Salah_Elmaghraby, interviewed by Shaler (Sandy) Stidham, October 9, 2015

SANDY STIDHAM: My name is Sandy Stidham. We're here today to interview Salah Elmaghraby, who is my former colleague. Salah has been associated with North Carolina State University for most of his academic career. He was a distinguished University Professor and founded the graduate program -- Interdisciplinary Graduate Program in Operations Research at N.C.State University in 1970 and served as its director until 1989. The program has been remarkable for its longevity. There are very few interdisciplinary and/or interdepartmental programs in OR that have not either withered away, or become an academic department, or been taken over by an existing academic department. It seems to me that the interdepartmental model is, in fact, an unstable equilibrium. That is, the slightest perturbation could lead to its demise. And that makes it even more remarkable that this program at N.C. State survived for such a long time under Salah's direction.

So I would like to turn it over to Salah to talk about how the program came to be, what its characteristics were, and what made it a success.

SALAH ELMAGHRABY: Yeah. Thank you for giving me the opportunity to talk about it. It's not only interdepartmental, it is unique in the sense that it is-- it involves all university-- almost all university colleges except design. So the important elements there were, of course, engineering, and mathematics, statistics, and economics.

And in engineering, many of the departments participated in it. The beauty of it is that we constituted a supervisory board of department heads. And many people in many departments helped, volunteered. I would like to mention mathematics, Nick Rose was the head of mathematics. And Hans Sagan, who is retired and dead now.

SANDY STIDHAM: What was his area?

SALAH ELMAGHRABY: His area? His area was control: control and feedback control. And in statistics, Bibhuti Bhattacharyya, in particular, who left us to join his wife in New York City. He was a really important element, component, member of the group.

So, we formed from all colleges. We formed an executive committee by the department heads, composed of the department heads. And then, I reported to two deans, the dean of engineering and the dean of PAMS.

SANDY STIDHAM: PAMS is the Physical and Mathematical Sciences.

SALAH ELMAGHRABY: Yeah. And-- but my boss was, of course, the dean of engineering. And Dean Fadum was very, very supportive. Very supportive of the program. His associate dean, Bob Carson, was also supportive.

I was invited here from Yale University, when I was an associate professor, by Cliff Anderson and Bob Carson.

SANDY STIDHAM: Both in the industrial engineering department?

SALAH ELMAGHRABY: Both, yeah. Bob Carson was the associate dean for Academic Affairs. And Cliff Anderson was the head of the IE department. And they were very supportive, very supportive.

So, other than that, in mechanical engineering, civil engineering, electrical engineering, industrial, of course, industrial engineering.

SANDY STIDHAM: Was anyone from textiles?

SALAH ELMAGHRABY: Yeah. Somebody, yeah. There was one person from textile who taught a course in the program at the very beginning. But then he diverted his attention somewhere else.

The interesting thing is that, at that time, there was no School of Business. And yet, the first time Introduction to OR was taught by somebody in the School of Business, which was just a department.

SANDY STIDHAM: It started in the economics department, business?

SALAH ELMAGHRABY: Yeah. It started in the economics department, yeah. And in mechanical engineering, there's Clarence Maday. And in industrial engineering, there were, of course, several people who were interested and contributed significantly.

SANDY STIDHAM: Before you came, do you think that Cliff and the other people had the idea of making it an interdisciplinary interdepartmental program, or did that evolve after you came?

SALAH ELMAGHRABY: No. It developed after I came, because I did not want-- I wanted more than one college to be involved in it. And, indeed, PAMS contributed significantly. And I was the director for 20 years. And it took me the last two years to find a replacement. And I found one who is Shu-Cherng

Fang. And Fang is in mathematics, really. His area of expertise is math programming.

But there are many people in electrical engineering who contributed significantly. I can't remember names, and I can't mention them because I should have brought my notes with me.

SANDY STIDHAM: I can remember during the time that I was associated with program, which was from 1968 to 1975, there were people like Billy Stewart in computer science, and Harry Perros in electrical engineering.

SALAH ELMAGHRABY: Electrical, yeah. Harry Perros, yeah. Yeah. These people in computer science started in the PAMS, but then it moved into engineering. But they're all people-- when we sat around the table-- there were people from all over the place, heads of departments over you name it, and he would be there.

SANDY STIDHAM: Was there somebody from agriculture?

SALAH ELMAGHRABY: Yes. There was a College of Agriculture. In fact, in the College of Forest Resources, which is now called Natural Resources, we had a project which is a very fascinating one. And that is, how many-- I remember it very well-- how many flights you should do-- have airplanes to detect spots where a contagious-- the southern pine beetle killed certain areas and they became black. They browned. And the question was, you want to cut the spread of the infection. And the question was, what is the optimal way of arranging the flights of the airplanes in order to cover the area. And which areas should be covered. What's the priority of covering the areas?

So the School of Forest Resources, all colleges participated except the School of Design. I could not find anybody there. But civil engineering uses in construction, in its construction, mechanical engineering in the design of parts of the engine, and optimization of the crankshaft and the bearings, and the lubrication, and et cetera, et cetera.

So, it was so unique. The dean of the graduate school at the time was Debra Stewart, and she was very supportive, very supportive of the program. And she used it as an example of cooperation among colleges.

SANDY STIDHAM: Which is quite rare, as you know.

SALAH ELMAGHRABY: It is. It is very rare.

SANDY STIDHAM: I don't know how to-- I have never been able to understand why it worked so well here. Except the force of your personality, I think, and your determination had a lot to do with it.

SALAH ELMAGHRABY: Well, thank you.

SANDY STIDHAM: But it also had something to do with the receptivity of the departments and colleges of this university. They were not being selfish the way they--

SALAH ELMAGHRABY: They did not feel threatened in any way. In fact, they felt very supportive. It supported what they were doing, and it helped them do it better. So, I am very proud of the fact that in 20 years, we had the cooperation of so many colleges-- all colleges, all of them, except design. Yeah. And somehow there must be something in recreation because the School of Design also deals with it regularly, recreation. But I could not find somebody who was interested in working on it.

But it took an effort, and half my time-- more than half my time-- was kept keeping people informed of what is happening so that nobody feels neglected or left out.

SANDY STIDHAM: I think you told me once, that every year-- at the beginning of every year-- you had to go around and tell everybody all over again what the OR program was, and what the nature of it was, the interdisciplinary nature of the program.

SALAH ELMAGHRABY: Yeah, it was very, very informative. And very, very interesting the receptivity of people when they feel that they can contribute to something. And I made many, many friends that way, throughout the university. But the people who really helped the program are from basically three or four departments. And it is mathematics, statistics, industrial and electrical engineering. They were the most fundamental ones. Yeah.

SANDY STIDHAM: Do you know of any other program quite like this program, for having lasted such a long time and been so successful?

SALAH ELMAGHRABY: Yeah. The closest to it is the one at MIT.

SANDY STIDHAM: That's what I was thinking.

SALAH Yeah, MIT. And the only difference is that we had a program which is inter-college,

ELMAGHRABY: intercollegiate, and very cooperative. There, they had a center. And the funding was always a problem because the dean of engineering and the dean of PAMS-- mathematics and statistics and physics-- were very supportive. And they gave me almost all what I wanted. Almost all what I wanted, yeah. What I asked for. Which, of course, means that I didn't ask for much. What I asked for--

SANDY STIDHAM: You should've asked for more.

SALAH ELMAGHRABY: No, I was very happy to see the program spread. And we had students from all over the place. From college of-- all colleges, majoring and writing their theses in operation research.

SANDY STIDHAM: And a large contingent of foreign students, which I think was-- of course, is not unusual. But more from the Middle East than most other places that I'm familiar with, perhaps because of your reputation.

SALAH ELMAGHRABY: Yeah, well. The Middle East and elsewhere. We had students from all over. I remember some of them are Indian students. They came specifically from the Indian Institute of Technology to study operation research here. And some of them-- one of them is a distinguished professor right now at Technical Institute, Virginia, Virginia Tech. He just won a prize. And many of them were very excellent, excellent students from all over the world, yeah.

SANDY STIDHAM: One of the best students I ever had was Muhammad El-Taha, who is at the University of Southern Maine in the mathematics department, was the chairman there for a while.

SALAH ELMAGHRABY: Yeah. But this was Subhash Sarin is a distinguished--

SANDY STIDHAM: Virginia Tech.

SALAH ELMAGHRABY: --professor, yeah, at Virginia Tech. And I had many friends. And then, the program gave me the chance to meet people and compare notes with them. The program really was unique in the sense that it did not reside in any department. It was inter-college, inter-departmental. And people really contributed their time and effort to it. And they supported students in it.

SANDY STIDHAM: And that idea, the interdisciplinary idea, goes back to the early days of operations research. After the war, or even during the war, when teams of scientists of many different disciplines were brought together to work on the same problem.

SALAH ELMAGHRABY: Exactly.

SANDY STIDHAM: And you were, in a sense, carrying that tradition forward. There were a lot of people who thought, in those days, that operations research should never be a narrow discipline, in one department. That that would be detrimental to its success and its mission.

SALAH ELMAGHRABY: It is, it is. I think so. And then when I left it to Shu-Cherng, Dr. Fang, he couldn't take it for more than five years. And after five years, he quit. He resigned. But during those five years, the mathematics department head contributed so that the contribution of mathematics requires a co-director. So he established a co-director, so that it became two directors of operations research.

I was opposed to it because I feel that one person should be responsible for happenings. And my feeling is that the program exists now in its skeleton form rather than in its true form, which is intercollegiate, interdisciplinary with a committee. The student, especially the PhD students committees, are constituted by different people from different disciplines, and that's the idea in there.

SANDY STIDHAM: I think every committee that I served on as a faculty member had people from other colleges.

SALAH ELMAGHRABY: Other, other, yeah. Other environment.

SANDY STIDHAM: Could we talk a little bit now about the different research that you did and the course of your research over the years? I took the title of the Festschrift that was published by Springer a year or two ago, honoring your achievements. The title of that book is Essays in Production, Project Planning, and Scheduling. And that, in a real sense, describes the three major areas that you worked in. And I wonder if you could talk about your interest and contributions in each of those areas.

SALAH ELMAGHRABY: Well, I'm an engineer. I graduated in mechanical engineering. So basically, and fundamentally, I'm an engineer. But operation research, I find it to be extremely useful. And really, really beneficial as a theory behind things. And for the past 10 years, I have been very much interested in project planning and scheduling. I wrote a book called Activity Networks.

SANDY STIDHAM: You were given credit for inventing the terminology, activity network.

SALAH ELMAGHRABY: Yeah. And now, if my health stands me well, I'm very much interested in-- what happened is the CPM people suggested a particular kind of precedence among events. You'll have to dig the foundation before you pour concrete on it. So something must precede something else. And the precedence is unique. You can't to do B unless you have done A first, and completed A.

Now, my current research for the past few years has been directed in two things, in two areas. One is generalized activity networks. And that is something has to happen after the happening of something by a certain time. So that is instead of what I call finish-start, FS relationship, which is the finish of one activity and the start of another activity. It is a finish-to-finish, start-to-start, and start-to-finish. There are four activities. That's one area which requires. The second one is the issue of stochastic, because everything about PERT, P-E-R-T, which is the people who invented the whole thing in the first place. They assumed that things are deterministic, but in all probability, and in almost all cases, things are not deterministic. They are stochastic. And the question is, how do you take care of that?

And I suggested something in a talk, plenary session talk, in [INAUDIBLE], and using Monte Carlo sampling cover to estimate. The idea came to me watching weather forecasts. You notice that if you watch the weather forecast for a hurricane, you'll find that it starts near Cuba, and then it opens up like a funnel. And I use simulation, Monte Carlo sampling, to do with that.

And in the meantime, you estimate costs. So managers typically don't know how much a project can cost, because of the uncertainty in the supplies or the-- in the supply or the equipment, and personnel, and resources required to accomplish the various activities, the uncertainty. And the question is, what would happen if certain things are delayed and/or advanced.

You can-- the material arriving too early, and then you have to store it. And that costs money. Or too late, and then you have to go and look for it. And that costs money. So the question is how to take uncertainty into account. And that's what is occupying me now. If my health stands up, I will do it. Yeah.

SANDY STIDHAM: If we could talk a little bit about production. My introduction to you, in fact, came about when I was an assistant professor in industrial engineering at Cornell. And I was assigned a course in production planning and control, which I didn't know very much about. Bob Bechhofer, the chair of the OR department at Cornell at the time, suggested I use the book by Salah

Elmaghraby on design and production systems.

SALAH ELMAGHRABY: Yeah, the design and production.

SANDY STIDHAM: Which had just come out very-- a year or two before I was teaching this class, I think. And you had been at Cornell as visiting--

SALAH ELMAGHRABY: Yes.

SANDY STIDHAM: Assistant professor.

SALAH ELMAGHRABY: Yes. SANDY STIDHAM: In 1967, I believe. And that was the year before I arrived.

SALAH ELMAGHRABY: Yes.

SANDY STIDHAM: So in any case, I used the book. I was very happy with it and very impressed with it. And that, I think, had a large part in my planning when I eventually moved to N.C. State. Because I already knew that there was this very smart person named Salah Elmaghraby who had written this very good book on production planning.

SALAH ELMAGHRABY: Yeah, thank you. Well, that book, believe it or not, I wrote three books which bear my name. That book was my first book, The Design of Production Systems. And of all the things, it was translated into Romanian. Don't ask me why Romanian. And I was really fascinated by and talk, and now lives in Bucharest, which is Romania. Yeah.

I have a copy of the book here. They gave me a copy in Romanian. Of course, I cannot read Romanian. But it's-- so that book summarized. I really would like to expand it. But the one that I really would like to expand more is the one on activity networks, because that was translated into Japanese. And I visited-- I was invited to Japan and to go over, you know, lecture from the book. And it's a really.

SANDY STIDHAM: That would have been in the '70s, I think?

SALAH ELMAGHRABY: Yeah, in the '70s. Yeah, in the '70s. But that our whole generalized activity networks, generalized precedence, what I call GPRs. Generalized Precedence Relations are very, very

important, especially when you take probability into account, especially. Because most people don't know how to deal with probability. In fact, most people don't understand the concept of probability.

SANDY STIDHAM: I recall, the original attempts to put probability into critical path methods in PERT were very crude, and involved just--

SALAH ELMAGHRABY: Very crude.

SANDY STIDHAM: Estimating the total project duration by adding up the means of the--

SALAH ELMAGHRABY: Exactly.

SANDY STIDHAM: Activities.

SALAH ELMAGHRABY: Yeah. They brought it up the range in it. And then they immediately escaped it by getting the expected value, substituting everywhere the expected value. Now it is no longer in a variable. And you find the longest path. And that is supposed to be the critical path. And that always underestimates, always underestimates the exact critical path.

So, but there are-- the tragedy is the handicap there is in the logic, because the logic is A has to be finished before B can start. But suppose you can start B halfway in A. And then what would happen? And the idea of introducing probabilistic stuff in the generalized precedence relations is something I really would like to accomplish before I die. But my health is not helping me there. Yeah.

SANDY STIDHAM: The other major area that is covered in the Festschrift is scheduling.

SALAH ELMAGHRABY: Yeah.

SANDY STIDHAM: Do you want to say a few words about your interest in scheduling?

SALAH ELMAGHRABY: Yeah. That-- scheduling is one of the fascinating, most fascinating areas, especially when you talk about stochastic, how to schedule of activities. I'm concentrating now in project planning, how to scheduled activities when it is uncertainty in the duration and the content of the activities themselves. And the contributions there lie in developing procedures where a

manager can, in fact, pursue a particular line of thinking different from the common, the common one. And the common one is the-- things have to wait.

But suppose things cannot wait, or should not wait? Because if they wait, something happens to them, to that content. And the question is, what can he do? One of the things that entices me now in my old age is concerning scheduling. It's the issue of how to schedule activities whose content can be split. An activity can be split or combined, combined. Two or three activities can be combined. This has never been discussed by anybody.

And that is quite common. You and I do it all the time. You want to do something, and somehow it's unachievable the way it is. However, if you split it into pieces, it can be easily, much more easily, treated. And the question is, how to split it and how to treat the pieces in relation to each other. And that's an area which I would like to get into. Nobody has gotten into it. And I hope before I die, I get into it. I hope so.

SANDY STIDHAM: You should find a student here at N.C. State.

SALAH ELMAGHRABY: Yeah.

SANDY STIDHAM: To [INAUDIBLE].

SALAH ELMAGHRABY: I really would like to. The only trouble is that being retired, I cannot direct any theses. So I have to team up with somebody. I have to team up with somebody who is interested. But the combination, the combining, the idea of combining activities or splitting activities is completely novel in scheduling and project planning. And I would like to pursue it if I live long enough. By the way, this month I'll be 88, so I don't have too many years to live.

SANDY STIDHAM: I expect many more myself.

[LAUGHTER]

SALAH ELMAGHRABY: Yeah.

SANDY STIDHAM: I'd really like to have you tell us something about your experiences other places before you came to NC State.

SALAH Before I came here, yeah.

ELMAGHRABY:

SANDY STIDHAM: We could start with your education in Egypt, or we could go even farther back and start with and--

SALAH ELMAGHRABY: No.

SANDY STIDHAM: Start with your childhood.

SALAH ELMAGHRABY: Yeah. You mentioned something about Budapest.

SANDY STIDHAM: That's of particular interest to me. Because you told me about your experiences there.

SALAH ELMAGHRABY: I was with the railroads at the time. I worked as a railroad engineer for four or five years. And two of them I spent in Budapest. And I was representing the Egyptian government as inspecting engineer in the Hungarian industry. So anything that Egypt bought in the sense of machinery came to our office. And there were two of us. So half the time, I was working.

So I drove the diesel engines, yeah, and tested almost every machinery that is shipped to Egypt If there are four or five pieces, I'll pick one of them and test it for its specification. And.

SANDY STIDHAM: This was after your undergraduate university experience and before?

SALAH ELMAGHRABY: Oh, yes.

SANDY STIDHAM: Before coming to the US.

SALAH ELMAGHRABY: That was after my undergraduate. Yeah. I graduated in 1948. SANDY STIDHAM: University of Cairo?

SALAH ELMAGHRABY: Cairo. University of Cairo. And that was in 1950, '51, '52. SANDY STIDHAM: The time in Budapest.

SALAH ELMAGHRABY: Budapest, yes. Budapest. Yeah. And life in Budapest was-- Joe Stalin was still alive. So he died in April 1953. Yeah. So when I was there, it was the-- I lived under a police state. And many people don't understand what a police state is. I lived under one. And I can tell you stories about it.

But coming back to the technical part, they were very, very-- the Hungarian industry is very well known for its accuracy and its expertise. But still, they did things sometimes for sure. I remember one instance in which Egypt would buy railroad carriages. And the carriage from the outside would look corrugated. You know, the face of the carriage would look corrugated. And I studied and noticed that the reason why it's corrugated is because they start at one corner. You know, a railroad carriage is a long one and rather short.

So they start at one corner. And they start welding. And by the time the go, they reach that corner again, the thing would have warped because of the extension. So I observed it and suggested to them what to do to solve it. And they did it. And that really made my life much easier after that. What I did is I suggested that they spot weld certain corners, and then start halfway stop welding, start welding again, and then do the welding. And that saved them time. And that raised my prestige among them.

SANDY STIDHAM: Among the Hungarians.

SALAH ELMAGHRABY: Among the Hungarians, yeah. Because that saved them a lot of extra work. And the thing really looked corrugated, looked awful. But this way, it was OK. And I did many things at the time from a mechanical and engineering point of view.

But living in Budapest was an experience in itself. People don't understand what a police state is. But I lived under it, and I know what a police state is. I had a letter because my job required me to travel. So I would leave Budapest and travel to where the company is.

I had two functions, one is to inspect the material being shipped to Egypt, and the second one is to certify that the company is, in fact, a company. It exists. It's not just a piece of paper. You know, it's not a shadow something. So I had to-- I had to meet with the directors, the people working in there, certify their credentials, that they are, in fact, what they say they are.

SANDY STIDHAM: Did you have to go to all parts of Hungary, all over?

SALAH ELMAGHRABY: Yeah, I did. And I had a piece of paper with me saying that because of my job, it requires me to travel, and please facilitate my travel. Because people don't-- people in the United States cannot imagine something like that happening. They would stop the train in the middle of nowhere. And the police would raid the train. And if you don't have a good reason why you left your home, they will take you.

So I had this paper with me. It's amazing what a police state is. It's a horrifying experience, horrifying. Yeah.

SANDY STIDHAM: But you have told me in the past about some of the benefits of being in Budapest, being able to go to symphonies and opera at very low price.

SALAH ELMAGHRABY: Yeah. That's one thing that really was a side benefit. The communists did many things. But one thing they actually, they did not invent anything new. But they perfected what was there. So ballet, and opera, and dancing were really highly regarded, highly regarded, and quite cheap, quite cheap. So I enjoyed my life there, because I was-- of course, my telephone was tapped.

And my acquaintances were all investigated and I couldn't invite somebody to dinner or lunch because I'm a foreigner. And it is dangerous to be seen with a foreigner. People don't understand-- you have to live in a police state to understand what a police state is.

SANDY STIDHAM: Were you the only Egyptian?

SALAH ELMAGHRABY: No, there were two of us in the office.

SANDY STIDHAM: So at least you had somebody.

SALAH ELMAGHRABY: Yeah, I had, yeah. But it was very interesting experience. I'll never forget it. Yeah. And it-- when the revolution came in 1956, I knew why there was a revolution. And I sympathized with it. It's a terrible, terrible thing to live under a police state, terrible thing.

I remember once, I was in a-- it has some good aspects to it. And I was once in a nightclub. And I lost my wallet, so I informed the police that I lost my wallet. And within 24 hours, I got it back.

SANDY STIDHAM: With everything in it?

SALAH ELMAGHRABY: With everything in it. It's amazing. Yeah. You really controlled everything there, everything under police control, everything. It's amazing.

SANDY STIDHAM: How did you come to the United States? How did that come about?

SALAH Well, I've always wanted to study. When I reached London with the Egyptian office, the

ELMAGHRABY: railroads, I was employee of the railroad, I got a government fellowship to study for my doctorate in England. So I took the announcement to my boss, who was an Egyptian in London. And I said, should I take it or stay with you? Now you must have realize that a fellowship is all paid. Everything is paid, including your salary, so you live very well. And he ask me, he said, do you want the scrap of paper or you want to be an engineer? And I said, no, I want to be an engineer. He said, you stay with me, and I will teach you how to be an engineer.

So I perhaps am unique in that respect. I'm one of the very few. I don't know anybody else who rejected a government fellowship.

Because it's very prestigious and you live very well. All expenses paid. Once a year you have a trip back home, paid, fully paid.

SANDY STIDHAM: Could you have chosen which university?

SALAH ELMAGHRABY: Yeah, I could. But so I stayed with the office. That's how I learn. And he fulfilled his promise. He sent me to study steel. So I studied steel, the making of steel from the raw material all the way to the finished product. All the stages. The blast furnace, the open hearth, the crucible, the electric.

I was in Sheffield. I lived for two years in England, and one part of it I spent in Sheffield. And I got to the point where I was really an expert on steel. I would test a piece of, take a sample for the thing, and I'd test it. And I would look at the broken part and I'd say, this is lacking such-and-such chemicals in it. And it was. I got to be very good at it.

But then to answer your question, I wanted to study. So after four years of doing this, I decided that enough is enough. I have to study. So I was offered a-- not a fellowship, but a scholarship in Switzerland. And then I was offered also a scholarship in Ohio State University, and I preferred to come to America.

So that's how I came here, and I spent one year to get my master's. I'll never do it again, because to get that master's degree, study, read, and write a thesis in one year, is terrible. It's an experience which nobody should have. But I had to, because I spent my money and I borrowed money in order to study. And I did it in one year.

And then I went to Cornell, where I was a little bit-- I still borrowed money to study. But I had an assistantship. Bob Bechhofer was my sponsor there. And the head of the department, Andy Schultz, was there. Andy Schultz. he was the chairman of my committee.

SANDY STIDHAM: What was the subject of your dissertation?

SALAH ELMAGHRABY: Well, it was mathematical programming. At the time, math programming was something new. That's in 1950-- I got my degree in 1958. So '56, '57, linear programming was brand new. And I did my dissertation, my thesis was about the transportation model of mathematical programming. And it was a good experience, and then I had a very good advisor at Ohio State, and a very good advisor at Cornell.

SANDY STIDHAM: Who else was on your committee at Cornell? Andy Schultz was the chairman.

SALAH ELMAGHRABY: The chairman was Andy Schultz. Bechhofer and I forgot now. I remember his face, but I can't remember his name. He was also a member of the committee. And they were very good to me, very good, yeah.

SANDY STIDHAM: I saw that you worked on a paper with Bob Bechhofer.

SALAH ELMAGHRABY: Yes. We had--

SANDY STIDHAM: Did that come out of your dissertation?

SALAH ELMAGHRABY: No. He was a interested in ranking variables, and when they are stochastic, how do you rank them? And I'm trying to remember the third member of the committee. I remember it at the wrong time. But it was fun, and I did get the paper, I did get my dissertation published a paper out of it-- one of two papers, I think. So that's was a good time. Very good time.

SANDY STIDHAM: You enjoyed living in Ithaca?

SALAH ELMAGHRABY: Ithaca is Cornell. Otherwise, it's a miserable. It's a miserable spot.

SANDY STIDHAM: Maybe a little different now, from what I hear.

SALAH ELMAGHRABY: And I had an apartment right next to the campus. And it's--

SANDY STIDHAM: By then you'd been in some places where it snows. You'd been in Ohio.

SALAH Yes.

ELMAGHRABY:

SANDY STIDHAM: And you had been in--

SALAH ELMAGHRABY: Well, I have traveled all over. When I came, I came to Columbus, Ohio, and then I went to Ithaca, New York. But then once I graduated, I traveled all over the world, so I visited. You name it and I visited. I visited all continents except South America. That's the one case where the closest I came was Central America. I went to Puerto-- not Puerto Rico.

SANDY STIDHAM: Costa Rica?

SALAH ELMAGHRABY: Costa Rica. Yes, Costa Rica. But I've been to Australia.

SANDY STIDHAM: Antarctica?

SALAH ELMAGHRABY: No. But you name it, I have been in England and France, Belgium, Holland, Germany, Italy, Spain.

SANDY STIDHAM: And many times for conferences or to give talks.

SALAH ELMAGHRABY: Give talks. I was invited, for example, in France I was invited in Lyons, the Lyons, which is a big university there. And several summers, more than one summer, I went there and the same with Belgium. Yes.

SANDY STIDHAM: One thing that we've left out, I think, is your time at Western Electric.

SALAH ELMAGHRABY: Yes.

SANDY STIDHAM: Well, we also haven't talked about Yale. But I'd be interested in your industrial experience at Western Electric.

SALAH ELMAGHRABY: Western Electric at the time was part of the Bell System. And the Bell System was the largest company in the world, and Western Electric was the 10th largest company in the world. So it employed many people. And I was participated in constructing, designing a whole new factory in--

SANDY STIDHAM: Princeton? In Princeton?

SALAH ELMAGHRABY: No.

SANDY STIDHAM: But you were--

SALAH ELMAGHRABY: I was stationed in the research center in Hopewell. Hopewell, New Jersey, which they gave the address Princeton because everybody knows Princeton, but nobody knows Hopewell.

But at Kansas City they established a new factory in Kansas City, and I visited Kansas City and lived there. Kansas City is two parts. Kansas City in one place is a dry state, and in the other place it's a wet state. So people would get drunk and drive for one to the other.

SANDY STIDHAM: I've driven across that bridge, and it's not one I would like--

SALAH ELMAGHRABY: No, it's not safe at all. Yeah.

SANDY STIDHAM: How long were you at Western Electric?

SALAH ELMAGHRABY: I was for four years. And then I was invited to be associate professor at Yale University. And I always wanted to teach. My father was a teacher of mathematics, and I always wanted to teach. So I took it, and I stayed there for five years.

SANDY STIDHAM: And that was in the Department of Administrative Sciences?

SALAH ELMAGHRABY: Administrative sciences.

SANDY STIDHAM: Later to become business school, the School of Organization [INTERPOSING VOICES]

SALAH ELMAGHRABY: Yeah, exactly. And that's why I didn't-- Yale is a great institution, but I was unhappy. First of all, New Haven is not a nice place. Second is I was not in an engineering college. And basically I have a love-hate relationship with engineers. I am an engineer and I like being engineer, and they made it so that the five years I spent some of it visiting other places. But at the end of the five years, I was invited here to create and head the OR program.

SANDY STIDHAM: Which brings us full circle to how we started the interview. And I think we're reaching the end of our time, because I know you have an appointment elsewhere. Is there anything else that you'd like to add?

SALAH ELMAGHRABY: No. I would like to thank you for the opportunity of going over. There are some people who I really would like to mention their names, but time does not permit me. But there are so many of them. They all helped me reach where I am.

And looking back I don't think I made a mistake. I don't think so. The program was a model program. It was quoted by many people in many places as an ideal program of intercollegiate, interdisciplinary program, and I'm very proud of it. And thank you for the opportunity to go over it.

SANDY STIDHAM: And I would like to thank you for supporting me when I was a member of the program in ways that were very important to me at the time. And I would also like to thank you for taking your time to tell us--

SALAH ELMAGHRABY: Thank you. I appreciate it

SANDY STIDHAM: -- about your professional life.

SALAH ELMAGHRABY: I appreciate it. Thank you. -