenomenal.

But the one course I took from him was integer programming, and that was an interesting experience. It was more a seminar, I guess, and he gave some lectures, and other speakers would talk about different aspects of integer programming. And I remember near the-- it was sort of a nontraditional course, though, in terms of assignments and things like that-- and I remember near the end of the quarter, someone asked whether there would be a final exam. And he said yes. And what will be on it? And he said, I'll think about that.

And then Friday he came in with a list of 25 problems or questions or something, just a long list. And he said, you might want to look these over a bit before the final on Monday. And they were broad topics, like, discuss the traveling salesman problem. Or, how do cutting planes work? Or really, really broad things, not all of which had we covered during the quarter. So I devoted my weekend to it, studying all these different things.

And that was time well spent, because on Monday, I did well on the exam, got an A in the course. I thought maybe it was sort of seminar-like, maybe he gave A's to everybody, but it turns out that wasn't the case. And those that hadn't devoted their weekend sometimes ended up with a C in the course.

Ken Arrow was another interesting fellow. I took optimal economic growth from him. And he would lecture and stuff, and it was so exciting, such a bright fellow. Interesting to watch him answer a question, because he'd think of new thoughts and new theories, and he'd just go on and on and on, saying, if we did this, or if you assume that, maybe this, just fascinating.

But there were a lot of them. Fred Hillier was very well organized and stuff. There's Veinott and Iglehart, and actually one of the instructors I liked very much wasn't there for very long, Harvey Wagner. He did a wonderful job interacting with the students. And he'd phrase a certain question to draw you in, and then phrase it in such a way that the obvious yes answer was exactly wrong. But I think he went to Yale then, after a couple of years or something.

ARJANG ASSAD: Maybe we can move on to your doctoral dissertation, and what work you did.

CHUCK MCCALLUM: Sure. I got involved in I was more interested in deterministic stuff, and working with Cottle and Dantzig there, too, I learned a lot about the linear complementarity problem, that ties together linear, quadratic programming, some game theory, and stuff like that, bimatrix games. And Norman Levinson had written an article that had just come out about linear programming in complex space. And so the issue arose, could you really do the linear complementarity problem all the way over to complex space as well?

And so I looked into that. My hope actually was applications, because complex space-- and I mean, square root of minus 1, of course-- is used in electrical engineering. So I studied electrical engineering in hopes that there might be optimization problems that could benefit from this. Alas, the applications were not there, but the theory was. I pushed the theory through, and published a couple of papers. But there were no applications. So my interest in applications hadn't been satisfied as yet.

ARJANG ASSAD: So it was an extension of linear complementarity problem?

CHUCK MCCALLUM: Yeah, actually--

ARJANG ASSAD: --to complex?

CHUCK MCCALLUM: Right.

ARJANG ASSAD: Spaces.

CHUCK MCCALLUM: So much of the theory went through the existence theorems, the calculations and such. So that was-- the title was, The Linear Complementarity Problem in Complex Space.

ARJANG ASSAD: OK, great.

CHUCK MCCALLUM: Actually, I thought-- I had another thought about the instructors at Stanford. I think when George Dantzig came, he brought a lot of government contracts. There

was a lot of money to bring in visitors. So we had all kinds of, in the early days of OR, so to speak, luminaries from all areas internationally, to visit for seminars or stays for longer periods of time.

So I had Cy Derman for queueing theory, though he was from Columbia. I had Ray Fulkerson from Rand for network flows. That was a grand period, to have all these visitors coming to town. That was very nice.

ARJANG ASSAD: So your PhD was which year?

CHUCK MCCALLUM: 1970 I graduated.

ARJANG ASSAD: And do you recall some people maybe in your cohort who graduated with you as doctoral students?

CHUCK MCCALLUM: About the same time, I don't know exactly, Tom Magnanti was about the same time; Mike Harrison about the same time; Curtis Eaves slightly earlier, and in fact came back at Dantzig's request to be a professor there as well. And I haven't mentioned Jerry Lieberman. I should do that as well. I don't think he was the world's best instructor, but I think he was the world's best administrator.

The program, of course, started in the early 60s, interdisciplinary, and then became a department in 1968 in the School of Engineering, which surprised me a little bit. Because with all the math, especially at Stanford, I would have thought it might fit in the sciences school. But I think it was a very good choice.

ARJANG ASSAD: You did mention you took a course from him.

CHUCK MCCALLUM: Yes. And then he just did a wonderful job running the department and growing the department, and bringing different professors on, and bright students. And then he went on to become Provost or Acting Provost at Stanford as well. But I think he did a wonderful job there at Stanford.

3. First Job at Bell Labs

ARJANG ASSAD: So now it's 1970 and you have your PhD on a fairly theoretical subject. What do you do next?

CHUCK MCCALLUM: Well, I wanted to go into those applications. So I did not apply for any university jobs. I applied to a number of places where they had OR groups and such. Most were on the east coast, even though I prefer the west coast. The only one on the west coast was Atlantic Richfield in downtown LA, which wasn't my cup of tea. And they would have my PhD be a leader of an OR group, and I wanted to do OR with other OR people. I wasn't interested in leading anything at the time.

ARJANG ASSAD: What about Rand?

CHUCK MCCALLUM: I guess I could have considered that. But I didn't. But I looked at a number of places on the east coast. Ended up at Bell Laboratories. Maybe motivated slightly-- Dick Cottle had been there and was well-respected there some years earlier. Maybe that was part of it. But I looked at Esso Math & Systems, Institute for Defense Analysis, but the best package was Bell Laboratories.

It had an OR department in the research area with lots of PhDs in OR. So it was great place. I was still interested in learning, not yet leading, so I wanted lots of talented colleagues to work with, and that was an ideal place for it.

ARJANG ASSAD: So what was your first assignment, or what kind of work did they ask you to do?

CHUCK MCCALLUM: Well, you have to remember that in 1970 OR was felt to be the solve-all by so many. They had a big OR department already at Bell Labs, lots of good colleagues. But also Bell Labs (and the Bell system) was a monopoly then. So funding was not an issue. And that makes things very, very different. So you could do research in whatever areas you wanted to.

We were supposed to contribute to the Bell system by helping out in various ways. But the Bell system and AT&T in those days was a million employees, and scattered around the US, really, really big system. One of the things I got involved in initially and for quite a while was network planning. The Bell system was sort of one big network. You had local networks, you had cell phone networks-- well, that's later on, I guess-- regional networks, national networks, international networks. And I got involved in network planning programs and techniques.

Because of all the money, you were also able to do teaching. They had an educational program both inside Bell Labs and outside, out of hours, they called it. So I was able to learn a little bit more about network flows and teach a course on it during regular hours. And learned a lot more about-- the shortest path stuff is big time in network planning.

And I worked on some network planning associated with the long haul network. It's like long distance throughout the US. The network existed already, but they constantly have to upgrade it, and rearrange things. And I worked with a fellow name of Steve Chen on a network planning program. I think it was called NETPAR. You have to come up with good acronyms. Network Planning with Augmentations and Rearrangements, I think it stood for.

And it was a very large linear programming model with special structure, generalized upper bounding structure. And we were able to exploit that and build a nice big code in Fortran that I think was used for quite a long time for our network planning activities there. But I did more than network planning. The Bell system had so many different activities.

Something very different that I got involved in was telephone directories. You don't remember them now so much, but in those days telephone directories were very, very important. The white pages were called number services, and giving phone numbers for people that might want to call someone. And you'd look in your telephone directory.

And the directories had to be scoped. That means, in a certain metropolitan area, you'd have to determine what exchanges were covered by, and found in, a telephone directory. And how do you design the different sets of directories in that area? And that could be modeled as a graph partitioning problem. And we used some heuristics, basically, to come up with a package that was interactive and could be used by the telephone directory people and different telephone companies.

ARJANG ASSAD: Was that published in any way?

CHUCK MCCALLUM: Yes, in fact, it led to a paper, again with Steve Chen, that became an Edelman finalist.

ARJANG ASSAD: Oh, OK. Great.

CHUCK MCCALLUM: So in 1976 in San Francisco we presented our work. We didn't win the prize, but we were a finalist. And so that made me an Edelman Laureate. 1976, long time ago. But we-- besides the publication, we made an impact in the Bell system. We came up with the program and a workshop that we would carry to Knoxville, Tennessee, as well as San Francisco and all different-- I think there were 22 or 23 telephone companies that we went to to teach the users and telephone companies how to use our package to do optimal or near-optimal directory scoping.

ARJANG ASSAD: Now you were housed in the OR group at Bell Labs, right?

CHUCK MCCALLUM: Yes.

ARJANG ASSAD: Or was there such an entity?

CHUCK MCCALLUM: There was, in fact.

ARJANG ASSAD: And how big was it at the time?

CHUCK MCCALLUM: Probably when I arrived, it was probably called the OR department. But probably about two groups that totaled maybe 10 people. And there were a lot of economists around in those days, until 1984, and the Bell system was a regulated monopoly. And then regulation gave way to divestiture and the separation of the telephone companies in 1984.

But early on we were in the research area, and it was strictly OR. Then it got bigger. The economists left, for sure, in 1984, because divestiture occurred. And there was no longer a defense of a regulated monopoly. But the department grew. I became a supervisor after five years there, I guess. And in 1980, I became head of the operations research department. And then it was maybe 20 people or something.

ARJANG ASSAD: 20 People then.

CHUCK MCCALLUM: Eric Wolman actually had a neighboring department. It was part operations research and part data management systems as well. And there were various organizations that-- reorganizations that took place. Originally we were in the research area, but later we moved to sort of a middle area that was just outside of research, but sort of applied research, area.

4. AT&T Divestiture

And then when divestiture happened in 1984, the telephone companies were split off, and we no longer focused on supporting telephone companies. They actually built up an entity known as Bellcore that was supposed to give Bell Labs type advice to the telephone companies in their various seven regions. But the rest of us stayed behind in Bell Labs, which was called AT&T Bell Labs to differentiate it from all the telephone companies.

And then we became interested in manufacturing, because we retained Western Electric. And so a lot of our applications of OR work were in the manufacturing area. Scheduling, inventory issues, facility location.

ARJANG ASSAD: And this is, again, 1980 or so?

CHUCK MCCALLUM: 1984, when we started focusing on Western Electric kinds of things, coupled with the engineering research center. I actually wrote a paper on OR in manufacturing that was published in the Bell System Journal, or AT&T Technical Journal, something like that, that really talked about a dozen or so different OR applications that were done in my department. Actually, I heard later that Mike Harrison, then and still at Stanford, has used some of those applications for his teaching and such.

So that was through much of the 80s and stuff. Then that was-- divestiture was in 1984. And actually, I should comment that that put an end to some of the free money, or the monopoly status. But during that status, we had some of the same benefits that I experienced at Stanford. That is, there was money for research and to bring in visitors. So some of my buddies from Stanford, Tom Magnanti, for example, and Mike Harrison, came to visit Bell Labs in the OR department for a period of time, like a quarter or something, on kind of a sabbatical.

ARJANG ASSAD: Again in the 80s, right?

CHUCK MCCALLUM: More late 70s. Late 70s, because I fell back to the 70s.

ARJANG ASSAD: Right.

CHUCK MCCALLUM: Tom Magnanti visited to get applied experience for his growth at MIT.

ARJANG ASSAD: That was a summer or something, I kind of recall.

CHUCK MCCALLUM: Yeah. Tom came in the summer. Mike Harrison came in the fall. That was interesting. I remember the first day he was there, we went to lunch. And he was talking to

different people. And he'd barely gotten organized at all. And he said, I've been here a few minutes, and already I've found scads of queueing networks to be analyzed. Real, live, honest to goodness, not made up-- they were called configurations.

There was always different language. In fact, queueing theory at Bell Labs was not called queueing theory, but traffic theory. Different terms. But I remember Mike Harrison being so excited to see all those real life queueing networks that needed analysis. So we had a lot of visitors and such. Ray Fulkerson even visited for a while. Curtis Eaves for a while, and many other visitors. So that was a nice thing of being a monopoly. So that was a fallback.

ARJANG ASSAD: Maybe you can recall some of the more senior OR people there at Bell Labs at the time.

CHUCK MCCALLUM: Yes. Paul Burke, Burke's theorem, was there, not in the OR group. Actually, I was in, and had later, the OR department, a centralized group. But in fact, there were probably another dozen departments that had significant people and activities that we would call operations research. But they were focused on traffic theory or whatever. So there were at least a dozen departments that had significant quantitative involvements in OR stuff that helped, probably, to the awarding of the ORSA Prize to AT&T in 1994.

The last ORSA Prize, because a year later it was the INFORMS Prize. But yes, in 1994, the ORSA Prize. And it was because of so much integrated OR throughout there.

ARJANG ASSAD: Do you have any comments on sort of what was the view of OR in your group? And you mentioned that you had to serve some of the company objectives?

CHUCK MCCALLUM: Yeah. I think it was well-respected. We did a lot in very different areas, and it changed over time. Initially OR was the solve-all for everything. And I think worldwide, it had to back up a little bit. But we were involved in lots of different areas. After the manufacturing thing of Western Electric in the 80s and early 90s, there was a "trivestiture" in 1995, where Western Electric was split off from AT&T. It became Lucent and took the name Bell Labs, as well as about two thirds of the people that went with Bell Labs and Lucent.

The others stayed behind with the name AT&T Labs. I was among those. But many of the Bell Labs people went, and much of the OR went with Lucent. Some of the names you'd asked me-- I don't think I responded well to that. Dan Heyman, Mo Segal, Ward Whitt, Marty Reiman, who just yesterday was awarded the John Von Neumann Prize. He was a Bell Labs guy. Debasis Mitra.

ARJANG ASSAD: Hanan Luss came later?

CHUCK MCCALLUM: Hanan Luss, Shlomo Halfin. And I'm probably leaving out a great number. Fred Descloux in other areas, Jim McKenna, and on and on and on. But in 1995 it split more. And again the Bell Labs people and the name-- but one third stayed behind. I did as well. We were involved-- we still had OR people, stat people, and a lot of computer science. But the physicists, the chemists, and all those went with Lucent.

We got involved in some financial issues, too, and credit management. That was an important area for us. And we hired more statistics people. And continued on doing good work. I think the credit management work actually was another finalist for the Edelman Prize in the mid-90s, I think, something like that.

5. Retirement from AT&T, First USA Bank, and Teaching

And I stayed as the OR department head until 1998. At that time AT&T got a new CEO, and a goal was to cut back in staff, but do it in a very friendly way. And he was the second or third CEO in a short period of time. But he introduced the VRIP, voluntary retirement incentive program. Real generous package. I had just turned 55.

They changed the retirement stuff, and so if you stayed around you were working for about half your pay because you got half if you left. And it was medical benefits and such. And I didn't want to take the package. We had six months to think about it. But in the end, the package was too good, and I decided that I just-- people said it was an IQ test, you're an idiot if you don't take it.

And there were 17,000 of us that took that package, way past the forecast of 10,000. But it was just-- and I was really sad to leave, because I thought the future of AT&T was really going to be grand and glorious. Data networking was coming in big time and such. But alas, I was fortunate again, serendipity, because AT&T and Lucent and their labs ran into bad times later on.

ARJANG ASSAD: Now at that time, what did you think your next step was going to be?

CHUCK MCCALLUM: Well, I could have actually retired and such. In the olden days, of course, we had pension plans and 401(k)s and all that kind of stuff. But I then took a position with First USA Bank in Wilmington, Delaware. That was really a credit card company, but called a bank. And I was Senior Vice President of Optimization, kind of a cool title. I had a group in OR and one in teaching, and technology, and quality. And I did that for two years, applying improvements in the collections business, if you will.

And then I left there and thought, well, maybe I ought to give a try at teaching. I had taught way back in the early 70s inside of Bell Labs, the network flows course. Actually at that same time I had taught a course in Introductory OR at Rutgers in the mechanical engineering department, I think it was. But I was thinking about maybe doing a little bit more of that.

And I looked at a bunch of universities that were within 50 miles of Chadds Ford, Pennsylvania, where I was living. And ended up at Villanova, teaching part time in the Mathematical Sciences Department. And that was really great fun.

ARJANG ASSAD: And this is early 2000s?

CHUCK MCCALLUM: Yes, I guess exactly 2000. And for a whole decade, I taught part time in the Math Sciences Department there. Taught two different kinds of courses. I taught Introductory

OR, and that was for graduate students, students working on a Master's degree in either OR-- or not OR, rather applied mathematics or statistics. But it was an OR course, an elective.

And that was a lot of fun, teaching students that were mainly fully employed and came for one class a week, and were incredibly attentive students. They were there because they wanted to be, and/or their employer paid for it. But they concentrated really well.

ARJANG ASSAD: This was a survey course?

CHUCK MCCALLUM: Yeah.

ARJANG ASSAD: Like Hillier-Lieberman type.

CHUCK MCCALLUM: Exactly. We used the umpteenth edition of Hillier and Lieberman, which allowed me to go through it in gory detail for words. And I was able to give Fred Hillier a few very, very minor typos. But he appreciated that. But yeah, it was a survey course. Actually one was deterministic, which I did more, and the stochastic I did once, as well.

I also taught calculus, both business calculus, because they had a big business school at Villanova, which was sort of like calculus without trigonometry, and maybe a little simpler. But also the regular calculus. And that was fun, too. It was very different, because freshmen-- you know, it's first year away from mommy, there are lots of diversions, coeds, activities, football. Actually, at Villanova, it's basketball.

But all those activities made it more difficult for them to attend class, pay attention in class, or do homework. But it was a lot of fun. It was a lot of fun. And it was all part time for kicks. So there was no politics or anything like that. I enjoyed that a great deal.

6. Roles in OR Professional Organizations

ARJANG ASSAD: So Chuck, maybe now we can turn into some of the roles you had in the professional organizations of OR.

CHUCK MCCALLUM: Sure. Like many others, I'm sure, I joined both ORSA and TIMS in 1967, when I was a graduate student at Stanford. I think lots of people did that. And I remember my first-- well, the first ORSA/TIMS meeting I ever went to was 1968. It was in San Francisco. And the faculty sort of adjourned classes because they were all involved. And as students we went up there. It was the psychedelic days, and all that kind of stuff.

But I first presented part of my thesis in Dallas in May of 1971. And that was an interesting experience, because in those days the meeting was sometimes starting on Wednesday and ending on Friday. And I was super junior then. And I was on Friday, and I was on Friday afternoon.

ARJANG ASSAD: Naturally.

CHUCK MCCALLUM: And I was on the second half of Friday afternoon. And I was in a paper fair. They've long disappeared, though they're a little bit like, I think, the poster sessions, which is a big ballroom and a few curtains that separate the ballroom into little pieces. And there's a few chairs. And you can talk to anybody that stops by. And on late Friday afternoon, on the last day of a conference, not too many people stop by. But some of my Stanford buddies stopped by.

But other than go to some meetings and present at some meetings, I wasn't really involved in society affairs until the early 1980s. Tom Magnanti, a Stanford buddy and colleague that had visited Bell Labs for a while, invited me to join a committee he was chairing. It was maybe Education and Student Affairs or something like that. And I worked on that committee with him. And then maybe the next year a different committee or whatever.

And then in 1986 I was elected Treasurer of ORSA. And that was a much larger involvement. And I served as Treasurer for three years. And then I was on the nominating committee one year, and then the following year I was elected Vice President/President-elect. And served in that capacity. And then ORSA in those days had past presidents for three years, so that ran right up into the start of INFORMS in 1995.

ARJANG ASSAD: That's great. Great career.

CHUCK MCCALLUM: Yeah, the treasurer stuff was interesting. I think I helped to strengthen the finances in ORSA, and then also publicize it more. It was sort of a hidden subject for a while. And it was really interesting, in that we had a lot of joint activities with TIMS in those days. Probably all of the national meetings were joint. And so TIMS and ORSA shared in so many joint activities. But we had different numbers coming from those joint activities.

TIMS and ORSA business offices operated a little bit independently. So the dollar numbers from the same meeting would be different whether you looked at the financial reports from ORSA or TIMS. And that was sort of astounding, I found it. I worked some with Randy Robinson, who was the treasurer of TIMS at the time, or maybe VP of Finance, I think they called it, to straighten things out a little bit. But it was crazy.

ARJANG ASSAD: Common lore was that ORSA always did better financially. But I won't go there.

CHUCK MCCALLUM: Yes, yes. But we all got together eventually.

7. Bell Labs Retrospective

ARJANG ASSAD: I want to go back, Chuck, for a moment to your role at Bell Labs, because we have so little of an institutional history when we look at the history of OR. And I want to ask, what were viewed as sort of the major accomplishments or successes of the OR group by the organization, by Bell Labs? What, in their view, made a major impact and made the group sort of worth, you know, the investment?

CHUCK MCCALLUM: Really, OR was so pervasive. I had the central OR group. But so many other groups that were quantitative in nature contributed substantially. Traffic theory, for example, was a huge, huge entity. You had to figure out how to route all these calls, and how to size up electronic or other telephone exchange things. And that was absolutely massive, and led to the-- or involved in the International Teletraffic Congress, which is something outside of OR but had a whale of a lot of OR.

There were all kinds of planning, facility planning, to determine where you put what facilities, and which ones to develop. I actually had a personal involvement in that direction, but a very small piece, in the 70s, when I worked in network planning on something called the Atlantic Basin study. Because one of the jobs-- AT&T sort of had a huge thing to do with global telecommunications. And one of the things was to route the traffic between the US, the east coast, and Europe.

And so the job was to put in submarine cables across the Atlantic Ocean, on the floor of the ocean. There's a big ship that did that. But you had to determine what cables of what types to put where, when. And then once you get the cable exiting over certain landing points in Europe, you had to route traffic to meet traffic demands between US and European points. And so that all had to be determined.

And at that time, too, satellites were coming into being. And so you could route some of the circuits through satellite. And satellites were assumed not to have a fixed cost. But the laying of the cable was assumed to-- or definitely had a fixed cost. And there were questions about diversity and stuff. So you could write that as a very big integer program-- not super by today's standards, but fairly large integer programming problem.

And that was called the Atlantic Basin study, and I helped model that. Didn't help solve that. We actually used an IBM code called MIP, because it wasn't a huge IP program at the time. But that was used to plan that little piece of the global network. But there were all kinds of facility planning issues, logistics issues, distribution issues. And all that traffic theory was really queueing theory that was done at Bell Labs. I think all that was very, very important.

ARJANG ASSAD: We have covered most of the questions, I think, on the list. So I'm going to ask you if you have any other observations to share with us.

8. Preparing for the ORSA/TIMS Merger

CHUCK MCCALLUM: I'd like to comment a little bit on the days of preparing for a merger with INFORMS and such.

ARJANG ASSAD: By all means.

CHUCK MCCALLUM: One of my activities as president of ORSA was meeting with the council of ORSA with the council of TIMS, brought together by John Little. He, in my mind, was the first and then Al Blumstein, to sort of push forward what ended up being merger. But it

wasn't that way at all in the early 1990s. We were collaborating on a lot of things, but we had some frictions, and we had different pieces of interest.

ORSA was more, a little bit more, academic, and engineering, and military. And TIMS was more management, business school and stuff, and IT and stuff like that. But both John and Al had been presidents of both societies, so they had a credibility that a lot of others did not. And they kept bringing us together, the councils would come together.

And we'd have all day meetings arguing about whether we should collaborate more, cooperate more. We already collaborated with most all national meetings and some journals and stuff. But was there more that we could do? And there was duplication, too. Most of us were members of both societies, but a whole lot of people not on councils were not in both societies.

And we got together trying to figure out if we should do the IEEE model, because IEEE is a merger of two prior societies. And we copied them and used their executive director in some ways. But I think John and Al pulled us together, and again and again we worked and worked. And so when we were finally ready for the votes of ORSA and TIMS, the merger was overwhelmingly approved. And, you know, became history starting at 01/01/95.

I do remember, though, on the eve of that, the last ORSA/TIMS meeting, or TIMS/ORSA meeting, talking to Carl Harris at the time. You know, ORSA is going to be done after this meeting, and then it's INFORMS. And it was a great new world, but we kind of missed the old ORSA days and stuff. But it's done gangbusters since then.

ARJANG ASSAD: Yes. And John Little has promised our committee to write a paper on that whole merger experience.

CHUCK MCCALLUM: OK, well, there is actually an existing paper that was written by Craig Kirkwood and Robin Keller about that. Because, let's see-- Robin-- Craig was on the ORSA side, Robin was on the TIMS side. We all had our roots, even if we were society members of both. We would normally speak for the one that we were an officer in. And they wrote an article, published in OR, I think the FORUM section that used to exist, commenting on some of that period.

Because we'd get together for these long meetings, and I remember going out to John Little's house where he gave us lobster and stuff to get us in friendly moods and stuff like that. And so some of that merger planning is documented in that article.

ARJANG ASSAD: But it seems to me you were commenting that they were working together pretty--

CHUCK MCCALLUM: Pretty well.

ARJANG ASSAD: --pretty nicely before.

CHUCK MCCALLUM: Yeah, but there was still a lot of duplication. They had to do TIMS/ORSA one time and ORSA/TIMS. It was-- and the opportunities together were greater than the opportunities apart. And John and Al saw that early on. They were the first two presidents of INFORMS, of course, and did a just fantastic job pulling us together.

I actually thought of one more article that I should mention, based on our discussion. I coauthored a paper with some others at Bell Labs about the early history of OR at Bell Labs. And that appeared in a series of three successive papers, maybe called The History of OR at Bell Labs, or something, that brought it from the earliest days all the way up through about maybe '75 or '80. So it was really early history, but that's available in the OR journal. It was the same FORUM section.

ARJANG ASSAD: It was in Operations Research?

CHUCK MCCALLUM: In Operations Research. And I think it was early 19--

ARJANG ASSAD: Yes, we should be careful to cite that.

CHUCK MCCALLUM: Actually, the citation there-- but probably it's not 1990s. It was early 2000s. So 1998, 2000. But some early OR history at Bell Labs is included in those papers.

ARJANG ASSAD: Were you the author? The first?

CHUCK MCCALLUM: I was a coauthor. There were three other coauthors: Cree Dawson, Brad Murphy, and Eric Wolman.

ARJANG ASSAD: OK. Excellent. Well--

CHUCK MCCALLUM: That's the story.

ARJANG ASSAD: We really enjoyed this, Chuck. Thank you for all your--

CHUCK MCCALLUM: Well, I appreciate it.

ARJANG ASSAD: --observations and history. It was a pleasure.