INTERVIEW
WITH
ROY WELSCH
FEBRUARY 23, 2015
SLOAN ORAL HISTORY

R: Roy Welsch
G: George Roth
B: Bob McKersie

G: We start by asking people to share with us when they first heard about MIT. So tell us your story of coming here.

R: I grew up in the Midwest, so I wasn't closely associated with New England or Boston. My brother, who is six years older than I am, was a very technical, engineering-type person. When he looked at colleges, he looked at MIT. That's probably the first time I really heard of MIT. He didn't go to MIT and I went to Princeton. That got me on the East Coast and got me to Boston.

G: From where in the Midwest?

R: Kansas City. I spent my first 18 years in Kansas City. I went to Princeton and was very fortunate to work with John Tukey in statistics. I was in the Math Department; there was no statistics department at that point. Then I went to Stanford. That was somewhat by accident, in a way. Not the school but the career, because I'm very much a product of the Vietnam era. If I had gone on to something other than a PhD program, say I'd gone to law school, which I applied to and got in to. I would have been finished at 25 and immediately drafted. So again, I am a product of Sputnik with the big push on science. I think that had a lot to do with my high school experience. It generated funds so I was able to get an NSF Fellowship to get a PhD in mathematics. I don't regret that, and it certainly kept me in school until I was 26.

G: You went to the Stanford PhD program.

R: From Princeton, in mathematics. At that point, of course, your antenna is open to what's going on. I knew about MIT, and I had been back to New England a couple of times and liked the area. It's hard to leave a place like Stanford, in terms of weather and so on. MIT was a very exciting place. I wanted to do something where I used mathematics, rather then just DID mathematics.

The Sloan School was looking for people in operations research and I applied. They were crazy enough to offer me a job. Other than staying on the West Coast, which I did consider, this seemed like a very nice place to be. So I came to MIT.

B: What year was that?

R: 1969.

B: Who was recruiting you? Where did the pull to come here?

R: I think the main person I interacted with was Gordon Kaufman. Later, Ed Kuh. It was mainly Gordon Kaufman. Bill Pounds had come out of management science and was quite interested in adding capabilities in the stochastic processes area. Statistics wasn't explicitly mentioned. I was in the Math Department. In order to come, though, I wanted to keep my foot in mathematics. Part of the negotiation was that I could teach probability courses in the Math Department, as well as teach at Sloan, which I did for several years.

I mentioned negotiation because I made a note to myself that there was really no negotiation other than that. I didn't have a clue that I should negotiate over salary. There was some nominal number for moving expenses. Now I'm on the other side of the fence, I see the kind of negotiations that go on, and I say, "Boy, was I naïve!" Maybe no one else did it then either.

G: Times have changed, too.

R: Times have changed. It was a nice Math Department at Stanford, very comfortable situation. I was pretty naïve about the academic world, since I had no family connections with academic life. Certainly no connections with a business school, although my father was a CPA, and he kept saying, "The best thing to do is get a law degree and an MBA." As you can see, I tried for the law thing. The irony of it is, he wasn't pressuring me in that sense, but when I graduated from Stanford, I applied to business school and got into business school as a student. Then I got this offer from Sloan, and I said, "Why not be a faculty member rather than a student?" A little twist of fate. I became a faculty member at Sloan.

B: Did you explore the possibility of having an official connection to the Math Department? You mentioned the Math Department at Stanford and coming here to MIT, there's always a question, where do you put your legs down?

R: Yes, my advisor at Stanford was not overly happy with my going to a business school. First place, as an undergraduate, John Tukey kept saying, "Why did you go to the Math Department at Stanford instead of the Stat Department at Stanford?" I took courses back and forth there. Then when I got out of math, my advisor, Sam Karlin, says, "What are you doing going to a business school?" So that had something to do with it. But I just wasn't motivated by reading mathematics journals and solving the next layer of mathematical problem. I really wanted to be motivated by applications. It seemed to me that MIT collectively, and Sloan in particular, would have motivational activities. The Math Department has always been (less so now maybe) very theoretical, including applied math.

B: Different than the Stanford Math Department?

R: In the first place, in mathematics, I was in probability. I could see applications there, including some I didn't fully realize about the Ito calculus and all the financial option things that grew out of that. I had taken courses in statistics. I appreciated that. Computing was coming along. We were just getting into computing and that appealed to me more than just pure theorem proving.

Was Sloan the right place? I think in the end it probably was. It probably satisfied my need for applications. The School has changed, in some ways it's moved away a bit from what it was when I came. I would say it was more of a business school based in technology. As it's gotten bigger and broadened its outlook, it does more things. It doesn't look quite like a business school that's designed for folks who have a technical background. In fact, it has resisted becoming a boutique business school for folks with a technical background. However, the inevitable result of being at MIT is that there's some of that anyway. I felt pretty comfortable in the early years.

Arnie Barnett came somewhat later. Over in Economics, there were econometricians and I met Ed Kuh early on. He came to me to solve a problem he had. I was able to do something with that, about aggregation theory and so on. He asked me to join him in the NBER Computer Research Center, which was housed in Tech Square. They had gotten an NSF grant in 1965, a five-year grant, using computing to do large-scale econometric modeling. He invited me to participate in that. That's how I got to know the Economics & Finance group pretty well. Never had too much connection with Behavioral & Policy Science, or whatever it was called at the time. I did have these connections with Economics and, to some extent, Finance.

I went half-time with the NBER Computer Research Center. For a number of years, I was half-time at Sloan.

G: You were at NBER half-time, which Sloan funded?

R: These are the kinds of things that I now know about, that I didn't then. Apparently Ed took care of it. I was half-time, but enough to stay within the MIT benefits system. I know I also have an NBER pension. That half-time must have been accumulating some sort of benefit piece on that half.

B: You were a junior faculty at this point?

R: Yes. In terms of mentoring, we try to do so much now. I don't recall mentors, I don't recall people helping with my teaching. It was get in there and do it.

I had my struggles teaching. We used to have a full semester of Optimization and the other semester of Probability and Statistics. I remember teaching that, and I remember having a tough time, particularly coming from a math department. That's the disconnect, I was more theoretical relative to the typical business school student looking for short-term solutions to problems. They want tools that would help them get a job two years later in the real world. I struggled with that. I taught some more advanced courses, stochastic processes and things that were a less problematic. But looking back, and I may be forgetting things, I don't think there was a lot of help getting started in teaching business compared to what we do now. During that period, we had all the disruptions associated with Vietnam.

G: So you came in 1969.

R: Right. From a bucolic environment at Princeton, where the most crazy thing that happened was a panty raid, to Stanford where there was a lot going on. The Free Speech Movement started in 1964, and I show up out there in 1965. The West Coast was really changing very quickly. We had a lot of things going on. Then I came here, and I remember getting caught in riots at Harvard Square and lots of things out here on the plaza, outside the Herman Building and the Sloan Building. There were endless faculty meetings. A grade of N if somebody was protesting and couldn't attend the final exam. All sorts of special things were done then.

Finally, we had the Center for International Studies, something like that. It was on the fourth floor of the Herman Building, and was a partially CIA-funded operation. A bomb went off in a bathroom on the fourth floor of that building. It didn't really cause any major upset, but that got me to take home everything important. It was a very disruptive period early in my career, ending somewhere in the early to mid-'70s.

All that settled down and life became more normal. Howard Johnson was president. I don't know when Howard left. During that period, I worked with Ed Kuh a lot, and we developed the TROLL system and put a lot of new robust statistics and graphics in that system. I began to work on a book called, *Regression Diagnostics*, which came out in 1980.

B: Can you say what the TROLL system is?

R: The TROLL system stands for nothing in particular.

G: It's not an acronym?

R: I think it was reverse engineered at one point. I don't remember what it was! That was taking the very-large-scale, time-sharing systems that MIT had developed, take very large econometric models of the economy and forecast and predict. We had access to lots of data at that point. Ed knew a lot about these models and how to build them. He assembled a team of statisticians, numerical analysts, John Dennis, and people who knew about computing. He put together a system that economists, real people doing real things, could sit down and use. It was quite successful and got into lots of central banks. There was another effort at the Wharton School as well, at that time. Ours became a very good system for doing econometric modeling. It still exists, is still used in some central banks. I'll get to that down the road.

It was a great vehicle for me to try out ideas, have them in the computer right away, then watch some economists use it. I'd say it had a big impact on my early career, aside from funding research in summers. I always had a summer salary.

That was another thing. When I came, you weren't guaranteed a summer salary. That's all new. I was able to support students as well, through this funding.

I went through the usual promotion process, with some grief I think, of promotion to associate professor without tenure, and finally tenure. I believe Bob Merton was head of my committee at the time. I remember getting tenure and continuing with Ed Kuh to work on the Center, becoming associate director.

B: What year did you get tenure?

R: That would have been 1976-77, somewhere in there. It was probably effective in 1977. Then a couple of years later, I made full professor. By 1980, I was pretty much through

with the academic marketplace. I thought a couple times about leaving. I got married in 1975, and my wife did not want to leave the area.

This is my long-running issue for academics. I argue to this day that the Dean should have a pool of money for folks who do well and want to stay, rather than always having to go out and generate competitive offers in order to do anything about your salary. That's the way it works, but it's unfortunate. In my position as Area Head, I've had a number of people complain to me. "Gee whiz, I only get 2% a year." The only leverage is to go out and get an offer from Stanford, etc.

Computing continued to be a part of my life through the Center. In 1980, the computer companies started deciding they were going to give desktop computers to people. IBM approached MIT, as did Apple. That's how I got associated with computing in a big way. I played with both computers, not that I'm a computer scientist, and I liked the Apple. I was asked, "Would you run this effort, dealing with bringing these computers in?" I chose Apple, much to the chagrin of some people here. The rest of MIT chose PCs. That led to some interesting friction. But we put them in, and it was quite an effort.

Companies were very generous. When I came we must have had maybe 70 faculty members. Most people got computers. We had had time-sharing computers, and that began to change things quite rapidly. I played that role as a faculty committee. Then it was taken over more and more by professional IT staff. I went on to do some other things, but basically I remember having a hand in that. I think I got the timing right. It was certainly somewhere about then, I'm pretty sure. 1980 sounds right.

I was talking about statistics. When I got here, the vacuum that I saw at Sloan and at MIT was statistics. There were probability people in math and, to some extent, in Sloan and Engineering. The dean at the School of Engineering once said to me, "What's the difference between probability and statistics?" He didn't have any sense of a distinction between those two things. I encouraged Bill Pounds: "Why don't we do something about statistics in the Sloan School?" It turns out that, for whatever reason, the ball to increase statistics went to the Math Department. There was a recruiting effort. George Box came by, Dave Andrews, and other people. Herman Chernoff was finally hired around 1976.

The Math Department fairly quickly after that formed a statistics center that was housed in E40, which had just been remodeled. That began developing a statistics presence. I was part of that center. The students had to come through the Math Department, they didn't come through Sloan. That got statistics going. Not quite the way I'd hoped it would go, but certainly put it on campus.

The 1970s were involved with getting tenure, and keeping the Center for Computational Research, which continued to get funding, and interacting with the Statistics Center. Then pretty much doing my thing in the 1980s, research and so on. I can't remember any distinguishing elements. The dates I don't remember. Bill Pounds stepped down, Abe Siegel took over.

B: Around 1980 it was. Bill went off to the Rockefeller family.

R: Abe had come up through the system and it was small enough that it was still a family. I could know everyone.

B: There was the faculty table and the Faculty Club.

R: Yes, that's a good point. You know, that was one of the most important things. Faculty Club was on top of the Sloan Building. They had a round table, and if you were by yourself, you could just sit there. That's how I met Paul Samuelson and all these people sitting at that table, having conversations. Fantastic connections throughout the Institute. I haven't a clue how you'd do that today. I'm sure there's a way, but it's not easy. I think that's an unfortunate change.

Abe took over. I think the School was still small enough that it was more family-like. I don't know this for a fact, but my sense was that there was a salary issue where some people earned more than others. I think he felt people should be paid the same unless they were really screwing up. What they were in, whether they were a social scientist or an economist, or finance, there shouldn't be that big difference. I'm not necessarily being critical because I'm not sure that we're any different than anybody else. How much do you make? What do you do on the

outside? At least that's my sense. Maybe it's because I was younger and didn't know better. I think Abe kept that together. I don't remember when Abe stepped down. Must have been late 1980s, and Lester took over.

B: Lester took over from Abe. It was the late 1980s.

R: Lester had a different view of the world, certainly in terms of managing the faculty. He was quite sensitive to market forces and the era of economists and people in finance earning a lot more than people in other areas began to grow up. I think that led to some issues inside the School. But you live with it.

Then the School began to grow, the international program started to grow. We had a broader focus, more programs, more activities. International engagements, in my case, with Singapore. Getting involved with some of those international things.

B: You got involved in the NTU?

R: Yes, I was at NTU. I didn't do the first round. I think the first round was 2000–2005 maybe. The second, SMA 2 was 2005–2010.

B: We should show for the record that that stands for Nanyang Technological University (NTU). SMA is the Singapore/MIT Alliance.

R: SMA-2, by that time I got involved in because Paul Matsudaira, who was in Biology, asked me. He said, "We want to put together a program in computation and systems biology. I get people who know biology and some computing but have almost no knowledge of statistics." So he set up that whole thing around the fact that he would bring us in to teach biologists a lot about computing and statistics. I taught in that program for five years. Distance learning during the academic year, and then a boot camp in the summer. That had a big impact in that period.

Ed Kuh died in 1986, I'm pretty sure. Before that, probably the early 1980s, NBER spun off the Computer Research Center, and it moved again to E40. The name was changed to the Center for Computational Research in Economics and Management Science (CCREMS). It was next to the Statistics Center. That was a nice group of folks. We had the Mathematics/Statistics Center and Ed Kuh's operation right together. The Operations Research Center was on the other side of E40, so it was a nice group. I spent a lot of time interacting there.

When Ed Kuh died in 1986, I took over the Center for a little while. We pretty much wound down the Center, partly because we were generating a lot of revenue. TROLL had been licensed to a lot of companies and banks, and it was generating revenue. I got a fair amount of pressure from Abe to spin it off because it was being viewed that universities were generating revenue and not paying taxes. That became an issue.

CCREMS was spun off. The whole TROLL system was licensed to a company called Intex Solutions, which still exists. A lot of the CCREMS computing people went with that company. I did some work with them, too. Ironically, they got involved in evaluating these mortgage pools of asset-backed securities, using the TROLL system to some extent, and other systems.

Life comes full circle. In recent years, I've done a fair amount of consulting on the other side for various firms, trying to deal with this mortgage-backed security problem that came up in 2006-07.

B: The selling of assets based on bundles of mortgages to pension funds, etc.?

R: Yes. You pool the mortgages together and sell them. What's the risk if you're going to sell it off to the MIT pension plan or something? All you care about is you get a fee for originating it and you get a fee for servicing it, and you get a fee for this and this, and there's no risk. Never comes back to bite you. It has come back to bite some financial entities.

Anyway, TROLL went off to Intex. I played a role in making it happen. That was pretty much the end of my involvement directly with that Computer Research Center activity.

The School was growing, reorganization was occurring. BPS developed and grew. Management Science had been headed by John Little, and he went over to BPS. Economics/Math/Accounting is the one area that somehow seems to have been there and stayed there, obviously changing. Management Science became its current five groups over time. OR and Statistics was one group when I started, it was mainly OR. It became OR and Statistics, then Statistics split off from OR with Gordon, Arnie, myself, and some junior faculty members. Those junior faculty members were not promoted to senior positions and Gordon Kaufman retired. The Dean's Office said, "We can't have a group with two people in it," so Statistics rejoined OR.

In 1988, Lester had a lot to do with this, there was some worry that the country was failing due to manufacturing. I knew Tom Magnanti well because he'd been in the OR group. The Leaders for Manufacturing Program (LFM) was built. I had been asked to teach experimental design outside of MIT, to MIT graduates. Companies would ask me to teach experimental design. They thought it was very important, but in effect, it was not taught at MIT. People were graduating from MIT having relatively little statistics background.

G: What's the difference between experimental design and design of experiments?

R: Same thing. DOE is the nice shorthand for design of experiments.

When the LFM program started, I was asked to think about what one might teach. I said, "I think it's very important that we teach things like quality control and experimental design." From the beginning, I started teaching that in the summer to all the LFM students. Out of that, I began advising a lot of students. They'd go out on a six-month internship. I probably advised over 200 of those students because I was in management and they needed to have both a management and engineering advisor.

In the early days of that program, those internships were fairly technical. There was more and more data and more and more things to do. While I was on the management side, I liked to see people lead teams and leadership and put some of things they'd learned at Sloan. I obviously was playing the game of technology as well. That became a big part of my life, starting about 1990.

B: Has that continued right down through the metamorphosis to Leaders for Global Operations (LGO) and so on?

R: My involvement has, but it changed. That brings us to engineering systems. Here we are in 1990 with LGO. It must have been early 2000s, and ESD started. It's about ten years old now, I think it was 2003 or 2004. There were several things. People thinking we had to put engineering silos together into something that can tackle big problems. That had been around for a while and finally coalesced in ESD. Then, because we had some programs around that were pieces, they were put together under the ESD umbrella, including LFM. That led to the idea that it was an "engineering" thing, because to get into LFM or LGO you had to be admitted by both Sloan and an Engineering Department. ESD became another Engineering department that you could be in, aside from mechanical, electrical, etc.

That began to change the nature of the program. The internships became less technical, depending on what you mean by technology. As recently as a couple years ago, half the students went in through ESD. It changed the nature of the student. It led to some issues with advising as well.

As far as Sloan was concerned, I was able to continue to advise and I continue to teach pretty much what I taught. But I noticed the LGO students are becoming somewhat more interested in immediate results. They're great students. I love those students. They all have a technical background, so they're not afraid of technology. But that's softened a bit. I don't mean the background so much, but their goals and desires have changed, with this high fraction of engineering systems students. I think that's being reviewed now, and I think it will change, shift back toward fewer ESD students.

LGO has been a major part of my activity, other than the long-running activity of trying to get statistics going. Chernoff left in 1986 or so. He went to Harvard, and Peter Huber of Harvard came to the Math Department. Huber was not a builder, he was not going to build a Statistics Department. The Stat Center kind of stumbled along. Dan McFadden, from Economics, came to co-direct it. I was co-director as well. He wanted to hire an econometrician. They started moving the Statistics Center to Humanities and Social Sciences. They decided math was not

doing its thing. Sloan still resisted the idea. They moved it to SHASS. McFadden tried to recruit a new faculty member and a new director of the Center. That failed and he left and went on to get a Nobel Prize somewhere else.

That's it for statistics. It went over to the OR Center, which decided in the early 1990s that there was no future, that OR was the way to go, and that pretty much put it out of business. That's pretty much it for statistics at MIT until recent years with the advent of the "Entity", now renamed IDSS (Institute for Data, Systems, and Society).

B: I'm interested in that, because I was at Cornell for eight years and they had great problems there fitting in a field of statistics. Is it something about the nature of the subject, that it needs to be applied, so people pick it up in different schools, to create an umbrella?

R: That's an excellent question. I think if it operates in isolation, it becomes mathematical and theoretical statistics. To me, the fundamental paradigm, the fundamental primitive in statistics, is data. You have data and you figure out how to make decisions or do something. If you don't have mathematics, you don't have probability, you have data. In a math department, it never seemed to really thrive. There was real tension. On the other hand, departments needed people who knew statistics. The idea of teaching in a deferred gratification way is a problem. To say, "OK, you're going to take this course in statistics. It's not necessarily geared to your applications. You're just going to learn these things." Students often don't react too well to that.

I have two things in mind. Deferred gratification is a problem if you have a central thing. The other is just-in-time statistics. I've toyed with the idea that you should wheel in your statistician in a class in biology or whatever, just in time to teach methods that would then be applied very quickly to what they're working on. Statistics thrives best when it's tied to applications. There needs to be a core group that thinks about, "As these applications generate issues, then you think about 'Is there a new method to solve those issues?'" It's difficult. I know Cornell has come up with a solution that's kind of interesting.

B: For the campus-wide committee?

R: Yes. They seem to have done it in such a way that, to the outsider, it sort of looks like a department. I've been struggling with that whole issue of having this new entity. I was not able to win the battle of forming a department, even a small department with six people, like Harvard. I think part of that is quality control and the experience of ESD. With ESD, the feeling was that they'd do searches and the searches had to be dual, one foot had to be in Engineering. The problem is, you'd get somebody who was great in engineering systems, but only #6 on the market in electrical engineering or something. If you get the reputation, "You're hiring weak people." Then you don't hire anybody at all because EECS or another department doesn't approve.

Personally, I'm afraid that the current setup with the entity is problematical, in the sense that we're competing for talent with the other 20 top universities, 18 of which have departments of statistics. In this new entity, you have to have a foot in a department, you have a foot in the new entity. It's not clear what the entity is, exactly. Everyone I've interviewed in this process has been, "What's the path to promotion and tenure?" and you have to say, "Well, the department is going to have a major role." That would be true at Sloan as well. Maybe if someone was a good solid candidate but a close call in the department, then they might have a role, but you really don't want to turn off your own department. I have a feeling that's going to hurt. MIT has never quite put it together. On the other hand, statistics is hard to put together.

G: I couldn't help but think of the analogy with software. You have these big, complicated programs and they can do all kinds of stuff, but it doesn't really matter until you try to figure out what you need. The last thing you ever want to do is go take a course on how to use Excel or Word. Is that analogous to statistics? You don't take a general course because what you need is a very specific capability, then you figure it out when you have the data to look at.

R: That is part of the problem. In economics, you really need to know a lot about time series. Other areas, that doesn't happen. Teaching these general courses is difficult.

B: This is perfect the way you've laid this out, Roy. We should let you continue. Keeping an eye on the clock…

R: There's current history and there's past.

Statistics has had a checkered history. You could dig into the archives about George Wadsworth and the Math Department. Harold Freeman in the Economics Department wanting to start statistics. In that period, in the late 1950s, early 1960s, he could have had some of the world's best statisticians at MIT. The Math Department fought him and it blew up, and again lost time as far as that goes. It restarted about the time I came.

That's been a long history of statistics, and even though my PhD is in mathematics and probability, I view myself as a statistician. By the time I retire, I'm hopeful that MIT will actually generate something. Given MIT's DNA and the way it works, it could have a very interesting, modern, 21st-century statistics effort. It's going to take a lot of work and searching. We need some senior people to come in and help. They have to be attracted to a department. That has been a part of my career here, and it just hasn't materialized. Now what has materialized is big data.

G: That's where I was going to go. That's my ignorance. I thought the two were very connected. Who is it that was telling us that some of the students that had taken these courses at the undergrad level had suddenly become much more attractive to potential employers?

R: Oh, it's phenomenal! My course enrollments have doubled, maybe tripled.

G: Your course enrollment in what course?

R: One is a Master's course, essentially it's data mining, but its fancy title is "Finding the Data in Models That Create Value". Another one is, "Statistical Thinking and Data Analysis." Another is, "Statistical Learning and Data Mining." All are aimed at data mining. One is a PhD course, one is a master's course.

I've taught the undergraduate course. We have 15.075, an undergraduate course, but the enrollments have gone way up, interest has gone way up. Competition has gone way up because now there are quite a number of courses in EECS and elsewhere. The Math Department

has turned around some of their courses. They're more applied. It's diffusing. Everybody wants to do it. The students want to do it because, you're right, the McKinseys and Bains and other folks like the students who have good training in statistics. That's a good thing. Take advantage of it while it lasts.

What's coming in five years, who knows? I think that's very good and that's helping this effort to get things going at MIT along with the IDSS effort.

I think those are the main things. I was looking at my resume, trying to remember what the heck I'd done.

B: I've got a couple other questions. You mentioned not leaving the place. Did you take any sabbaticals?

R: That's another good point! I was so naïve that I didn't really know about sabbaticals. I arrived at Sloan and because a couple years later I became this half-time thing, I didn't even know whether I was accruing a sabbatical or how that worked. But eventually, seven years in or so, I did do a sabbatical. I didn't go anywhere. I think it's because my understanding in later years is that the Institute pays your salary when you're on sabbatical, so you get off the Sloan School payroll. We didn't have the point system or any of that stuff.

Looking back, I did essentially take a sabbatical every seven years. The first one would have been about the time I got married. Then we had kids and my wife was a high school English teacher. We really couldn't get away so I spent my sabbaticals pretty much traveling in short stints to various places, but never a whole semester at another location. I was at Stanford and other places. I didn't go up the river, as so many of my colleagues have done.

G: Some people go up there to write an applied article! We've heard that I think a number of times.

R: I thought it was just to have a nice, comfortable office! I did think of the point system. How did we handle teaching in the early days? Basically, there were some courses and people taught them. There was discussion about courses and what to do, but there was no

particular system of keeping track of things. The view was, some people were teaching relatively few students, and others were teaching quite a few. There was some imbalance of load. I don't remember exactly when the big push came for this whole point system business. I think that was before the Sloan School went off and became its own profit center.

That was the other major thing that occurred. More recently I believe; Sloan pays MIT for services. That changed the nature of things.

B: Probably that was Dick Schmalensee. A number of deans were trying to do that, but I don't think it actually happened until Dick became Dean. The point system was Paul Healey and Paul Asquith. The two Pauls. That would have been some time…

R: Anyway, we went on this system. A lot of people don't like it in various ways. But on the other hand, there seems to be a reluctance to end it. That was a change. It led to pressure not to have a small class. If you wanted to experiment with something, or have a small class, it became more difficult. Teacher ratings became more important. You needed points, you needed students. The incentives may have changed, but I don't have data on that.

Did the School drift away from what it was when I came, in terms of rigor and standards in classes? I felt that way in terms of management science. I can't speak for the rest of the School. We don't teach at the level we used to in management science.

G: Even though you have more tools and support?

R: No. Can you use a derivative? The economists seem to talk about first differences and so on. I think we ask people to have more coming in. Now I think we do, I mean calculus is nice. We have some remedial stuff in the summer. The admission standards have changed. Not in terms of the necessary test scores. I wouldn't say that.

B: We also lost the thesis for our regular masters.

R: We lost the thesis. That's true.

B: You mentioned how important the thesis is for your LGO.

R: It's absolutely essential.

B: A related question: do we ever get anybody working for a PhD within Sloan, within Statistics? In terms of how to think about the graduate output that's connected to research here.

R: My PhD students have come from two sources: (1) people admitted to other departments who take a course and get interested and want me to help them, and (2) others have come through the Operations Research Center, which has gradually broadened its portfolio, with difficulty, because it's highly regarded in optimization and highly regarded in terms of stochastic processes. It is not regarded very well in terms of statistics because there's just no visibility for it. The students who apply, wanting to do statistics in the OR Center, don't look as good on paper. There are very few of them flowing through the OR Center. Maybe the new entity will help. IDSS is going to start a PhD program in Statistics, so this may change.

G: This is the new ESD?

R: We call it the "Entity" and now IDSS. The OR Center has refused to join IDSS. I don't know if that's wise or not, but unfortunate in the short run.

To answer the question, I haven't had as many students as I would have liked because the flow is difficult. Sloan is pretty restrictive in terms of its fellowship support. I can't use it for anybody but Sloan PhD students and this year's OR students. If somebody from EECS comes over and wants to do something, I've got to figure out how to fund them independent of the Sloan program. I don't particularly like that.

But there is an output, there has been. Arnie Barnett, Gordon Kaufman had some students, so there's been an outflow of statistics. I don't think it's a natural interest for the School. It's just not visible in the School.

Our program is very small, and the PhD program has not grown, to my mind. It used to be 50-60 PhD students when we had 70 faculty. Roughly one-to-one. It's still 70-some students but the faculty is 120. In recent years, I've been saying, "Look, this is nuts." But it's viewed as a loss. If people are going to get PhDs and go into industry, should they pay it back? Back and forth. That's unfortunate, but I've been unable to persuade the School that it really would benefit the faculty and our output if we had more PhD students. On the other hand, some areas of the School feel those PhD students are a drag. They prefer to work with masters students.

G: Meaning in Engineering, because the Masters students are funded very differently.

R: I don't know about the funding. It's just that the Masters students are more able to help them with research than the PhD students. They're less maintenance, if you will, broadly speaking. A disturbing thing to me in recent years… All this business about the PhD program and funding it. We've just cut back on our TA support—the amount we pay a Masters student for teaching assistantships. We always supported Masters students from under- represented minorities, etc. Now this money is being transferred to just outright support because our competitors are bidding for good Masters students, and they're pouring money into giving them upfront fellowships. This is disturbing. If somebody is going to go out and earn $500,000 a year, why do we need to support their education? There are long-run stability issues.

That argument can be made about PhDs, too, but probably at a lower salary point. That's a disturbing change in the School. I don't know where that's going. If our competitors are raising money and taking money out of the executive program and pouring it into buying high GMAT scores or whatever, I'm worried about that.

G: We made the news with the million dollar signing bonus.

R: After leaving.

B: In the finance sector, probably.

R: Yes. I would very much like to know how much we supported that student!

B: Before we conclude. You mentioned earlier about being on the Faculty Policy Committee. I think you ought to say a word or two about that. That's a very important role to be playing, outside of your teaching and research. Anything else that fleshes out how else you've connected with MIT?

R: I think maybe to my detriment, in the early years I didn't do much outside the School. Hence I didn't connect much with the rest of the Institute. I knew some people in math of course, and with computing, definitely more so. The one huge benefit of the LFM program was getting to know the Engineering faculty. That was fantastic for me. That broadened my view of MIT as a whole.

Instead of saying, "No, no, no on these forms you fill out every year about what committees…" I started to serve on some undergraduate committees including the Committee on Undergraduate Program (CUP). The Math Department Visiting Committee said, "Your students are telling us in the Math Visiting Committee that the one thing they regret is graduating with no statistics." We talked about putting statistics as a GIR at MIT, so everybody would know some statistics. I was on a committee at the time and I actually taught a couple of prototype courses, but the faculty killed it because nobody would relinquish control of those things. The Math Department would not give up control of that type of course.

I went pretty much directly from there to the Faculty Policy Committee, which was extremely interesting. Then I served on a nominations committee. I've tried to get younger faculty involved in these things sooner rather than later because I think it's very important. Otherwise, you're over here, you're busy, and you do your thing. You don't understand the way the place works.

B: Roughly what were the years that you were on the Faculty Policy Committee?

R: I've been off two years now. I worked my way up through a couple of other committees. Now I'm on the Medical Affairs Advisory Committee. Dealing with sexual harassment issues, the whole issue of Obamacare, how we're going to deal with it at MIT, and what it means. It's been quite interesting. They have data, so they can actually make use of a statistician! That's been quite interesting as well.

Of course, now I'm Area Head. But that has also been an interesting experience, broadening my view of the School and how it operates.

B: This is for management science?

R: Right, management science. I was asked to be area head about six years ago.

B: That's a good run!

R: Thanks. I have a sabbatical beginning in January 2017 and may give the job to someone else. To see the controversies and some of the issues that arise at that level is informative Otherwise, you're just a faculty member in your own little fiefdom and you don't get to see that broader picture.

We have meetings now that are better than we used to have. We have not only faculty meetings and personnel committee meetings, but now we have area heads and group heads meeting three or four times a year. The area heads meet once a month. There have been changes in that picture, closer to the Dean's office if you will. A little bit more about what's going on.

B: George, you have anything else to cover?

G: We always ask this question: As you reflect back on your time so far at MIT, what are you proudest of?

R: I'm proud I chose Apple! Unfortunately, watching Apple go down and everybody switch over to PCs, even at Sloan, and now watching most of them come back. Then watching the Engineering School switch over as well.

I think what I've accomplished through the economics and the TROLL system, and more recently, through the LFM/LGO program, has been extremely rewarding. Doing the internships, getting out of these companies, has definitely impacted my teaching. I have PhD students who did internships as well. Even if they're going to be an academic, I think they should get out there and do something in the real world, particularly in statistics, where you understand what the issues are. I like that model—and I know we're going to use this model. I'm now involved with Malaysia.

B: You're involved along with Charlie?

R: Yes, right.

B: Right. So you're going to be part of that team?

R: I'm on the committee. He's very enthusiastic about the LGO model and how to implement it as part of a business school education—as opposed to what we have, engineering and business. Since I've done so many of these internships, trying to figure out how to make that work.

G: Can you contrast the internship (a six-month intensive period) with the Action Learning Lab, which seem to have taken over a lot of the attention and identity of the School. I don't know how you see them or if you're involved in any of the labs?

R: I have not been, because of the load with the LGO program. The Tiger teams, there are different names for these things. International and domestic. The student feedback I've heard is very good. I think Charlie would like to incorporate some of that as well. The idea is people come in, present a problem, and you go out and attack it. You go there as a team and

attack a problem. I think it's a great experience for future leaders. It takes a lot of energy and resources.

G: Right. It moves back, though, to the faster gratification that students are interested in as well.

R: Exactly right. The best educational experience I've had has been what used to be the 10K, now the 100K competition. Team comes in, they've got a problem. They've got some data. They think statistics will help them and I can help them. I really get the focus and make it work. That's what I mean by this "just-in-time." Maybe our educational model needs some thinking. Kahn Academy.

G: I say that because I have two young adult daughters, one of whom has started her Masters in environmental science and policy at Johns Hopkins. She lives in Washington. When she needs to brush up on things, she goes to Kahn Academy. It's really a just-in-time. I wonder if that kind of model might not help in some of what…

R: I think in statistics there are some things that don't change. I think that stuff could be learned outside the classroom pretty much. We could do a lot of different things in the classroom, including more applications. I'm very much thinking about that. As I end my career, I really like to think about how we might do some of that. That's what I mean by just-in-time and so on. Could we make that work? But we're so structured around semester unit courses. There's a discussion going on at Sloan.

G: It's a sequentially interdependent model and what we really have is a reciprocally interdependent world.

R: Yes. And you can get information about a lot of things very quickly. It may not be perfectly correct, but you can certainly get some of it. In the classroom, I don't think I need to lecture about the t-statistic every year. I could tape that and you could learn that off-line. I agree.

I do not understand the business model at MIT or Sloan about this. How do you give points and generate revenue for doing those courses? They're talking about how to do it.

I view residential education as important, at least some component of residential education. We charge a lot for that and, in some sense, we admit people and they just kind of interact with each other and that's a certain process that's hard to duplicate online. But some mixture of things I think would be very good. We could turn out a student in two years who would be a better product—if that's what we do—we turn out products, right? I'm for that. Let's figure out how to do it.

We should run experiments. Get people to run educational experiments. Could I get Sloan to teach the new core to half the class and the old core to half the class? No. My biggest failure is getting people to run educational experiments! Even if you have the data, even if you have MIT level.

B: This is great.

R: If you think of anything else, let me know.

B: Thank you!

END OF INTERVIEW