

INTERVIEWER: Today is September 24, 2010. My name is Karen Arenson. We are speaking today with L. Rafael Reif, MIT's provost since 2005. Provost Reif, who is Maseeh professor of emerging technology, came to MIT 30 years ago. Prior to his appointment as provost, he directed MIT's Microsystems Technology Laboratories and served as head of the Department of Electrical Engineering and Computer Science, MIT's largest department. He held the IBM Faculty Fellowship in MIT's Center for Materials, Science, and Engineering, received a United States Presidential Young Investigator Award, and was elected a fellow of the IEEE for his pioneering work in the low-temperature epitaxial growth of semiconductor thin films. He also received the Semiconductor Research Corporation's 2000 Aristotle Award. His field is three-dimensional integrated circuit technologies and the fabrication of environmentally benign microelectronics.

Rafael, thank you for talking to us today. You've been provost for five years, the senior academic officer of the Institute. What does a provost do, and what have you tried to do in that role?

REIF: What does a provost do? That's an interesting question. The provost is the chief academic officer and the chief budget officer at MIT. So the primary functions are to coordinate all the academic activities. So the deans of the five schools report to the provost's office, associate provosts as well, libraries as well. So it is where the coordination of all the academic programs occurs, and where allocation of resources are decided. And that links to the role of Chief Budget Officer, which is responsible for the MIT budget, the advanced academic operation. The vice president for research, and also associate provost, who does not have a school responsibility, but has the job of coordinating research on campus, also reports to the provost's office. So everything that deals with education and research, is on the academics side for faculty and students, it goes through the provost's office.

INTERVIEWER: What does that translate into on a day-to-day basis, a typical day, or a typical week? Are you in meetings from 5 am to midnight?

REIF: Pretty much. I think operationally what it means is that I have to meet frequently with all individuals that are in charge of different parts of the academic operation of MIT. So meetings are part of the game. It's a daily activity. Meetings normally lead to decision-making, so the meetings are not to have conversations. Lots of decisions have to be made on a daily basis.

So the day is really filled with meetings to discuss options and decisions. The evenings are normally going to try to catch up with e-mail and regular mail, and on occasion I try to think here and there, driving to the office, or before I go to sleep, or when I take a shower, I guess.

INTERVIEWER: How did you get up to speed on everything that was going on at MIT? It's a big place, it's a complicated place, and there are so many parts. You came from one big corner, but it was a part of what was going on.

REIF: That's an excellent question. Yes, I came from an engineering side, and although I was of course thoroughly familiar with EECS and the research in EECS, and I was somewhat familiar with the rest of the School of Engineering, I was not much familiar at all with what goes on in the rest of the Institute. I was somewhat familiar with science as well, but not that much.

So that was quite a learning experience. However, it was just simply fascinating. I mean, the opportunity to learn about all the things we do-- I mean, I love to learn. I think everybody in academia loves to learn. We never stop learning. We learn when we do research. We just learn all the time. And this was a different kind of learning. Instead of going deeply into a subject, I just had to stretch laterally into all sorts of subjects. So I didn't find that challenging. I just found it absolutely fascinating.

Then on the budget side, that was a little more complex. MIT is a fairly good-sized institution. These days it's a \$2.4 billion operation, and understanding how everything works from the budget side was quite complex. That was also fascinating, and I enjoy that, but in a different way. So it took a few months of complete immersion to become familiar with budget issues and all the academic operations. And those were a very intense few months from the learning standpoint. But they were just absolutely fascinating to me.

INTERVIEWER: Was there anything like a set of briefing books, or did you sit down and talk to each dean, take the departments one by one, and tell me about them? Or literally, how did you go about that?

REIF: Yeah. It's a good question. The way to get educated is to read what has been written. So we had strategic plans that had been written by schools and by departments. Every year, every academic unit submits a budget plan to the dean, who then submits a budget plan to a provost, for example, in a school. So I had all those documents, so I would read all about them, just to understand where we come from. We have our budget book, our treasurer's report where we put all our financials-- so I read all of it.

But like with everything that you read, you read things, and some things make sense, and some do not make that much sense. So you spend, then, a great deal of time talking to principals to understand how things how things are run. I think during that period I learned a great deal, understanding what was written by talking to the deans directly, the different school deans and student deans.

And then on the way we run our finances and budget, I learned immensely from Doreen Morris, the assistant provost, and Israel Ruiz, the VP of finance. They were very patient, particularly Israel, but both of them, actually, patient with me, explaining me all the details of how MIT does the accounting and the finances. And so I learned a great deal from them, after reading all the material they gave me.

INTERVIEWER: When you looked at the different academic areas that MIT encompasses, did you find any that you said, gee! If I hadn't gone into EECS, maybe I would have enjoyed doing this, or when I retire someday? That's what I'd love to come back to, but I really didn't?

REIF: Oh, yes, absolutely. There is no single answer to that. I mean, I went into engineering because, you know, I had to have a job. So engineering was a career that would give me a job. But I'm fascinated by sciences, whether it's-- and to me, it all merges, whether it's physics or biology. I mean, I'm fascinated by social sciences, whether it's political science, or economics, or history. I mean, I don't know, there is not enough time in a lifetime to learn everything that I wish I could.

And MIT has so much to offer. I think the best part of my job is that luckily, I can go to any faculty member and say to him or her, I don't understand this, and I really want to understand. And they always patiently explain it to me. So I'm getting a free education tuition free for the last five years, and I enjoy that immensely. I mean, the thirst for knowledge, the people in this place want to have, and that includes me, and the amount of knowledge here to be shared is just immense.

So I couldn't be able, I couldn't. As an 18 year old, I don't know how you choose what to do. I chose on the basis of, I need a job, I need to make a living right now. If I had the time, I wouldn't even know where to start. There is so much that I would love doing some more, and learning more from.

INTERVIEWER: Has your role as provost changed much since you first took the post, in terms of what you, aside from that getting up to speed and learning about these areas and the processes, the things you focus on, and that need to be dealt with, have they changed much in the time?

REIF: They're changing some. I think all of these jobs, whether it's department head, or lab director, or dean, or provost, they have a component of management of people, they have a component of making sure that things go well. But they also have a strategic component. And I love managing people and working with people, but I love strategy probably the most, just thinking where we're going. And when I took the job, and when I learned about it, I realized that I had to make time for strategy, but the problems were quite immense, quite challenging, and that's what required my attention the most. So I cannot avoid thinking strategically and doing things like that, but unfortunately most of my time went into just addressing issues we were facing.

I think in the last perhaps nine months or so, I can see some light through the clouds, and I can now think that, let's try to be much more strategic. Not that we haven't been, but not as much as I would like it to be. So in that sense, I'm still managing, I'm still paying attention to things, I'm still solving problems on a daily basis, but now I'm spending quite a bit of time thinking and sharing potential strategy with faculty, with deans, and hearing what they have to say in response.

INTERVIEWER: What, if anything, surprised you most as you learned more about MIT?

REIF: That's an embarrassing question. I mean, when I lived in the engineering world, I knew that engineering was very strong at MIT. And I had interactions with people in the School of Science, I had grad students in the School of Science in my research group, and I know faculty, and I knew how strong they were as well. But I had little knowledge of our other three schools. Not that I thought they were weaker. I didn't think much. I didn't interact much with them. I'm talking about Architecture and Planning, and SHASS, and Management. I was so incredibly pleasantly surprised to learn that those are jewels, as well. And I just didn't know, didn't think of it. That, to me, was the most incredible surprise, and pleasant surprise, and happy surprise. We don't have any academic unit at MIT that is not extremely strong. Boy, that's such a thrill. So that was, to me, part of the biggest surprise. And I still remember realizing that about just everything we do is so strong.

INTERVIEWER: And I gather that the new NRC rankings are about to come out, that they've been circulating a little. Did that bolster your feeling that things were going well, and that there were such strengths? I think people were pretty happy.

REIF: I think the rankings are coming out next week, I believe, officially. And I've seen some very preliminary versions of it. I believe so. I think, I mean, I have to study those a little more, but I think it does support exactly that notion that MIT, across the board, is a strong institution. We don't have great departments over here, and departments so-so over here, and my initial reading of the NRC rankings support that kind of notion.

INTERVIEWER: You talked about beginning to think about strategic planning more broadly, about vision. On the vision front, what do you think is MIT's role in America, and in the world, and how that's changed, and how it's changing as we go forward?

REIF: I think what MIT is, this wonderful place that does everything around science and technology, science and engineering. That has been the way it's been for years, and that will continue to be. I mean, I think two thirds of our faculty are in science or engineering, and one third are in the other three schools. So that's the place. And in doing so, MIT has played a tremendous role in America, in the US, creating the graduates that go into the economy, and making the economy work, whether it's by being employed, or whether it's by starting companies, and so forth. So MIT has played a significant role in America. It's not the only place, but played a very important role.

I think what has been happening in the last few years is that the gap between America as the most powerful country in the world economically and the other countries, that gap is beginning to get closer. And so the world is changing. And MIT has to realize that the world is changing, and MIT does so, and to realize how to adjust to our changing world, how do we educate students for that changing world, and how to position ourselves in that world, and to think of ourselves as primarily an American institution, which is what we are, but we are playing a role globally, not just in the US. And that means a lot of things that we have to just figure out carefully. Before us, we are trying to figure out a role in the world, and how we want to practice it. The world has noticed us.

So in the last five years, because I've been in the office, I've seen it, but I'm sure that was the case even before I showed up at the provost's office. Institutions all over the world, countries, come to MIT to figure out how to engage with us. So they have noticed us, and they want to do things with us. And we just have to think carefully, whom do we want to engage, and why, and in what way those engagements will make MIT stronger, which, at the end of the day, is the most important reason for doing anything. To help our students and our faculty to be as strong as they want to be.

So all that is a changing landscape that I see MIT has to come to grips and understand it's role, now in a more global landscape.

INTERVIEWER: *The Economist* magazine recently questioned whether higher education in America might meet the same fate as the American auto industry. Are you concerned about foreign competition for higher education generally, for MIT specifically?

REIF: No, I'm not concerned about that. *The Economist* article actually has a lot of other important things to comment on, but let me address your question specifically. I think that, several issues on that. A significant fraction of our talent-- MIT is an educational institution which means that-- it's an amazing institution because it's truly a reflection of a meritocracy. You know, how many institutions would have someone born in Venezuela as a provost, or three of my school deans are born in a foreign country. You know, you don't find that easily. In America you might, but even when you go to a foreign country, you'd don't. So MIT is a true meritocracy, but it's based on attracting the best talent. And we're very lucky that we attract the best talent. And the best talent worldwide wants to come to MIT, and we're very, very fortunate about that.

But those countries that send their people to MIT, their students and so forth, the students from those countries who still want to come to MIT, those nations are becoming stronger. And they're offering to those students opportunities in their home nations, with institutions, MIT-like, where they can study and get degrees, companies as good as American companies, where they can get jobs after they graduate. So their desire to pack their bags and leave a culture they're comfortable with to come to another place is going to be lower.

And that may have an impact on this meritocracy, in which we want here the best people who want to compete with the best talent to come, get together, and change the world. So that is more what I'm seeing. I haven't seen that yet, but I don't think it's far-fetched to say that it might happen. So in that sense, we have to figure out globally how to maintain MIT as the place that people still want to go, even if their local institutions are strong. We still need to make sure that the action happens here, and that more of the ideas happen here, and how do we maintain that in a more globally competitive environment, competing for talent. So I think that, to me, is the key issue.

But in addition to that idea. I mean, it used to be, if the US is the strongest country economically, most of the ideas and most of the research funding to work on those ideas are generated here. Most of the most important problems are generated here. There are important global problems that may not be important within the boundaries of the US, but are important for us to make a huge contribution. They are not here. They are found elsewhere. And we can collaborate with those people elsewhere, to make a bigger impact of what the MIT talent can do.

And then of course, research funding. If you want to solve or address a global problem, which is not a US problem, why should the US government pay to solve that problem? So we have to find the funding to work on a global problem, elsewhere. So for all those reasons, I think MIT has to identify its place in the world. Talent, ideas, funding.

INTERVIEWER: To what extent do you see other leading universities in the United States grappling with that same issue? Do you feel like MIT is an unusual place in that respect, or how many other universities do you see that are thinking that way, and moving in the same ways and places that you are?

REIF: I think quite a few of the strong American institutions are thinking about their role in a global landscape. And different institutions use different models. Some of them have created campuses in foreign countries, have created basically educational institutions, extensions of the home institution, in foreign countries, and have conferred degrees, the same degrees, in foreign nations. So all these institutions are trying to figure out what is the role they should play in this global landscape, and what solutions they may have.

Not all of us are thinking in the same way. The MIT approach so far has been somewhat different from the idea of creating a campus and so forth. But this is not, I wouldn't say, isn't that MIT is identifying global as an issue, and we are pioneering. No, I think all of us are looking into it. Just each of us has to address it in our own way.

By and large, when people think of MIT, when you go to a foreign country -- just this summer I visited to have conversations, I visited Russia and Brazil, and Singapore, but we have a long-term engagement with them. In Russia and Brazil we were just chatting. When they think of MIT, they think of this place that can generate, that can fuel the economy. A place that can not just come up with new knowledge, but also finds a way to apply the knowledge to solve problems that can be moved to the marketplace. And they would like to figure out, how do they do something like that.

So in their minds, that is MIT. When they go to another university, they may think of something else. So every one of our institutions have an image, or a strength, or a core competency, that foreign nations, or foreign entities, look for. MIT has a very clear identity. So because of that, we have to figure out how to play a role. We've seen our identity, and not change it, that's our strength. So to answer your question, other institutions are looking into it, but they all have different strengths, and they're trying to figure out how to play a role with different models.

INTERVIEWER: I wonder how much of the foreign appetite for American higher education involvement focuses on science and technology, engineering, versus the social sciences, or the humanities, whether there's a particular match with MIT because they're especially hungry for the science and technology, or whether that's just one of a bunch of areas they care about.

REIF: Yeah, excellent question. Of course, what I see, from the governments I've spoken to, is the strong desire to move faster and quickly to a knowledge-based economy. And that means generation of knowledge, applying the knowledge, tech-transferring the knowledge. And that is MIT to them. I have not engaged in conversations with them about any other goals they may have. But I think they probably do have them, because when I look at the campuses abroad that some institutions have built, they are not in this domain, by and large. They're in different areas. So clearly, there is hunger for other areas of academia outside something centering on science and technology. But the rest would be speculation. I just can tell you what I see. So I think there is hunger for more than just what we have to offer. But clearly, there is tremendous desire for what we have to offer.

INTERVIEWER: To come back to Cambridge, Massachusetts, for a minute. What shape would you say that MIT is in compared to five years ago when you became provost? We've had a pretty bumpy financial and economic environment going around the outside.

REIF: Yeah. I think financially, we are in much better shape due to a variety of things we have done, and some benefits of different things that occurred. Perhaps some of the things we had to do because the financial situation became pretty ugly rather recently. But I think in terms of the financial infrastructure, things were fine. But I think, and we have been getting better and better through the years, and we kept getting better, and I'm sure we'll continue to get better. So I think in terms of, financially, we are in somewhat better shape.

And academically, we are extremely strong. I don't know that we are much stronger now than five years ago. MIT is just a terrific place. I think MIT is going to do well, no matter who is the provost or the president. It's a very strong institution. No matter what I do, I don't think I can wreck it. It's a great place. So I don't know that academically, I can say we are much stronger. We have adapted better-- we have made some changes toward the future.

The Energy Initiative that Susan started is a great thing for MIT. So we have that now; 10 years ago we had something else. So we always have new things to offer. So academically, we are with the times. We're living with the times. The Koch Institute is a tremendous vision of integrating biology and engineering. So we're leading in the times, we've always led the times, we continue to do so. So I wouldn't say that academically, we're in better shape. We're just as well, as good as we've ever been, and we'll continue to be strong.

Financially, we were able to tighten a few things, and we're somewhat in better footing right now, and we have been improving through the years, and we keep on that path.

INTERVIEWER: MIT people tend to be quantitative, and I wonder if you look for any kind of metrics in trying to measure the quality. How do you know that the research effort is better? Is it simply the dollars of outside funding, or are there other ways of thinking about it, and do you look at them, do you care about them?

REIF: Great question. Of course I do care about them, I look at them. No, it's not money. I think money's not really the metrics in my view. There are two very simple metrics that I think one can check. One is when we identify the time we want to hire, say, faculty, do they come? If this is a place-- I came here because this is a great place to be. If faculty, 30 years later, still come here because it's a great place to be, we're doing well. Faculty, young faculty know where they can go to make their careers, and to be successful. So a metrics to me is, are we the place where they still want to come? Are we the place where our students still want to come? That is very important.

And then, another important metrics is, are young faculty, are they getting awards? Are they getting recognized? These are the future successful people. We are very lucky, very fortunate, to have quite a few Nobel laureates walking our campus and teaching. But that's a result of a career of success. So that is not our success of today. What guarantees success in the future is our young faculty. And I see our young faculty getting those awards left and right. So they are as strong as ever. And getting a significant fraction of them. So I know that our young are doing very well. And I know that they still want to come here. That, to me, is a measure that things are fine.

INTERVIEWER: Tell us about some of the highlights of your tenure so far, understanding that you've had to grapple with all of the financial issues that have been thrown up along the way. Are there one or two things that you take special delight in yet, or is that what's still in the making?

REIF: No. A lot has happened, a lot has been done. I expect a lot more to be done. I think, perhaps, it's very hard not to include the whole financial and budget situation as something that was important. I think we're extremely fortunate to make what seemed to have been all the right calls at the right time for MIT to be today where it is. We did hurt. We did have to cut back \$120 million of our recurring budget. But it could've been much worse, in terms of the people we had to lay off. It could have been much worse in the way we did it.

So I think that whole domain was one which academicians like to write papers about things like that, that they're very proud of. I don't think you write papers about this. But I think what happened the first couple of years in my tenure, in which we had, you know, a structural deficit of about \$50 million or so, and how we fixed that. And right in time, so that when this financial tsunami hit us, we didn't have that chained albatross on our shoulders. And then how to, very cautiously, very methodically, handle the declining endowment. That took another two years. So of the five years, two and two were spent on, not all the time, but that took quite a bit of thinking. It's very hard not to include that. I mean, things could have gone in so many different directions. So I'm extremely proud of how all of us managed that period.

On the academic side, there is so much that has happened, that I'm very happy about. I think on the international domain, we started what we called the SMART Program in Singapore. It's the Singapore-MIT Alliance for Research and Technology. It's just a great operation there. It's basically MIT as a research entity in Singapore, collaborating with the local talent faculty and students and postdocs from the local universities in NUS and NTU.

I'm very proud of that. I think it's so successful. I've been there every summer since the beginning, and I've seen, not just the activity that you expect to see among faculty, postdocs, and grad students, both from MIT and the local institutions, but I see rising sophomores from MIT, just our kids spending summers there doing internships, and you know, males and females. And so these are kids doing something very exciting in Asia for the summer. To me, all that, all the effort, all the kinds of things that are happening there is a really good example of how MIT can expand a little bit of its impact in the world, and solving problems that are not particularly important in America, in a place in which we have access to infrastructure that allows us to do some very fascinating research. So I think that's another activity on the academic side that I think is worth highlighting in my tenure.

And then we have been busy with quite a few other things. The Broad Institute becoming autonomous, it's a great thing for the region. We played a significant role to make that happen. We're very proud of that, and Broad will do great things. And I can go down the list so far, the Ragon Institute is something we just announced, I think, a year ago or so, with MGH. It's focusing on AIDS. There are quite a variety of programs like that that are making MIT stronger and stronger that I'm very happy with, very proud of.

INTERVIEWER: On an international research entity like the one in Singapore, do you think it's going to be possible within, I don't know, three or five or 10 years, to say, are they collecting the kinds of awards that you expect MIT people are here in Cambridge, or getting the kinds of citations on their publications, or the kinds of things that you look at here to say, are we doing well when they make offers? I don't know how you begin to think about how is that doing.

REIF: I think it from the point of view of MIT, the answer is yes, simply because it's still MIT. I mean, the faculty that have research groups there, that are doing research there, these are MIT faculty. They go and spend some time there, they have a research activity there that they monitor from here. So I already begin to see evidence that what they're coming up with there is just really extraordinary.

So the only difference is that these faculty, in addition to doing their research in one of these buildings around us, they are doing some research far away, because that's where they may find the pathogens they need in their research, or that's because they may have the transportation infrastructure they are studying. So it's like their lab is bigger. Their lab is not just at MIT. It's in other places. But it's the same people.

I think what I would like to see, and I'm beginning to see that also, is that these kinds of research results now do not just belong only to MIT, because they are collaborating with talent from the local institutions. And that is, I think, part of the strength of doing something like this.

INTERVIEWER: What are you seeing in terms of the financing of basic research? So much of the financing over the years came from the federal government, and we're seeing changes there. Places like Singapore are attractive, partly because they are willing to put up money, I believe. So how much of the money that needs to be here for what professors want to do is there, and where's it coming from, and where are the gaps? REIF: Yeah, great question. You know, we have to anticipate that funding for research from the federal government will decline. I mean, I hope it doesn't happen, but we have to assume that it will. And in that case, a place like MIT in which research and education are so integrated, in which, we don't just have this building for research and this building for education, it's all completely integrated, that could have an impact in how MIT does things unless we find another way to support the research enterprise.

Right now what we see growing, in terms of research funding sources, are funding from industry, funding from foundations, not-for-profits, and funding from foreign governments. Those three areas are growing. And I think that's the strategy that we have, that we want to maintain our connection with the federal government. That's the best funding that fuels the American economy. Industry funding is terrific. In some cases, we have structured it in such a way that it helps the industry that's funding it, but also provides some discretionary money to do some other things.

Foundation money is highly welcome. One problem with foundation money is that they typically do not like to pay the indirect costs of research. They want us to subsidize it, to pay for it. So if this particular room is being used for research, the funding source pays for the cost of this room, the electricity of maintaining it, and so forth. That's what we call the indirect costs. Foundations typically don't want to do that. They want universities to pay for that. But it's money that allows us to do a lot of things, and at some point, we have to work with foundations to figure out how to continue the funding, and for them to understand that electricity of a room used for research has to be paid by somebody, and we just don't have the resources to cover that.

And then foreign entities. I think it's important that we, there is significant amount of money from foreign entities, but we cannot play with all of them. We cannot engage with everyone who wants to engage with us. So we have to be strategic about, with which ones we can do something that would benefit MIT. Using any criteria you wish, including the one that I just mentioned. And that is the, we have to be very careful that the pressures we may perceive to have, to bring research funding, does not force us to do some things that may bring the funding, but may not strengthen MIT. And that's a very important component.

INTERVIEWER: How do you think about undergraduate education at MIT, and the model being used, which is remarkably similar to what was in place when I came here in the mid-'60s? I mean, you now have a one-class art requirement, I happened to take three classes. But you have a year of physics, and a year of math, and a term of chemistry. You've added one semester of biology, and cut the number of free science requirements, you have a lab requirement. How well do you think it works? You've had task forces, and they've gone around and round. What's your view?

REIF: This is a fascinating question, too. There are two issues there. One is, what is it that we teach, and what's the content. So as you said, we added biology some years ago, and the GIR is the General Institute Requirements. And we have tinkered with a few things here and there. So we try to update, each department, each major updates their curriculum. When I was in EECS, the year that I was department head, I had a group to work in revamping the EECS curriculum, and they did, in my opinion, a terrific job on it. So every department, every major from time to time, updates what they do. And some may add more hands-on. And so the content is something they worry about it. I don't have to just tell them to worry about it. It's a very dynamic place, and they do it themselves.

I think what seems to be changing a bit, is I meet with students with some frequency, in addition to faculty. And something that I've heard in the last few years from faculty is some frustration that they work very hard at preparing lectures, but fewer students show up. And I think that has always been the case. I mean, MIT students are very smart, and they are very busy, and they take as many courses as they can possibly take, to take as much as they can out of MIT in four years. And if they are asleep at 10 o'clock in the morning, they just won't go to class. Or if they have something to do at 10 o'clock, they won't go to class. That's always been the case, but it looks like in the last few years, it's gotten a little worse.

And in talking to students, I learned from them that, indeed, it's gotten worse. But part of the advantage for them is that a great deal of the material thanks to our greatest contribution to society, which is OCW, OpenCourseWare, is online. So not only in the past, they wouldn't go to class, because they would read the textbook, typically written by the teacher in the class anyway, so they know the material being taught, they don't hear the lecturer, but they more or less can figure it out because they're so smart, but now it's online. So they have that-- this is an on-demand generation. They want to see this stuff, the lecture, when they're ready to see it, and it may not be at 10 o'clock in the morning.

So we have that change in our education society, so to speak. So we have to figure out how to adapt to that reality. And I will be-- in fact, I will be announcing early next week that we're going to focus on education this academic year heavily, and I'm going to have three, two study groups and one standing committee look into three aspects of education. And one of them is exactly that. How do we strengthen the value added that a campus provides?

Because by and large-- and I would like this group of faculty and students to look into this, because by and large, when you come to a campus, when you're 18 to 22, is to learn social skills, to learn how to socialize, to learn material. By and large, you learn as much or more from your peers, from other students as from the faculty teaching a lecture. So how do we optimize that experience on campus, and how do we use what we call a classroom today for some more interactive activities?

So my point is that, the content, the departments are doing a great job upgrading it. What we teach, they are working on it. The question is, how we teach, and how to adapt to the way students think today, because of the advent of online tools. And I don't think that's something that we can let a department, or a program, worry about it by themselves. They don't have the resources to handle this. So that's where we have to step in. So I would like a group of faculty to recommend what it is that we should do, and to think about it thoroughly, and then we'll probably take some action after I get recommendations, sometime late in the spring of 2011.

INTERVIEWER: And that'll be one of the groups, you're thinking?

REIF: One of the three groups will focus on that, correct.

INTERVIEWER: And the others?

REIF: The other two, one will focus on other opportunities on campus, taking technology aside. So for instance, we typically do not offer summer courses. Should we? Is that of any benefit to anybody? Would students benefit from that? Should we explore creating, or recreating, what we call three plus two programs? Programs in which a student studies three years in a different institution, and two years here?

By the way, these ideas that I mention, they are not so much my ideas, but they came from the Institute-wide task force on budget planning. This is one of the things that we did to get ideas on how to handle the crisis. They came up with an array of wonderful ideas that we have to figure out how to implement. Some are no-brainers to implement, but these ones require faculty and student thinking. So these are a set of ideas like this, that ought to be explored, and another group will focus this academic year on that.

And the third group is a somewhat more radical idea, which is, what kind of role should MIT play in the virtual world of granting certificates for taking material online, or granting grades for taking material online, or perhaps even granting Master's degrees for taking material online? And here I'm not talking about MIT offering a degree, because to get an MIT degree, you better suffer sometime here in this campus. But I'm referring to using MIT content and credentialize someone who studies from MIT content, and whether MIT should call that a degree from MIT online, or some other way of credentializing something like that.

You know, we're doing this thing for the sesquicentennial of MIT, when MIT was born 150 years ago, the campus residential model existed. We just came with a new way of doing it, whether mind and hands, or hands-on, or more practical. But residential campus existed before. The virtual online world is here. Nobody will eliminate it. It's here, it's graduating people, they're getting jobs. So the question is, do we want to engage and figure out what role MIT can play in an MIT-unique way in that domain, or we just should decide to let it go by and just not participate.

I think that there is a role for the virtual kind of learning, and teaching, and degrees, and I think it would be great, I believe, for us to play a role, and to see whether graduates from that online entity could be, as good as continuing education, as graduates from the residential campus. I think we should offer the best we can, the best experience to those who come to Cambridge, and we should offer the best experience for those who cannot come to Cambridge.

But again, these are just thoughts, and all of these, as I said, coming from the task force, and I would like a group of faculty to look into it. They may just recommend, the three groups, we shouldn't do anything. And I would be disappointed. But I just have to respect what some group of people thinking deeply about it will come up with. So these three topics are somewhat related, but I would like them to be viewed with a different focus, and let's see what they come up with.

INTERVIEWER: Are there going to be criticisms, do you think that this is all being driven by money, and whether or not there are new ways to bring in new revenue?

REIF: I think, good question. I think the issue of strengthening campus with online tools is not driven by money. It's driven by, this is how students learn, can we just teach them the way they want to learn. The issue of offering summer courses, or three plus two, is not driven by money, either. I mean, do we benefit students by offering summer subjects and so forth. I mean this is a different-- it's more what we can do on campus to benefit them.

The third one, one could criticize that as driven by money. But I would like not to think of it that way. The way I view it is, there is a whole new world of education being created. Do we want to play a role there, or do we prefer not to play a role there? We may, we have to assess the opportunity cost of not playing a role. What happens, what would MIT look like 20 years from now if we don't play a role? What would the rest of the institutions? What if a big competitor of MIT offers that, and engineers in Bangladesh, or any other place, with two kids, and working very hard, and they cannot come and get a Master's degree in one of the top institutions, they get it from that institution? And that becomes, now the biggest brand in terms of quality institution, globally, and MIT says, no, you have to come here?

I think we have to look into the opportunity cost of playing or not playing in that game. That, to me, is the most important thing. Now having said that, we have to assess the importance-- if the Faculty Committee with the students says that it is something we absolutely must do, then we have to assess, at what cost? Just about everything we do on campus is subsidized. I think that the only part, really, on campus that is subsidized relatively little is research. Not completely pays for itself, but pays significantly for itself. But everything else is subsidized.

I don't think we can afford to expand what we do, thinking I won't have to subsidize that, too. So in my view, this expansion into online, if we do it, at the very least has to pay for itself. Unless the faculty says, this is so extremely important, we should do it even if we have to subsidize that too. Which I would not be too happy, because we're trying to keep some control on our costs.

So my point is, this is not driven by money. It's driven by, what do we gain but doing it, what do we lose by not doing it. Assess that, and then of course, I would like to make sure that we can do it without subsidizing it.

INTERVIEWER: And when you're talking about subsidizing, you're talking about gifts and endowment income paying for some of it, or what do you mean by that word?

REIF: Yeah, I think, exactly that. I mean, you know, in simplistic terms, I estimate, we're trying to come up with the appropriate figure, but I estimate that the cost of education at MIT per student is more like in the \$70,000 range, \$75,000 or so, but we charge \$38,000 or so. So we're subsidizing education. I think that's a good thing to do, but I don't think we should subsidize expansion into the online. That should pay for itself. That's what I meant by that.

INTERVIEWER: Let's back up and talk about your personal history. Where were you born and brought up, what did your parents do, what were you like as a child?

REIF: That was a long time ago, I don't remember when I was a child! I was born in Venezuela, in a very oil city, in Maracaibo, Venezuela. When I was nine, my parents moved to Caracas, which is where I grew up until I came to America. My parents were immigrants. They came from Eastern Europe. They left Eastern Europe, I think it was around 1938 or so, right before the whole situation with the Holocaust occurred, so basically they escaped. And the country that took them at the time was Ecuador, so they moved there. My oldest brother was actually born in Eastern Europe. Then two of my brothers were born in Ecuador. My parents, they moved up north to Colombia, and eventually to Venezuela, where I was born, and then they lived until the end of their lives.

INTERVIEWER: What did your father, or your parents, do for a living?

REIF: As immigrants with not a great deal of education or opportunities, they did everything they could. I mean, we were very poor. By the time I came along, we were not as poor as we were when my three brothers were growing up. So by the time I came along, my father was mostly doing photography, he was a photographer. So he would just go to places, take pictures, try to sell them, and try to make a living any way he could.

INTERVIEWER: What were you like as a child? Did you know what you wanted to do when you grew up? Were you interested in science and technology?

REIF: I was curious, but as a child, I was just a happy little kid that enjoyed himself being with his three older brothers, and with his parents. I think, I don't remember that I felt a particular passion for anything. As I mentioned earlier, I have passion for a lot of things, and when I was finishing high school, I realized that, I mean I had a chance to go to a university, and so what mattered to me was, what should I do that can give me a job that I can support myself? As I said, we were, you know, fairly low, low middle class. Not to say poor. And so making a living was the most important thing in our minds.

So I chose to be an engineer, and then within engineering, I had the option to be in electrical engineering, so that's what I chose to do. I loved it. It's not that I did it by force or because I forced myself. I loved it, but as I meant to say, I loved a lot of stuff, to learn. So that's how I chose that. I don't remember that growing up, I liked to do-- I liked to do everything. I like to take things apart as much as I love reading, and I love reading about history. I mean, I love a lot of stuff. So I didn't have any particular strong passion for doing a specific thing.

INTERVIEWER: Although you played chess as a child, didn't you?

REIF: Yes, I mean, I was introduced-- I have three brothers, and they are much older than me. One is nine years older than me, and then 10, and then 14. So growing up, I did the things they did. And one of them loved playing chess, so he taught me how to play chess, so I played chess with him, and I loved playing chess. So yes, I enjoyed very much doing that. I think it's a great game, in my mind. It teaches you a lot how to think.

INTERVIEWER: Were you the first in your family to go to college, or did your parents or your brothers go to college?

REIF: No, actually, I was not the first, but I had relatively easy life in that fashion. No, the first in my family to go to college was-- if I say that my oldest brother is brother number one, so brother number three was the first one in my family to go to a high school and was the first one to go to college, and he was the first one to get a PhD.

So, basically, I loved him. I love all my brothers. And my other two brothers, after elementary school, they went to work to help support the family, to help my dad. So I saw my brother studying, the third one, so I loved that, and that seemed to me like an easier way to live. And of course, he was able to do it because things were a little more stable. He didn't need to go out and work as my other two brothers did.

So I just did what he did. He went to high school, I went to high school. He went to college, I went to college. He went to get a PhD, I went to get a PhD. I just followed his steps. He was a trailblazer for me.

INTERVIEWER: Did he go into engineering, too?

REIF: No, he went into chemistry and physics. So he was a scientist.

INTERVIEWER: And did he leave the country to study, or did he stay there?

REIF: He did. He went to get his PhD in America. So that's what I meant. He did all that, and I did all that, too. I mean, what he was doing, although in a different field, I love doing, too. And then he went back to Venezuela, after he got his PhD.

INTERVIEWER: How did you decide where to go to college? Was there any choice, or there was simply a college nearby, and that's where you went if you were going?

REIF: Yeah, Venezuela had options in state schools and in private colleges. And at the time, there was one prominent university, a state university, that was perceived to be the strongest. And I was lucky enough to get admitted there. That was in Caracas, in the city I lived. So that's where I started going to college. Two years or so into college, two and a half years, there were many rallies by university students against the government. The government closed the place down, closed it down after two years of not reopening, and I was making a living tutoring kids in high school and so forth. Then I found a way to be transferred to another university, two or three hours, a two-hour drive from Caracas. And that's where I finished my undergrad education.

INTERVIEWER: Did you grow up bilingual?

REIF: Bilingual, but not English, Spanish. I didn't really speak much English when I came to America.

INTERVIEWER: But your parents spoke--?

REIF: My parents spoke Yiddish at home. So I would hear, and listen, to Yiddish, particularly with my mom. My father spoke Spanish. And I would answer in Spanish. So that was my childhood. So in that sense it was bilingual, but not bilingual in any other formal language.

INTERVIEWER: When did you start thinking about going to graduate school in the United States?

REIF: When I finished college, I wanted to teach in a university. I mean, that's really-- if there is something that I always knew wanted to do, was be in academia. I mean, I didn't know whether I wanted to be, perhaps, I could have been in academia doing anything. And I chose electrical engineering because I wanted to make sure that if I didn't have a job in academia, I could get a job as an engineer doing something. But the one thing that I did know that I wanted to do, was academia. Probably partly by the influence of, as I said, my brother number three, but that's really something that I loved being around.

And then I was lucky enough to get a job to teach in academia in Venezuela. And then I thought that the best way to cement a career in academia is to get a PhD. So at that point, I was thinking, that's probably what I should do. But again, I want to emphasize that that kind of thinking came out because one of my brothers did that already. He was teaching at a university and went abroad to get a PhD. So he was the one who opened my eyes to those opportunities, because I really I was not exposed to that, if it weren't for him.

INTERVIEWER: How did you make it to graduate school in the United States? How did you know where to go, and choose where you went?

REIF: Yes. That's a great question. The decision-making process was simple. I went to the embassy to see college brochures, because I didn't know how to get them otherwise. You know, there was no way to get that kind of stuff. So I looked at whatever university books they had, and looked at course offerings, and that's how I chose a few institutions to go. But I must admit that I basically looked at California institutions, because growing up in Venezuela and not being ever outside Venezuela, I was scared to death about snow and winter, and I'd heard that in California, the weather was nice. So I just figured, I'd better stick to that, just in case. And I applied to Stanford, and I was just extremely fortunate that they admitted me. And that's why I ended up at Stanford.

INTERVIEWER: Did you know English before you came?

REIF: Some, but very little. Very little, really. I mean, I couldn't understand anything of what the lecturer said in class. I mean, I remember, in fact, I probably should find those notebooks. They probably are hilarious right now. I didn't understand what the lecturer was saying, so I wrote the sound that I heard, and then I would go home and read the sound, try to figure out what on earth was he or she talking about. I had no idea. So eventually, it took me a while to learn the language. I knew some, but not-- I could more or less read easy English, but I could not understand spoken English. Those words really made no sense to me.

INTERVIEWER: Did they give you any English classes, or did you take any?

REIF: Oh yeah. I was taking English classes as I was a student. I guess I did know enough-- you pass some test, or so. I think TOEFL. I don't remember those names anymore. So I knew enough to be allowed to take classes. But I had to take English as well. I was not as ignorant of the language that I had to take only English before taking classes. I was allowed to do both, and I did. And it worked out. It was tough, but it worked out.

INTERVIEWER: So for what, a semester or two? That you would go home and decipher notes, and look up words?

REIF: I did that for easily a full year. It got better and better.

INTERVIEWER: It must have taken hours and hours of parsing?

REIF: I better go back and look at some of those notes, because they must be hilarious to see it right now.

INTERVIEWER: And at some point, you began to get comfortable, and to really focus on the material, and it was a good match?

REIF: You mean, what I chose, or Stanford, or both? I think it was a good match. I enjoyed doing it. You know, the more I understood what was being said, I enjoyed it. I had a great experience there, so yes, I loved what I was doing.

INTERVIEWER: And what did you end up focusing on? You were in the Department of Electrical Engineering? And what did you decide to write your dissertation about?

REIF: This was the mid '70's, mid to late '70s, and Silicon Valley was getting born, so all these companies were getting started, and, you know, it is the '70s, late '60s, where-- really the '70s where the Silicon Valley term came to life. So I was again extremely fortunate that I was there at the right place at the right time. So I got into that activity.

I knew nothing about that in Venezuela. In fact, that was a period in which America, with its high technology, crossed the world from vacuum tubes to solid-state. The electronics that I learned in Venezuela was vacuum technology, vacuum tubes, it had nothing to do with solid-state. So the whole thing was a significant culture clash of knowledge, technology, language, the whole thing. But it was fascinating. It was the beginning of a new industry, and I was there seeing it happen. So that's what I chose to do, and it was great.

INTERVIEWER: Did you have mentors while you were there?

REIF: Oh yes, quite a few. The faculty supervisor of the research group, the person who asked me to join the group, who offered me to join the group, is a fellow named Jim Meindl. He's now at Georgia Tech. He's a tremendous towering figure in the field. A person that also mentored me as a grad student, and then hired me after I finished my PhD, a fellow named Bob Dutton, he stayed at Stanford, another towering figure in the field.

I worked closely with a person that at the time was a research associate, not a faculty, now he's a faculty member at Stanford, Krishna Saraswat, and yet another fellow, all those names from the past that I remember very fondly, Ted Kamins, he was working at Hewlett-Packard at the time, and he came once a week to see my progress and talk to me about what I was doing. I enjoyed working with all of them.

INTERVIEWER: Aside from the fact that you were there at the birth of an industry, or the infancy, how similar do you think your graduate student experience was compared to that of graduate students, say, in electrical engineering here at MIT, including many who come from another countries?

REIF: You mean the experience of a foreigner as a student here at MIT?

INTERVIEWER: And the academic, both.

REIF: I think, from the window, I only had the window of that of a grad student at Stanford. And then I did stay at Stanford a little over a year after I got my PhD in some kind of a postdoc role of sorts. So that's the window that I had, and it was very confined to electrical engineering, so I really cannot say much more. But the experience is somewhat similar. I think it's all based on, you learn a great deal from other students, you have professors who ask you the tough questions and you figure things out by yourself, I mean, I think the experience of a grad student at Stanford and one at MIT, I would say, is relatively similar. It's a very similar environment, looking at just electrical engineering. I couldn't comment beyond that at Stanford. I don't really know enough.

INTERVIEWER: How did you end up moving from Stanford to MIT?

REIF: I was, as I mentioned earlier, my goal was to be a professor in academia, and my goal was to be a professor in academia in Venezuela. That's where I got a job, and I went to study to come back. So I had told people at Stanford that I was leaving, and this is May of '79, I was planning to depart by the end of '79. And by sheer luck I met a colleague of mine at MIT who knew me, because he was at Stanford, he got his PhD at Stanford. He also worked in the same research group that I was, but he was already here a faculty.

And in talking to him, he mentioned that MIT was looking for a faculty member. But he had heard that I was leaving. And I said, that's true, I'm leaving, but perhaps it's worth to talk just in case. So he made the connection with the search committee, and I really-- I did not want to close the door. I wanted to see MIT. I'd never been here before.

There is also another interesting reason. I mentioned earlier that, when I spoke of my three brothers, that brother number three was the trailblazer, and I just followed his footsteps. Brother number two, who initially, after elementary school, he went to work to help my family, eventually brother number three went to college. He realized, boy, I'm not going to stay behind. So he went to high school at night, he worked in the day and went to high school at night. To make a long story short, during that period of time, he was a grad student at MIT.

So I kind of wanted to see him, and I wanted to see MIT. I wanted to explore that option, but I really, really, deep down, I felt like I knew I was not going to do it. I just wanted to explore it, why not, but not to come. Remember, there is winter, and all that kind of stuff, and it was not my cup of tea. And besides, MIT has such a tough reputation, at least at the time.

But one thing led to another, and this colleague of mine, Dimitri Antoniadis, mentioned, I suppose recommended, me to the search committee, and they brought me for an interview. And I was shocked by what I saw. I mean, this is the most amazing place in the world. I met Millie Dresselhaus, Steve Senturia, Clif Fonstad, people who are no longer here, David Adler, Dick Adler, both passed away. I thought, this is the most, this is the best place in the world. So I spent a day here, and I went back, and I went to my wife, you know, if they make an offer, we're going there. What about Venezuela? I don't know, but I'm not going to miss that opportunity.

So they made me an offer and I came. And you know, I had to change all the plans at the last minute. It was just one of those accidents of history that helped me a great deal.

INTERVIEWER: What field was your brother in here?

REIF: Urban planning. He's in Venezuela now. So here I was, eventually I came here as a faculty, and he was a grad student. I went to stay with him and his family while I was looking for a place to live. And he basically walked me to my office my first day of work, my older brother.

INTERVIEWER: And your first winter, how did it go?

REIF: It wasn't so bad! I remember Steve Senturia, he was the head of the search committee, a faculty in electrical engineering, he just retired recently. I remember telling him, you know, I'm afraid of winters. And he said, just layer yourself up! Just add a bunch of layers. That's all there is to it. And I did that, and I said, it's not so bad.

INTERVIEWER: You lived in the lab, anyway, probably!

REIF: Pretty much.

INTERVIEWER: What were your first impressions of MIT as you came to work and settled in? You had your day here, and were very impressed, you said, what have I gotten into, or--?

REIF: No, no no! My first impressions working here is, why does this place have such a tough reputation? I mean, everybody here is great. I mean, it's not like they hug you every morning, and they hold you by the hand. Nobody does that. But everybody here is smart, and helpful, and they-- I don't know, there is no-- the perception that I was told to have, is that everyone at MIT was arrogant, and impossible to talk to and stuff, and I found the smartest people on earth being the nicest people to be with, and to talk to! I just was in paradise. I was in absolute paradise.

I loved it here, I loved the students, the students are incredibly smart. Working with my grad students, and teaching undergraduates, that was a terrific experience. If anything that I miss not doing now, it's not doing that. I had to stop hiring grad students when I became provost. In fact, I had hired three the summer before I was appointed, and I didn't think it was fair to them. I loved my colleagues, students, I loved it all, so no.

INTERVIEWER: Did you have a particular mentor when you got here? Did anyone take you into their lab or under their arm?

REIF: Not really, but everybody was available to talk to. I mean, I spent many hours talking to Dimitri Antoniadis, and Steve Senturia, the people in the search committee, and Dick Adler, and Clif Fonstad. Then I had a colleague that came after me that I worked a great deal with, Charlie Sodini. I spent many hours talking to all of them, and all of them have always had time for me. So I didn't have a particular mentor. Millie Dresselhaus was the director of the Center for Materials Science and Engineering, and I was assigned to the Center when I came. And she was always available. I wrote my first proposal, I didn't know what I was doing, but I wrote a proposal, and I gave it to her, and she read it, and she made marks on it, and I was thinking, how does she have the time to do this?

No, everybody was great. I didn't have one mentor that led me by the hand. I was pretty-- MIT is a sink or swim environment, pretty much. But in that environment, everybody's more than willing to help, if you talk to them. And that's what I found.

INTERVIEWER: Do you think MIT still has that reputation that you had perceived when you were in California, or do you think it has diminished, or just that you somehow got an unusual idea about it? Is there anything, as you try to recruit faculty, is that a concern of yours, that they perceive it the way you did?

REIF: I don't assume that the perception continues, but I think it does. Because in the few occasions in which I'm in a position to help recruit faculty, and in the last five years, I don't do that much with junior faculty, but before, when I was in EECS, I did. So what I'm telling you now is five years old, by and large. But still, at that time, during the years that I was in EECS recruiting young faculty, I still heard those stories. So somehow the perception is still out there. I wish it would go away.

The perception is that MIT's a very cold-blooded place, and that we don't tenure anybody. And I just don't know where that comes from, but it's there. And I think it's probably still there, but I'm not that much on the other side to really know, but I still hear that from prospective faculty who are concerned about coming because of it.

INTERVIEWER: As provost, do you think there's anything that you can do about that, or can help others do about it? Is it something that would be useful in terms of faculty recruitment?

REIF: I don't know that there is a great deal to do. I think that MIT is a place of facts, and facts speak for themselves, and data. And if a prospective faculty hears things like that, and doesn't look at the facts, and accepts the perception without checking, maybe he or she doesn't belong at MIT anyway.

So I think, if you look at the numbers and you ask the questions, you realize that that is not true. We do tenure people, we do tenure 40 percent to 50 percent of those we hire. So we don't tenure everybody, but we do tenure well. And another perception is that we hire three faculty for the same tenure track and then we let them beat each other, and that's not true. We just hire, everybody we hire has his track, and that's a tenure waiting for him or her. I think faculty, prospective faculty, should ask those questions, and they do, and we explain it to them, and then the facts speak for themselves. So I don't know that there is much more to be done about it.

INTERVIEWER: Given the field you were in, did you think at all about whether remaining close to Silicon Valley might have been more useful to your research, and when you got here, did it become a concern at all, because you were working on what they were trying to do far away, and suddenly you weren't there?

REIF: Yeah, that was something that I was thinking. In fact, when I told people that I was leaving to come to MIT, I think pretty much everybody I spoke with, friends and others, thought that I was crazy. Because Silicon Valley was already there, and what am I doing going away from it in my field? But there were two things in my mind, at the time, one was that Stanford is a terrific institution, and where I was, there was a tremendous amount of talent there already. So I didn't see myself, even if I would be lucky enough to be given a faculty position, that it was not in the cards at the time.

The directions, everything was already set. It was a strong place. Together with Berkeley, Stanford was the birth in academia of all of this activity. In academia, I mean. And it would have been very hard to influence much of the direction of a place. Now as I said earlier to you in the conversation, I like strategy, and I like to figure out, where's the edge and where's the action, and what we can do that's better, and I didn't see myself ever, at least for quite a while, if I was lucky enough to get a job there in academia, to influence the strategy.

So MIT didn't have that much. So coming here would allow me to basically figure out with others, what on earth do we do here, how do add value? And that, to me, was more attractive, and creating value where there wasn't any was more attractive, than trying to figure out how to find a place where there was so much value already.

Also, at the time, the reputation was that Silicon Valley is where you build the components, and at the time Route 128 was where you build the systems. So I thought, systems could be where the action is. It ended up that the kinds of systems that were built were not the ones that the public was buying later on, and Silicon Valley came up with the Mac, and IBM with the PC, and so forth. But my point is that I saw the opportunity for me to not necessarily be married to Silicon, but come up with something, okay, Stanford owns this, so what can MIT do? And I saw that as extremely attractive.

INTERVIEWER: I wonder if your experience in seeing the growth of Silicon Valley and that whole aspect of the industry had been useful in thinking about economic development here, and even in places like Singapore or Russia, whether somehow seeing that model in an economics way, or a political way, as well as in a technological way, has been useful.

REIF: Very much so, very much so. When I came to MIT in the '80s, there was the perception, and I say the perception, because I don't know that this is the reality of the time, that MIT viewed itself as an institution in the world, and didn't view itself as an institution that had to do much to help the local economy. Stanford, on the other hand, they felt that they were part of the local economy. So I saw that and I didn't think that it made a lot of sense not to have a presence regionally.

So when I became provost and joined Susan in her administration, I discussed this extensively with her, that I thought that MIT should have a regional presence, and should help the local economy, in addition to everything else we do. And Susan pretty much endorsed the concept, and she is now very heavily involved as a convener in regional issues.

INTERVIEWER: Tell us a bit about your path through MIT, the research and the microsystems technology labs.

REIF: I came here to do research in silicon technology, and I did, I remember in the mid-'80s, I think it was '85 or so, we had a large silicon research program at MIT, and the sponsors were not too happy with the direction in which it was going, so there was some minor crisis. So the senior faculty decided that I should take over the program and do something with it. It was important to MIT. Maybe it was '84. I remember that I wasn't tenured at the time, and I had some concerns, and I was told, just don't worry about it. Keep at it. So I did, and that was the first time that I organized-- until then I'd just run my research group. That was the first time in which I organized groups of faculty to do things together. And again, I love doing that, it merges management and strategy. So that was something that I enjoyed.

And one thing led to another. I think I started with this one, then I created another one, and then another one, so I was running quite a few large research programs that were funding quite a number of faculty, not just in EECS, but other departments in engineering as well, and actually also engineering. And then one thing led to another, and the position of MTL Director became available. That must have been the late '80s, probably '89 or so. I don't quite remember. Must be '89, or '90, or 1990, I think it was.

And I then was asked to become director of that lab. That lab was just a few years old, and just to see what I could do with it. It was an important lab for MIT. So I did take over. And I had a ball doing it. I enjoyed it. Again, the MTL community is a great community, faculty are terrific, students are terrific. I worked very closely with Charlie Sodini there, who was instrumental in what MTL became eventually, today. I think I did that for about nine years or so.

And then, I was already thinking that I really wanted to do something on the education side, but I didn't see how to do that. I was MTL director, and this is all about research, and that was fun. But MIT is about research and education. I wanted to get into the education side, and I didn't know how to do it. One day, there was an opening for department head. John Guttag was chosen as department head, and he asked me to be associate head, or one of the two associate heads. My job was mostly dealing with EE, and I just jumped at the opportunity. I mean, I did try to think of it for a day or two, but I realized, what am I thinking? This is the chance that I was seeking. So I joined him dealing with the EE faculty. Again, a tremendous group of people.

When he stepped down, then I was appointed the head of EECS. And that lasted that year in which we did quite a few things. I was very keen into the curriculum renovation, as I said, a curriculum renewal, and that I got going. I also wanted EECS to be a little more international at the time. I was thinking about those issues then. We had a core program, that's Course 6, called 6A, and I wanted that to become more international. And so that got going, and I think it's doing relatively well right now.

And then, we had a new president, and one day, Susan calls me to her office to seek my advice, like she did, asking many, many people. So I told her my views, and what I thought she needed. And then she called me again, and then she offered me the job as provost.

INTERVIEWER: You had first met her, were you on the search committee?

REIF: I was on the presidential search committee, yeah. So that's how I saw her first. Whether she saw me, she saw a lot of people, but that's when I saw her first.

INTERVIEWER: How did you end up on the search committee? You'd been a department head for, what, a few months, or barely, or maybe you weren't a department head yet?

REIF: I don't think I was the department head -- I was of department head rank. As associate head of EECS, I had department head rank, so to speak. But I was not the department head. But I was associate head when I started in the search committee, and then through it all, I became department head in the middle of it. How, I have no idea. I think that, seriously, the search committee had half Corporation members and half faculty. I think the half faculty were chosen, I believe, by the chair of the Faculty at the time, who I believe sought input from people, and then appointed based on that input. But to tell you the truth, I don't know, I'm speculating. The chair of the Faculty was a fellow named Rafael Bras, who right now happens to be the provost at Georgia Tech. And he called me, so I assumed it was his doing. I mean, why he asked me, what other people thought--

INTERVIEWER: Had you worked with him before, or--

REIF: No, I mean, I knew him. Since before he was chair of the Faculty-- I think before he was chair of the Faculty, he was department head of Civil Engineering, Course 1. So he was in engineering council with other department heads, where I sat as associate head for EECS. So I saw him in that way, but beyond that, he was just a colleague, and a very good colleague, but that's about it.

INTERVIEWER: Were you surprised to be offered the provost position? I guess you'd been department head, actual department head, for even less than a year when you were approached. And how did you think about it?

REIF: Yeah, I was surprised. I was surprised. I was pleasantly surprised, but I was surprised. I mean, this is what I thought. As a president who needs to know MIT, she needs someone, I assume that's the way she thought, I actually never asked her, why on earth did you ask me? Maybe one day I will. I assume she must have felt, look, I'm new, I need somebody who understands the place very well. I'm from science, I would rather have an engineer who knows the place very well. EECS is the largest department in engineering. So let's go with this guy. He looks normal. He does speak funny, but other than that, he looks normal. So I assume that was the logic behind it. I don't really know. I never asked her.

INTERVIEWER: Did you have any reservations about taking the job? Did you think about, gee, I might have to give up my research, my teaching, or were we ready to, you said, you know, this administrative stuff is kind of interesting, let's go for it?

REIF: I was very interested. I mean, I was very surprised, truly I was surprised. Because even though I could see that logic that I just outlined, you know, there are so many-- MIT's blessed with so many good people. I didn't know it would come to me. And I did think about it a little bit, but not that long. I think I love research, and I love working with grad students, and that latter is more important to me.

Research, I've done what I could, in the sense that I've done plenty. Many good things happen in our lab. Many good things have been published. It's all out there. If I didn't take this opportunity, I would never know what it is to run a place like this. And MIT is a place that I just absolutely love. So I was more than willing to give up something that I love doing, which is working with students, particularly my grad students, to try something that I've never done before at this level.

INTERVIEWER: How do you and President Hockfield work as a team?

REIF: We work very closely. Just about every important academic decision, I discuss it with her. So rarely a week goes by that we don't meet, and by meet, I mean, meet for hours. We typically meet just one on one, one or two hours every week. We're typically in meetings with others several more hours every week. We exchange emails extensively. It's not rare that at night we call each other to talk. So we work very closely together.

INTERVIEWER: Do you think you've approached your job significantly differently from your predecessors? Did you go talk to any of them before you, or as you were getting started?

REIF: Yes, I did. I didn't talk to them before, because that would have been inappropriate. So I had to take the job, and then after I was announced, that was a few weeks after I accepted the job, then I did talk to people who have had those kinds of jobs before. I certainly spent quite a bit of time with Bob Brown, who did the very best at trying to teach me the office, although I think he clearly could see that most of what he was saying was over my head, because I couldn't understand it. I hope he didn't see that. But he spent quite a bit of time with me to teach me the office.

But then I also spoke with others, like John Deutch, Joel Moses, Paul Gray was very generous with his time. So people that had had those offices before, they were very generous with their advice. So I listened to how they approached their office while they were in office. I mean, I'm different from them, so I approach it differently. You know, it's not better, it's not worse, it's just different.

INTERVIEWER: They probably each had their own approaches, in any case. I don't imagine that they were very similar to each other.

REIF: That's right. But boy, I learned a great deal in talking to them. And to this day, I don't bother Bob Brown much, the man is a busy guy, he's running a big university. But I still bother, with some frequency, John Deutch, Joel Moses, and Paul Gray.

INTERVIEWER: Who are all on campus.

REIF: They are on campus, and they are always generous with their time with me.

INTERVIEWER: You've talked about the budget responsibilities before, and the challenges of dealing with the financial issues that came from the crash in the markets. And I think one of the things that you put in place was the concept that dealt with green bars, and tell us about how you thought about that, and how you used them.

REIF: Yeah, this is where my Latin American upbringing may come up, because I am going to be using my hands a lot when explaining things. When I became provost, Israel Ruiz was very patient explaining me the financial details of MIT, Doreen Morris explaining to me how we run the budget. In working with Israel, basically he pointed out to me a couple of things.

One is that we basically were running with a \$50 million a year structural deficit. It was needed at the time, it was the only way to run the place. So there was no, I'm not, that's just the way it was. But what he pointed out was that we had about \$500 million of discretionary funds that could be used to cover that. And they were being invested with the endowment at the time. So the risk was high that, you know, if that money makes money, then it'll last more than 10 years, if we have to run that deficit for 10 years. But if for some reason we don't make money, we don't have money for 10 years. And the model that Israel and others had done before I came to the office, was that we needed about 10 years of that kind of deficit before we can adjust things.

So that looked pretty scary. And Israel just was very adamant at trying to tell me that perhaps we have to do something about it. So that was the first thing we addressed, and that's probably what you heard about the green bars, which is basically, we did something using our resources much more efficiently, so that without any budget-cutting of any kind, we managed to basically balance the budget. And that took two years. You know, I thought about a way of doing it a few months into being provost, and then Israel spent quite a bit of time with me to figure out how to implement this, and how to sell it to department heads and deans. So it took one year of selling it, basically, and one year of implementing it.

INTERVIEWER: Were there some issues of the money being here, but the question of being able to allocate it differently?

REIF: Yeah, that's right. So the discretionary part of the budget, the unrestricted part, was the problem. We didn't have enough to pay for everything we were spending money on. On the restricted part of the budget, we had plenty, but that could only be used for the restricted part. So the issue, the brilliance of the idea, and I, you know, I think it was my idea, but chances are Israel told me that, two or three months before, and I didn't understand it, so God knows whose idea it was, but Israel and I put it together, is that we used unrestricted monies to subsidize some of what the restricted money was not enough for. So all we did, basically, is to increase the payout, so that the restricted funds would cover more payout from the endowment, so that they would cover more of it, and the unrestricted would cover less of that same activity. So it was all within the domain of what that restricted money could be used for, but now using less unrestricted. And by doing that, we just saved the money. It was as simple as that. Although it sounds pretty convoluted.

INTERVIEWER: I think there was a good deal of respect both inside, and some envy outside the Institute that you had found a way to deal with some of the issues.

REIF: You know, I think we're, again, extremely fortunate that we did that when we did, because if we would have had to deal with that \$50 million structural deficit when the financial crisis came, things would have been very, very hard.

INTERVIEWER: Another of the challenges that I think you faced when you came into the office was the question of minority representation within the faculty. You've appointed two associate provosts for faculty equity. What were the issues there, and what do you think can really be accomplished in this area?

REIF: Yeah, that's a very important issue. I think there was a perception, and I felt that before I became provost, there was a sense among minority faculty that they don't experience the same MIT as the majority faculty. They experience a different one. And they feel that way, so one has to validate the way they experience MIT. I tried to look into that with a couple of committees that I established a few months into becoming provost, but the work of those two committees was not moving fast enough. And the environment at MIT was getting a little more polarized because of other issues with the denial of tenure, of a minority and so forth.

So I thought that we needed to do something, and give it much more attention. So basically I merged those two concepts, committees that I had, and created a larger, a more visible taskforce to look into the environment that minorities face at MIT, and to look into that in a scientific way. And a group of faculty, and we had postdocs involved, they went through a very thorough process of interviewing present faculty, former faculty, they went to visit them where they were. It was a very thorough study to understand the MIT they experienced.

And they came out with a tremendous report, a very lengthy report. And one can really learn quite a bit from what they came up with. And I think there are quite a few recommendations that are something we have to address and pay attention to. The issue here is not an issue of only numbers. Clearly, we would like to increase our representation of minorities on campus. But the issue here is to do the best we can at bringing the talent that fits with MIT, to make sure there are no prejudices when you look at that talent. But most importantly, is when we bring that talent here, to make them feel as part of the family. I mean, the way I remember describing the MIT that I saw from the provost's office is a picture of all MIT faculty, and all of them are smiling, except the minority faculty, who are not. It's a pictorial representation. I did not want that. I wanted the minority faculty to feel that this is their place, that there was no difference. But they felt that there was. So now we have to address that. And that's what this report produced.

INTERVIEWER: And your two associate provosts were a way of signaling that this was important, or a way of also tackling it?

REIF: It was both a way of showing how important that was, but also it was operationally-- I had spent, I used to spend, I do much less of it now, I used to spend a great deal of time with minority faculty and with women faculty, to listen to them directly, what they were experiencing. In particular to pay attention to junior faculty and career situations. That took a great deal of my time, but it was extremely important. Because we need to learn of issues or problems before they occur in reality, before they become impossible to solve.

Having associate provosts, one for minority issues and one for gender issues, allows them to work on my behalf, to deal with these issues, to spend time with the faculty, to understand what they are saying. And that is their job, as supposed to being a small fraction of my time. So they are spending all their time in these issues, so I get to hear much more. And these issues are being addressed with much more vigor. So it's more than symbolic. It was operational. I needed somebody to help me do the job that needed to be done. And they are going to help the deans now implement the recommendations of this task force, on race and faculty diversity.

INTERVIEWER: One of the other things that those reports showed, besides the different perspectives of faculty members, was how different the departments were in terms of including numbers of underrepresented minorities. Is that something you or the associate provost can or expect to grapple with, and do you think it's going to be able to be changed?

REIF: I think it is a complicated problem, because we need to increase the pool of people we all compete for. In that report, we saw that some departments didn't have as much minority representation as other departments.

INTERVIEWER: There had been virtually no hiring of minorities in 20 years.

REIF: That's correct. At the same time-- I don't remember, and I have to go back and check the report again, I don't know whether the report thoroughly checked whether there were offers made. In other words, we want to attract the very best people, but we're competing with strong institutions that also want to attract them. And if very few of them graduate in a given year, and quite a few institutions compete for them, it may very well be that we don't get them. And earlier in the conversation, I said, a measure of success for institutions is that this is the place they choose to come. In some fields or some areas, we don't succeed. So it's a bigger issue, but it does require significant focus and attention.

INTERVIEWER: One recent announcement said that there's going to be some expansion of the undergraduate population, and Dr. Maseeh, who you probably know, because you hold his named chair, will be contributing \$24 million over some period of time. Is there something magic about going to the number 4,500, and do you think MIT should and will try to go higher, even, than that?

REIF: Yeah, excellent question. Is there something magic? Not really. The only magic number there is, that in the not-too-distant past, maybe up to the mid-'90s, we used to have an undergraduate population of 4,500 or 4,600. With the same thousand faculty, and with the same buildings, actually, fewer buildings. So we know we have the capacity to teach that number with the teaching staff we have, and with the classrooms we have. We did not have the capacity to house them on campus. So we're going back to the figure we used to have, with the physical plant we have.

Should we go higher? I really think we need to think about that. I mean, right now we are admitting 10 percent of those who apply. I mean, there are more than 10 percent that belong at MIT from those who apply. I mean, I would argue, you know, a good-- well, I wouldn't want to say a number, but certainly much more than 10 percent are MIT people. Can we handle that? Do we have the physical plant? Would we have to increase the faculty size? Can we afford that? I just mentioned earlier, we subsidize everything we do. Do we have enough money to keep subsidizing? Those are important questions we need to handle relatively soon.

INTERVIEWER: One of many you'll be dealing with. We've run out of time. Thank you very much for your time today, and the interesting conversation.

REIF: Thank you very much.