INTERVIEWER: This is the 150th MIT Anniversary interview with Ken Smith, professor emeritus. And how about if we start with you as a child. Where were you born? Where did you grow up?

SMITH: I was born in Winthrop, grew up there. Son of parents, neither of whom had graduated from high school. But wanted my brother and me to do the best we could. It was a great place to grow up. When it came time to go to college I thought I wanted to be an engineer. Family finances weren't going to make that easy. So I said, well, living at home is going to help the family finances, so that was the plan. And the engineering schools within commuting distance were Northeastern, Tufts, and MIT. And turned out that MIT's financial aid program was better than anybody else's, so I came here in large measure because it was less expensive.

INTERVIEWER: Were you able to live on campus or did you wind I commuting?

SMITH: No, I commuted.

INTERVIEWER: So you grow up in Winthrop before the airport?

SMITH: Well, I saw the airport get built. I can remember looking out of our kitchen window as a little guy when most of what's now the airport was what we then called Sage Banks. And every day the clam diggers were out there in their dories digging clams. And then I saw it all get dredged and Apple Island and Governor's Island went away and became part of the airport.

INTERVIEWER: So, it must have been a small airport when it was first built?

SMITH: Exactly. Yeah, and I never remember when there wasn't an airport, but the huge expansion I certainly remember.

INTERVIEWER: So, how did your parents make a living?

SMITH: My father had a small plumbing and heating business.

INTERVIEWER: Do you think that had anything to do with your interest in engineering?

SMITH: I doubt it. My brother was older than me and he went into engineering, and I'm sure that had an effect, but I don't think my father's position was relevant.

INTERVIEWER: Do you remember any events or influences from you childhood that you think shaped or pushed you toward your career path?

SMITH: I don't remember anything that specifically pushed me toward engineering or toward chemical engineering in particular. I certainly remember a few incidents when the idea that working as hard as my dad was not a good idea. I remember my 16th birthday when he came home, looked at me, and feeling very good about myself because I'm 16; I'm going to get a driver's license, horizons are really expanding. I'm going to do lots of fun things now. Ken, you're 16 today. That means we can get you some working papers and measure you for a pick and shovel. And the next Saturday I was on the job with a pick and shovel. And I remember getting to the job and he said, those are the two guys you're going to work with.

One of those is Petoni Silva. He's from Portugal, he's about 70 years old. You should ask yourself, do you want to do this at 70? He said, the other guy, that's Donny McCory. He's only 35 and he's young. He should be strong, but he's a lush. So here's the way it's going to go. You three are going to start off, Tony's going to be going the slowest, Donny's going to be going the fastest. At the end of the day, Tony's going to be going at the same pace he was at 8:00, but I want you to be doing better than Donny McCory is because he's a lush. So think about this. So yeah, a lot of life lessons, but not a chemical engineering lesson.

INTERVIEWER: Right. Of course, then you didn't realize how hard it was to work at MIT.

SMITH: Yeah, it's hard work here. That's for sure.

INTERVIEWER: Did you always do well in science in school?

SMITH: Yes.

INTERVIEWER: So when you got to MIT, do you remember what your first impressions were?

SMITH: I remember sitting in 10-250 with Hans Muller giving a physics lecture. I don't understand a thing he's saying. And I said, wow! Am I going to have to dig in on this because I am really behind and I am really confused.

INTERVIEWER: And you probably weren't behind because probably everybody--

SMITH: I think that's probably right. But I certainly felt as though, wow, this is going to be tough.

INTERVIEWER: And was it?

SMITH: Yeah. Freshman year was tough. That's no doubt. There were a lot of accomodations to be made and that was probably the toughest of the four years. Of the four undergraduate years I would say freshman year was easily the toughest. Probably because it may really have been the toughest, but there's all those issues about calibrating yourself and the place and what you do well and what your fellow students do well or not so well, and that takes a while.

INTERVIEWER: What do you think you learned that first year that sort of helped you in the subsequent years?

SMITH: Just keep plugging.

INTERVIEWER: Did you have to learn a different way of studying?

SMITH: No. Work harder, more consistent. But no, I don't remember doing it differently. Were there any mentors that you had that helped you?

SMITH: In the early days, not really. When I got to grad school and all, yes, but no. There was no one as an undergraduate that I would really describe as a mentor. In fact, I would say the ethos of the place at the time was sort of throw them in the water and see if they can swim. So mentoring was not really part of the scene. Now the commuters had a little club called the 5:15 club, which was located in the basement of Walker. And that was a place for us to get together and share war stories and eat together and play cards together and have a party once in a while. So that provided a community, which wasn't exactly mentoring, but was very helpful.

INTERVIEWER: Did you feel like you were at a disadvantage by not living on campus?

SMITH: Not exactly a disadvantage, but there is a part of college life that you don't have if you don't live here. So it's a little different. I'm not sure I'd call it a disadvantage, but living at home was a little different than living on campus. Not the first choice, but it works.

INTERVIEWER: So as you were approaching the end of your four years, how did you come to decide on graduate school? And then, how come you stayed here?

SMITH: Well, coming from a family that didn't have much money and had no experience in university education, I had every intention of going and getting a job, and I was traveling around the country looking at perspective jobs and fully expecting to do all that. The faculty member who is then the graduate registration office of chemical engineering, chap named Bob Reid, approached me one day and said, Ken, you shouldn't go get a job. You really ought to stay here. And he says, you know, stay here. Get a Master's degree. We'll make the finances work. It'll be worth it for you and he managed to be far more persuasive than I'm now being. But it's entirely due to the intervention of Bob Reid that I stayed. Without that I would have been out of here in four years. And part of the attraction was I said, I can do that in one year.

During that one year I took a course then taught by Harold Mickley. I said, boy, I really like what that guy's doing. I would like to do a thesis for that guy. So just by accident I got very interested in Harold's work. And decided to take the qualifying exams, see if I could stay on and do a thesis, which of course, I did. And I did do it for Harold. It was a great choice. Bob Reid and Harold Mickley really were mentors in every sense of the word. So they were great guys.

INTERVIEWER: Did you live on campus as a graduate student?

SMITH: No, I continued to live at home. Certainly, particularly at that time, it made less difference. Graduate students by and large lived in apartments distributed all over the place. Whether that apartment happened to be home or in Somerville hardly mattered.

INTERVIEWER: So you never considered going to graduate school anywhere else?

SMITH: That's right.

INTERVIEWER: And can you tell me a little bit about what you did after you got your doctorate?

SMITH: That was just as accidental as the fact that I got it in that, once again, I'm looking for a job. This time looked hard enough and was a little disappointed that I hadn't really found anything that was interest, somehow captured my excitement. So I went to Harold, my thesis supervisor and said, Harold, help me out here. I'm not finding a job that really gets me excited. He said, well, why don't you try teaching? I said, I don't think I'd be good at it, and I don't think I'd like it. And he said, you haven't run the experiment. I said, wow. It's true. I had this notion that I wouldn't like it, and that I wouldn't be good at it. And I thought by saying that I'd put this thoroughly to bed. But the truth is, I really don't know. So I said, well, I can try it for a couple of years and if it doesn't work out I'll go on and do something else. And that was it. It was that intervention by Harold that really made me try teaching. Without that I wouldn't have.

INTERVIEWER: And you wound up at Cambridge University?

SMITH: Yeah, by that time I knew I'd been at MIT far too long. So at the same time I accepted a position here as a faculty member, I knew I needed experience at a different university. And at the time, probably fair to say that G.I. Taylor at Cambridge was the world's leading individual in the sort of things I wanted to do. So I set to work to arrange to get a postdoc with G.I. And so that took a little doing to make it happen, but so I had the curious situation. I joined the faculty and then after a couple of years I went off and did a postdoc. But yeah, I did it at Cambridge with G.I. In G.I.'s lab. It was a fabulous experience. It was absolutely right that I needed that kind of an experience somewhere else.

INTERVIEWER: Can you talk more about that and what made it so valuable to you?

SMITH: Yeah, it's not the technical content; it's the value system. That Cambridge and MIT, while very much alike in that they each have a significant emphasis on science and engineering are very different in terms of the way they go about it. And less so now than then, but particularly, at that time, the way they went about it, what they considered to be important, what they valued, what they didn't value was just very different.

Certainly in the fluid mechanics community at Cambridge at the time, the most important thing was Friday afternoon. This is when people were expected to come in, present something to the fluid mechanics seminar, and get attacked by everybody. A seminar might be important here, but it didn't have anything like the centrality that it did at Cambridge. That was what brought the community together. So it's different. And that's just an example. There are lots and lots of examples of the fact the values there and here were quite different. And it's interesting to see what's important to some people and not to others and vice versa. That was far more important than anything technical. There was not the skill set. It's the value set.

INTERVIEWER: And how would you describe the value set at MIT at the time?

SMITH: What the value set was then and what it is now is a very important question. The value set at the time still, perhaps, had more of an engineering focus than was actually justified by the facts. Science and the humanitites at MIT were already quite important and very successful. And yet, engineering somehow was more nearly at the center then than it is now, and kind of defined the place. And the engineers had a little bit of a blue collar feel to them. I don't have to tell you how important what I'm doing is. Appearances don't matter. What really matters is what I do and how good it is when I get it done. I think we put far too much emphasis on this notion that one didn't need to somehow inform the world. That it was the world should just somehow find out by themselves. So a little bit grubby, a little bit leave me alone to do my work.

INTERVIEWER: Sounds a little bit arrogant?

SMITH: In some ways. In some ways it's exactly the opposite. Because in some ways it's far from being arrogant, it's that I just want to let the data speak for themselves. It's not that I want you to understand how good I am, it's that I want you to understand how good the job I've done, which is different.

Engineers still have a little bit of that notion of well, what are the data? But it was much more then. So that there was Building 20 out in the back here that looked like hell and that was fine. It was perfectly fine. People shouldn't mind that we're working in grubby conditions. But people have come to expect more and the world's come to expect they would be-- we will make an effort to inform them. So it's changed a lot.

INTERVIEWER: I'd like you to walk me through the research that you've done over the years and maybe how one thing has informed the next or led you down a path.

SMITH: The idea of describing my research is a little bit daunting because it's no more unified, no more thought out in advance than my educational path was. As I'd said, I'd gotten really interested as a grad student in what Harold Mickley was then doing. And he was doing fluid mechanics and heat transfer, mass transfer of the traditional chemical engineering processes. But in a way so that the focus was traditional, but the way in which he was doing it was quite untraditional. And that's what really captured my attention. So the fluid mechanics and the transport really was the heart of what I undertook to do with Harold. It's been at the heart of everything I've done since. But the applications are varied all over the place, partly because I've always enjoyed working closely with other colleagues. And so a lot of what I've done has involved joint efforts in supervising students and defining projects, et cetera.

So early on, for example, I got very much involved with Ed Merrill. Ed was one of the early pioneers in biomedical engineering. He needed some fluid mechanics and transport help. And what he was doing was fun. So Ed and I collaborated a lot. One of the first projects of collaboration was the artificial kidney. You know, it's a perfect transport problem. How big does this thing have to be in order to clear how much urea, how much creatine, all the rest of them. As part of that one of our jointly supervised students was Clark Colton, who later became a faculty member here. But that was an example of a biomedical problem, an important biomedical problem because the artificial kidney at the time was not well understood, was not well designed. There were chemistry problems, there were engineering problems, needed a bunch of us to get together to work on that. And yet, the elements of it were pure chemical engineering.

Ed and I also worked on drag reduction. There was this mystery of polymeric additives to ordinary fluids would somehow lead to lower pressure drops in turbulent flow in pipes. And why should this be? We didn't understand, and so it looked like a fun trouble. The navy was very interested in why it might be because it might have application to ships and other things. And so we worked on it, like I said, several students worked on that problem with outstanding support from the navy. Again, one of those students whom we jointly supervised ended up here on the faculty, Preetinder Virk.

Must say, in some ways, that was less successful. And that I think it's fair to say that to this day nobody understands why these things work. We can describe it much better. So we can tell, you, oh, you got this polymer, this fluid, this flow rate, et cetera. Will we or will we not get drag reduction? We can give you an answer to that pretty well. So we can describe it, but that description remains quite empirical. And so after a while you bang your head against that for enough and go onto work on something else.

By that time Clark was on the faculty and he and I worked on what looked to be a nice transport problem-- atherosclerosis. Why is it that fat accumulates in both of our arteries and why does it preferentially accumulate at certain places, like bifurcations, the carotid bifurcation being a favorite example? And so Clark and I worked on that with a whole host of students for a long time. That problem is a lot more biological than the artifical kidney. The artifical kidney really is an engineering problem. A lipid deposition problem in the artery has got lots of fluid in mechanics and transport in it. How does the stuff get in and out, and what keeps it there or not? And the fact that it deposits preferentially at a bifurcation suggests that fluid mechanics is important. But otherwise, why a bifurcation?

But biology is important too. The biology and the chemistry are super important in that. So I think we made some important contributions to where it happens, how fast it happens, which species deposit most readily. But we're, in some ways, in a supporting role to the biology. Then along about that time that turned out to be a much more engineering problem came to light in that a liquified natural gas storage-- well, actually, it came to me a little earlier than that. In that the Cabot Corporation through its District Gas subsidiary was then building natural gas storage tanks in Everett. And one of the chaps-- I'm sorry. The everett tank was built-- they were building tanks in Staten Island.

And they came to me and said, Ken, we hear that some people worry about whether stratification might happen in these tanks, and that's basically a hydrodynamic stability problem. We understand the you're interested in hydrodynamic stability problems. And that's what I'd done at Cambridge. Do you think this is likely to happen? I said, well, I don't know. Maybe. They said, well, don't work real hard on it, but kind of put it on the back burner and see what you think. And then about a week or two later they called me up and said, Ken, take it off the back burner. There's been a significant accident at La Spezzia in Italy and we think this is the cause, and it's important. And sure enough, it was the cause. That tank at La Spezzia had took product, incoming product from Libya and from Algeria-- they were very different products. Did lead to a stratification of that tank. Did lead to a situation that could easily have led to many deaths. Happily, no one was even hurt. But only by good fortune.

Then the whole industry, for a time, the whole industry was enormously concerned about understanding this problem. Once we understood it, there were operational ways to address the issue and the LNG tanks today work perfectly safely. But indeed, when we went back through all the records we could find other LNG tanks including one in the state of Massachusetts that had exactly this problem. Not severe, hadn't caused anybody any problem, but nobody was looking for it. And it could have been a big deal. So that's how I got to the rollever. That goes under the rubric of rollover. Somehow, somewhere along the lines, somebody had the idea that all this fluid that's stored in the tank rolls over like a spring lake and that that's the cause of the problem. And it has some rough analogies to a lake in the spring time, but it's pretty rough.

INTERVIEWER: When you were working on this artificial kidney, what's the relationship between that and the contemporary dialysis machine?

SMITH: Same thing.

INTERVIEWER: So was it the first one that was being done?

SMITH: No. It was very early, but it was not the first one. Willem Kolff probably gets the credit for that, he was a physician. And basically, cobbled something together out of sausage casing. And deserves the credit for showing that hey, yeah, this can really happen, even if it's just a cobbled together thing, and even if it doesn't work very well. It's a proof of principle. And so no, it wasn't the first one, but it was very early.

INTERVIEWER: When you think about these various problems that you've worked on over the years, are there some that you're particularly pleased with? Like you feel like you've really make a contribution?

SMITH: I've had fun with all of them. When I look at the research and ask, should I take more pride in some of it than others? I'm not sure. Because they're different kinds of contributions. And part of the contribution, for an Institution like this, I think the most important part is the education of the students. One of the projects I worked on at one time was the notion of achieving desalination of sea water by a freezing process. Well, that's gone no where. So in terms of a research achievement, there's no reason to be especially pleased with it. But I think we managed to carve out some intellectually challenging problems within that context. And there was some students who worked on that project that I think did incredibly well and I'm very as proud of those students as I am as any other students. And so in a real sense I think I take every bit as much pride in that as in some of the things that have attracted more attention like the rollover or the drag reduction.

INTERVIEWER: And of course, you don't know whether what you've done with desalination will come back to life in some point in the future.

SMITH: True.

INTERVIEWER: It's still a good idea.

SMITH: Oh, yeah. When we started this the membranes were not very effective, and the membrane guys did a terrific job. With today's process the membranes are far superior to the freezing alternative, but it was a great project. It was good intellectual content, good educational platform, great kids.

INTERVIEWER: So some of the research you've done is related to energy and trying to use it more efficiently.

SMITH: I don't think so, have I?

INTERVIEWER: I thought I had read that. Okay, maybe I found something that isn't completely accurate.

SMITH: Maybe somebody's trying to give me more credit than I deserve.

INTERVIEWER: Maybe. You clearly found out that you like teaching and you're good at it.

SMITH: You never quite know if you're good at it. It's a funny thing.

INTERVIEWER: You have students who keep in touch with you?

SMITH: Yes.

INTERVIEWER: Then I think you've been a success. I think that's how you know.

SMITH: But you don't really know until much later. I hope the main thing you help students do-- I'm going to back up. In terms of knowing whether you've done a good job in teaching, firstly, I think there's enormous difference in undergraduate versus graduate. Partly because undergraduates are much less tolerant of faculty who don't do a good job. So if you don't do well on Monday they're still going to be turned off to you on Wednesday. Graduate students on the other hand, are much more tolerant. They've been through this before. If you don't do well on a particular day they'll put up with it and hope it gets better. The tolerance is much different in those two classes of students. On the other hand, the rewards are also different. If in fact, you do a really good job with the undergraduates you can get them excited. It's much harder to get those grad students excited for exactly the same reasons. They've been through this before. It's harder to get them on a high. So teaching the two categories is a very, very different thing.

Nonetheless, when they walk out the last day of class you get review forms and all of that and you get some sense of what they liked and what they didn't like. And that's fine. I always used to bring them home and give them to my-- when my kids were little, give them to my kids. Particularly my daughter would say, daddy this one's exactly the way you are. He's described you perfectly. But that's fine. But what you really hope that you've helped the kids achieve is a way of thinking, it's not the content. It's a way of thinking and it's a way of analyzing problems, it's a way of taking something that they don't understand and asking themselves how they can better get their arms around it. You really don't know whether you've achieved that or not for a long time.

INTERVIEWER: In those moments-- I don't know how frequent they are-- where you've felt like you've done it, where you've gotten them excited or you've helped someone understand better or ask better questions, what does that do for you personally?

SMITH: Makes you feel really good. It really does. There's just a satisfaction that somehow I've helped the way this person can think about things. And that's not just something that he or she can use today, that's something that they really carry with them.

INTERVIEWER: Do you feel like that's been more important to you personally then say, collaborating with a bunch of colleagues and working something out?

SMITH: Yes.

INTERVIEWER: So you like working with younger people?

SMITH: Yep.

INTERVIEWER: Well, I bet your kids benefitted from that.

SMITH: I hope so. But I had to ignore them for these kids here sometimes. That's a challenge. There really is, there's a tension there. MIT is a very demanding place and it takes a huge effort. Raising a family is likewise a very demanding activity. And balancing the two is difficult.

INTERVIEWER: You may be the first man that I've interviewed who's even mentioned the balance between family and work. A lot of women have.

SMITH: Interesting. It's true. It's tough.

INTERVIEWER: To someone outside the Institute, how would you describe what it's like to teach here?

SMITH: Teaching here, like anywhere else, depends a lot on the setting. There's two easy settings to describe. One is the big lecture format where you have 100 or more students in an amphitheater. And I suspect that's not different than anywhere else. The opportunity for interaction with the kids is limited necessarily. So I don't think it's very different. The smaller classes where you have perhaps, 20 kids in the class is totally different. There you get a handful of kids who really want to bore in. They want to challenge you. They want to challenge the accepted practices. They want to challenge everything they can perceive. And so the class turns out to be mostly give and take, and it's fun. It's a lot of fun because the kids are so terrific.

SMITH: Have there been moments where you've learned from them?

SMITH: Absolutely.

INTERVIEWER: So can we talk a little bit about your experience in administration here? First of all, what was it that made you interested in trying administration?

SMITH: Paul Gray. That's the one word, the very short answer. I had had a short stint as department head, thought I had managed to dispense with that and gotten back to being a professor and doing research and teaching. I was quite happy doing that. I had no intention of going into university administration. Paul, when I was department head had been chancellor. He was later named president. And when he was named president apparently thought that I had done a good job as department head, so essentially came to me and said, Ken, I'd like you to be associate provost and vice president for research. I said, well, hadn't thought about this anymore than I'd thought about anything else I'd ever did. So what does this mean? And so we talked about it and he described his thoughts about what the administration would hope to achieve and what he hoped that position could do, and so I said, yes. That's how it happened.

INTERVIEWER: Can you summarize your responsibilities?

SMITH: Not easily because the responsibilities have a vague definition and they changed somewhat during the time I was in that position. Firstly, the vice president for research was intended to have responsibility for most of the large interdisciplinary centers and laboratories. So that's one kind of activity. In addition to that there was the certain research policy issues, so that independent of whether the research was to be performed in an academic department or in one of these centers and laboratories, it was really that office that was responsible for making policy. And this would spill over to issues like technology licensing. In addition, at the time, one of the idiosyncratic elemants was that Whitaker College of Health Science and Technology was just being completed as a physical building. And holy mackerel, what are we going to do with this? So that became my responsibility. But that wouldn't fit on any kind of an organizational chart; it just happened. But that was roughly the set of activities. So there were the interdisciplinary centers and laboratories, some of which we later decided would better fit within schools.

For instance, the laboratory of computer science initially, was my responsibility because it had been my predecessor's responsibility, but virtually all of the activity in that was School of Engineering activity. And it better fit within the School of Engineering, so it was moved to that. On the other hand, the research lab for electronics was partly drew on the School of Science and partly drew on the School of Engineering, therefore, would not fit comfortably in either school. And so, it properly stayed with me. So I continued to have all of the ones that were genuinely interdisciplinary in the sense that they reached across more than one school.

Some of those didn't need a lot of attention, some of them did. Those that were young and feisty and still growing were a lot of fun. And some of the others were less fun. But it was a fascinating experience because the spectrum of activities is just enormous. That was probably the thing I found most rewarding for the laboratories. Just to see it all happening and try to make judgements about this incredible array of talent and activity.

INTERVIEWER: What kinds of decisions did you have to make?

SMITH: How much help you can give them. Unfortunately, we didn't have enough money. So what the center laboratories and directors would usually want would be space, money, and help in convincing departments that they should hire faculty in this area or that area. And we didn't have enough of any of those, which made it difficult. But you do your best.

INTERVIEWER: Do you feel you were able to accomplish things in that position that you couldn't have done any other way?

SMITH: Oh, sure. Yeah. You know this Haystack Observatory out in Westford, which is one kind of activity, and there's the energy lab here in the lab, which is a totally different activity. In the one hand, the issue of Haystack, I tried to help them get some better space, whereas, with the energy lab the issue is really at that time, not today-- it's hard to believe today-- but at that time, it was what's the intellectual core? And we thought, well, the intellectual core is really-- and I think to a large measure it's still true actually. The intellectual core is really energy in the context of the environment. That it's environmental issues. That energy in and of itself is not the real issue. Less true now than it was then, but probably still a lot of validity to it.

INTERVIEWER: Were there things that you learned as a university administrator that were a surprise?

SMITH: You learn a lot of things as a university administrator. Most of them being people-related. My predecessor was a very wise man named Tom Jones. He said, Ken, you only need to know two things in order to do this job. First thing you need to know is that you have to pat somebody on the back twice before you have earned the right to kick them in the pants. Second thing you have to know is that friends will come and go, but enemies will accumulate. And Tom was right on both of those scores. I hope I managed the first part about giving people a pat on the back on the appropriate opportunities before the kick in the pants. But that's certainly true that no matter how hard to try, some people don't forgive you. I have a grandson who said, Grandpa, I found you on the web. Look what this guy writes about. Did you really do these things? Well, I have a little different view of it Gilden.

INTERVIEWER: I found that website too. Yes. A former professor here, yes.

SMITH: I didn't even know about it until my grandson found it.

INTERVIEWER: Yeah. But I was old enough to know from his writings that their was clearly some agenda, and it seemed very one-sided to me.

SMITH: Yes.

INTERVIEWER: One of the things that I believe you did when you were an administrator is the new policy on academic fraud.

SMITH: Well, I'm not sure. I guess I did do that actually.

INTERVIEWER: Do you remember, was there a story about how that came about or what the need was for?

SMITH: I was actually very fortunate. It's true that academic fraud was one of the responsibilities that could've occupied a lot of my time. Happily, it did not. Then there were really two reasons for that. One is it seemed to be a period in which there was simply-- if there was a lot, it didn't come to our attention. And to the extent that it did, I was very fortunate to have Charlene Placido who handled most of it very nicely for me. I understand from her that it's become more of a chore since, but it was not a big part of my life.

INTERVIEWER: Was this tied in with the issue with David Baltimore? Was it at that same time or?

SMITH: No, see the timing corresponded with David, but MIT was marginally involved because the postdoc had moved on, David had moved on. Our involvement was modest.

INTERVIEWER: Would you talk a little bit about this Singapore-MIT Alliance?

SMITH: Yeah I can talk about it. I haven't had a big role in it. Singapore-MIT Alliance arose long after I had left the administration and returned to teaching and research. And so I participated in it as a faculty member only in what goes under the rubric of SMA1 of the first five-year increments of the program. I thought it was fun. What we found was-- to a first approximation, we were interacting with the National University of Singapore, lesser degree with Nanyang Technical University, but mostly with National University of Singapore. And what we found there was they had a first-rate undergraduate educational program. Less than a first-rate graduate educational program. So roughly at task was to help them build the graduate program. And then the first five-year increment we did that by starting up really a mini program with its own courses in chemical engineering or in a series of other disciplines. And trying to attract students from all over the world, mostly from Southeast Asia, but not entirely. They into small groups and tried to raise the level of the students that we could attract and of the experience we could give them. I think that five-year program went pretty well. It then went on to a different configuration in SMA2. I found it less interesting; I dropped out. I have a nominal attachment, but no real involvement currently.

INTERVIEWER: So how did you decide to come to back off of administration?

SMITH: When I originally had my discussions with Paul, obviously I said, well, how long do you want me to do this? And he said, well, you can't get anything done in less than three years. And maybe after five years it's a good idea. So let's plan on at least three and probably five, but it's open-ended and that's that. So that was our original understanding. But Paul ended up staying longer than I think he intended. And we still had a lot of problems on our plate at the end of that three to five year time frame. And the provost changed so Francis Low stepped down and John Deutch became provost at about that stage. And there was just a lot going on and a lot to do. So we just kept doing the job. In terms of returning to the faculty and research, it probably would have been better if I stopped at five. In terms of getting some of the important things done that needed to be done, I think it was the right decision. And there were two-- you haven't asked me, but if you were to ask me what are the two things that I feel best about that I did as vice president, there were two.

One is that when I took the job on everybody knew that our licensing procedures were not operating well. There was lots of dissatisfaction with them. Nobody seemed to have a solution. So that was one set of problems. I spent an incredible amount of time trying to understand it. Looking at other universities around the country, trying to understand what they were doing. Not being impressed any more with what was happening elsewhere than I was with what was happening here. Discussing it with the visiting committee that we had for research. Getting some important help from them, but ultimately, coming to understand that almost every university-- our Technology Licensing Office was then run by an attorney. And despite all the attorney jokes, there's nothing wrong with attorneys except that their training is mostly directed at protecting things. If you want to protect something they're exactly the kind of person you should have. But the role of Technology Licensing Office is not that at all. It's exactly the opposite.

It's to take a technology, which is embryonic and make it useful for somebody else, not worry too much about what rights you retain, not worry too much about whether your royalties are the very best you can get. But rather, to transfer it and make it useful to the world as a whole. That's our responsibility. And that's not what a lawyer's trained to do, so what you need instead is somebody who loves technology. And understands that technology transfer in this world happens through the business activities, and loves that kind of business ferment of taking a technology and turning it into something.

So with some very important help from Nil Seramis, who was then at Stanford, and George Dummer, who then ran office of sponsored programs here, and with that understanding we managed to get two people who fit that description to a T. And hired them to run the office. And we changed lots of stuff in the written procedures and the royalty sharing and conflict of interests, and all of that. But none of that is nearly as important as getting the right people in there. So yeah, I'm quite proud of those changes and the way technology licensing happens here now as compared with the way it used to happen.

INTERVIEWER: The two people you got to run the Licensing Office, tell me what their backgrounds were and why it was a better selection than having an attorney?

SMITH: The two people were Lita Nelson and John Preston. Lita had been a student here. Had been a chemical engineer and then a Sloan School MBA. Had worked for a number of firms-- Arthur D. Little, Miller Poor, perhaps one or two others. John had a background on the electronic side. Also had an MBA, also had experience in industry. So both of them loved technology. Both of them had experience in industry, and loved the idea of taking of something that wasn't yet commercial and yet, moving it into a business and making something happen with it. And both of them had enough experience to know what it took to make that really happen.

INTERVIEWER: And when tha transfer happened ftom the attorney to the sort of business savvy tech lovers, how did it change licensing practices at MIT?

SMITH: Completely. It's interesting that most of our licenses are written with small companies. Often the start up company created around the particular technology that's being licensed. Some of it gets transferred through really big companies, particularly if that large company has been the sponsor of research here. But it's bimodal, it's either a really big company or a really small company, very little with medium sized companies. So that the mode in which one deals with the big company and the way that one deals with small companies is totally different.

A big company can give you a license fee and running royalties and all those kinds of things, but there's no way they're going to share stock with you. Whereas, the small company doesn't have any money so it can't give you running royalties and all those things, but to them stock is only paper. That they can do. So there's enormously different way of interacting with these two companies. And John and Lita both understood this and understood how to interact with each and how to help each, particularly the small companies. It's not just a matter of negotiating with them, it's a matter of how do we make this work for this particular small company because each one's different.

INTERVIEWER: So for people at MIT who might have a new process or a new technology, practically speaking, how did this sort of new way of doing licensing change for them? I mean, did it happen more quickly or-- tell me a little about the practical changes for them.

SMITH: For somebody here who wanted to play the role of an inventor, and as a successful inventor of making something really happen, it changed completely. Because rather than having people in the office who were wary of interacting with the outside world, you had people that wanted very much to engage with the outside world. Wanted to make it happen. Therefore, things did happen a lot faster because if you take forever that's equivalent of killing it. You've got to make it happen fast. And John and Lita both knew what kind of additional people to hire into the office, how to interact with themselves so things happened. All of the time prior to that change, if you were to compare all of our prior licenses and say, did any of them make money over and above the expense? The answer is yes. Two. But only two. Only two licenses in the entire history of MIT had made money up to that point. And that's just because people didn't know how to engage the [INAUDIBLE].

You now had a very positive attitude. Took a couple of years, so there were a couple of years in which people were saying, well, you know, things still aren't happening quite as fast as we'd like them to. But it soon began to happen. And so now we see net royalties on the order of $20 million a year.

INTERVIEWER: That's an accomplishment.

SMITH: Yes.

INTERVIEWER: And what was the other thing that you were most pleased about?

SMITH: Well, I mentioned earlier that one of the obvious issues was what on earth are we going to do with Whitaker College? There was another problem at the same time, which was that MIT had a-- Whitaker College had many issues attached to it. Mostly derived from the fact that it had never been defined. And therefore, different people had different visions for what it should be. It could not possibly be all of those visions. Which ones of those visions should we pick, if any? And how does Whitaker College relate to the Harvard-MIT program in health science and technology?

It was all of those issues and so we had to somehow bring this together and try to understand it, which we did. So I put together some committees that tried to define it better in the end. And we tried two or three different things. By happenstance, there was one other issue, which at the time appeared to be unrelated. Which was that the then Department of Psychology was not enjoying the intellectual success that most people thought it should. Its then department head, Dick Held, described the situation as being one in which the total was less than with sum of the parts. And I think that's fair. The parts seemed good, but somehow it wasn't right. It didn't fit with MIT quite right; something wasn't right.

So out of this procedure of trying to decide what should go into Whitaker College, two people were particularly effective in convincing me that the brain sciences really should be an important part of MIT's future. Those two people were really Ann Graybiel and Emilio Bizzi. And so we had this resource. We had this problem in the Department of Psychology. We had this resource in the Whitaker College, which was just about finished as a physical entity. And can we bring these together? And the answer was yes. We decided in lots of discussions with the department as a whole, department has to buy into this and it's a big thing. But the department in the end decided that it really did want to move its intellectual home from humanities and social science into something that was more oriented toward the biological sciences. And Whitaker College, at least in the interim, could provide that kind of a home.

So the Department of Psychology changed its name. It became the Department of Brain and Cognitive Sciences. Emilio became the department head. It's mission changed in that it now put greater emphasis on the biology component, but it didn't cut itself lose from its roots. Cognition is important. That's what it's all about in the end. So it defined itself as a different kind of brain department than most that were being created at the time. In that there were some that were purely biological and did not connect back to the cognitive and systems elements. We didn't do that. We kept the cognitive and systems elements. We added on the biology components. It was difficult. Well, it was not difficult within the department I should say. But by and large, that those within the department with some important exceptions, but for the most part, the members of the faculty in the department thought this was a desirable thing to do. There were others at the Institute that thought this was a crazy thing to do and so it was not an easy-- it was not a time when people said, oh, brain sciences are wonderful with the same kind of reflex that they now do.

So anyway, we did create a Department of Brain and Cognitive Sciences. Emilio agreed to become the first department head. We did take advantage of the physical space that was made available in Whitaker College, and I think it's just been terrific since.

INTERVIEWER: Seems like a good decision.

SMITH: Yep, those are the two that make me happy.

INTERVIEWER: Over the years you've done work with a number of outside companies, and I wonder if you talk a little bit about the relationship between industry and MIT and why that collaboration is beneficial to both. And you can use examples if that will help you.

SMITH: It's certainly true that I've consulted for a large number of companies over the years. It's also true that industrial support of research at MIT is something that I've seen wax and wane during the course of my career. I think I'd like to talk more about the MIT role than about-- well, they're not really separate. The conventional wisdom would certainly be that one consults in large part because it allows you to get a working relationship with industry and allows you therefore to influence the kind of research you do and the kind of values you bring back to your students. And I think that's a valid position to take. How easy or difficult it is depends a lot on the situation as the business world exists at any one time.

I was very fortunate; I've consulted with a very large number of companies. Should probably mention two because I consulted for those two each for-- I probably consulted for Dupont for 40 years and I probably consulted for Air Products for 35 years. But I also consulted for a number of others. And I think that that's correct that consulting experience does influence the way you think. Both in the classroom and in your research it indirectly has an influence. A much more interesting question I think is the one about sponsorship of research. And attitudes towards research. And in my young days as a faculty member, by and large there was very little sponsorship of research at MIT by industry. It was almost entirely federal sponsorship. Many disciplines were if not disdainful of industry, nearly so. And I think that's unfortunate. I think that going back to our discussion of a few minutes ago about transferring technology, if we're going to have an impact on the economic well-being of this world, that business world is important to us. And we can only understand it and interact with it if we're fully engaged. So that meaningful interaction, I think, is crucial.

The curious thing of course, is that there was a time when industry was dismantling its own in-house fundamental research. When Bell Labs was shutting down and GE was shutting down and Dupont was sort of much reducing its research. That there was a notion that, ah, they're all going to come to us and we're going to get an enormous increase in our sponsorship. That was a sugar plum that was never destined to be. And it was never based on reality. At the time I said that I don't think that we can realistically expect them to fund more than something like 20% of our research. That turned out to be about right. And it's not the right measure in any case. The real issue is, do we have a meaningful, intellectual engagement here? And in those terms I think the situation today while certainly imperfect is better than it was when I was a young faculty member.

INTERVIEWER: Since you've been basically a lifer at MIT, can you talk to me a little bit about what it is that you think makes MIT unique in the world?

SMITH: What I think makes MIT unique is a real commitment to the basics. I want to do a first-rate job in the classroom. I want to do research that makes a difference and is absolutely beyond reproach in every way. In some ways it goes back to a comment I think I made earlier of the very early days of show me the data. Don't give me all this palaver. I just want to know what you really have here. And there is still, I think, a real commitment to that underlying basic values that makes the place terrific.

INTERVIEWER: Why have you stayed here for your whole career?

SMITH: Every time somebody said, come join us. And I looked at it, didn't look quite as good.

INTERVIEWER: That's a completely fair answer. You've seen a lot of changes in the time that you've been here. Can you talk a little bit about how, for example, the students have changed?

SMITH: The students have changed a lot. The most obvious one that anyone would mention is the role of women. There were almost no women in the early days. My undergraduate class of chemical engineers, there were roughly 100 of us, and there were two women. The undergraduate classes in chemical engineering now are a bit more than half women. So there's an enormous change on that front. And there are other certain things that I don't think are important. For instance, there were fewer Asian Americans then than there are now. I don't think that's really important, but it's true. But it's not important. The students have probably changed in other ways.

They speak better. I think they were more inclined to be reticent, quiet, introverted. I think that now they're more inclined to be much more forthcoming. That's a good thing. Do you think that the transition from a predominantly male student body to more of a half and half, has that altered the culture? I mean, obviously it's altered the social make up, but has it changed the classroom?

SMITH: Not a lot. The classroom was a pretty tough place when I was-- if you go back to when I was an undergraduate, we all smoked, the teachers smoked, the students smoked. The faculty swore. There's a famous story of perhaps, apocryphal, Doc Lewis, famous chemical engineering faculty member who received a note from the dean of students on one occasion, back in the old days when they were carefully typewritten and all. And it said, Dear Professor Lewis, we understand that there have been complaints about profanity in your classroom. Doc reputedly grabbed the letter, scrawled across the bottom, it's a goddamn lie, put it in an envelope and sent it back.

INTERVIEWER: It's a good story.

SMITH: This is a good story. Whether it's true or not it's a good story. But there was very much that kind of a tough bordering on crude kind of an environment where profanity and all the rest was part of the scene. It's unthinkable today that a faculty member would tell a student to-- lots of little things we were told. Just unthinkable. Most of that change would have happened whether there were women there or not though.

INTERVIEWER: I wonder. We'll never know.

SMITH: We'll never know. In terms of one interaction with guys versus gals, I don't see much difference. When the shift first began, an appreciable number of women first began to make an appearance, there was perhaps, a tendency for women to be a little bit inclined to feel that they had something to prove. That's gone. I don't find any significant difference interacting with Joe than interacting with Jill. It's the same thing.

INTERVIEWER: You mentioned that you sort of witnessed the transition from the heavy engineering influence to, I guess what's more interdisciplinary now. Can you talk a little about how that happenend and the change that it made?

SMITH: The change took a while and World War II probably played the biggest role in making it happen. I think it's probably fair to say that immediately prior to World War II, MIT was viewed as an engineering institution, period. It was maybe an unfair view in that it had some truely splendid people in chemistry and mathematics and elsewhere. But nonetheless that was probably the view. World War II clearly demonstrated that yes, you need good engineering, but you really need good science with it. And of course, the role of physics in World War II speaks for itself.

So coming out of World War II there was immediately an emphasis on strengthening science. In addition, there was formed the Lewis Commission. I forget its exact name, but it was put together by K.T. Compton and the president to say, what should MIT be in this post war world? It was the commission on something or other, but Doc Lewis, about whom I just spoke was the guy that was selected to chair it, and it's universally known as the Lewis Commission. I think even now, it's probably the best single document to capture the notion of what MIT's about. The clarity of the text is just remarkable. And Doc deserves a lot of the credit for that. There was no profanity in it, but Doc had a way of phrasing things that had a certain power to them.

There was a subcommittee there chaired by Tom Sherwood, also a chem engineer-- later became dean of engineering. That dealt with the humanities and that subcommittee said, look, we need a School of Humanities. We need a dean of humanities. We need to really beef up that side of things. So I think it's this whole process of coming out of World War II that really led to the change. The science, increased emphasis on the science was self-evident. It was the Lewis Commission that really brought tha humanities and the social sciences into focus.

I mentioned that Tom became dean of engineering and the first dean of humanities was John Burchard, who was very grateful to Tom for chairing the subcommittee of the Lewis Commission that brought about the School of Humanities. And John used to say that Tom Sherwood was the best dean that the School of Humanities ever had. It took a while to make it take root. That's bound to be true. By the time I arrived, both of these changes were well underway; not complete.

INTERVIEWER: And it sounds like you think that these changes have made the Institute a much richer place.

SMITH: Correct.

INTERVIEWER: I'm interested in the other sort of shifts that you've seen over the years-- in faculty, in administration, in the culture.

SMITH: The administration has grown. As this becomes bigger it becomes more complicated. And that means there are more administrators. Unhappily less accessible. It's too bad, but it's true.

INTERVIEWER: One of the things that interests me though about MIT, which is not true everywhere, is the commitment to bringing in department heads and deans and then returning them in a regular basis. People are not long term administrators in some of the most powerful positions. Is that something you think is a strength?

SMITH: I think it's a fantastic strength. There is a tendency in any organization to have a sense of us and them. And if the administrators, whether they'd be department heads or whatever, are not them, but really us. It makes a huge difference. And by and large, MIT's done that well. My time in the central administration was largely when Paul was president. He'd been a faculty member here, he'd done all those things, he really understood. And even as president he then returned to being a professor and went into the classroom and taught undergraduates. It's a powerful message.

INTERVIEWER: I read somewhere that at some point one of your assitants won some sort of staff award. And I wonder if you could talk a little bit about the support staff at MIT.

SMITH: Actually, I think I've had a couple in that position. Support staff are critical. One of the things I worry about is that again, as an organization grows and gets what I would regard as too many rules, there's a tendency to measure people by some construct of what they should be doing. I think it's much more important that you have people who are prepared to take an initiative and do something that's not on that list. And I've been very fortunate to have two people who probably deserve mention in that context.

One is Charlene Placido, who was my assistant in the latter portion of my time as vice president and continues to serve that role for Clark Panazeros. And she was just incredible. I mean, I rarely said, Charlene, would you please because she'd already figured it out and knew what needed to be done or had forseen things that I needed to think about, and she made not just a huge difference of the quality of my life, but to the quality of the job that I was able to do. Charlene is very special. And she did get one of the Infinite Corridor Awards. I'm currently very fortunate to have Linda Muso, who has a lot of the same qualities and has also received an award within the department for exactly the same kind of thing. So yeah, the support staff are absolutely critical.

INTERVIEWER: What about the strengths of your department and your School, how would you articulate what the strengths of your department are?

SMITH: Can I answer a different question first? For a number of years now, 10, 15-- I'm not sure how long, but for a considerable period, been this growing fad of having all sorts of league tables by which one tries to measure how good the School is, how good this department is, et cetera. And it's awful. All of them pretend to have a precision in what they in fact, lack. If you read U.S. and World Report or whatever your favorite version is, and say, I'm going to take a look at this and see who's in the top 10. Then that's probably okay. But if you think you're going to measure who's first, you're kidding yourself. So I'm dismayed by this growing emphasis on trying to measure with ever great a precision because it's not right. But, having said that, I am very proud of my School and my department.

INTERVIEWER: And they're highly ranked.

SMITH: Both highly ranked. It's easier to speak about the department because it's better defined. It's amazing how different departments are. The culture and all the rest in chemical engineering as compared with some of the other departments within the School of Engineering as really remarkable. So it's much easier to speak about chemical engineering and one of its characteristics would be that it's very cohesive. It doesn't have subgroups; it sees itself as an entity. Whereas, in some of the other departments, oh, I belong to such and such a entity within the department. So I would say one of the important, defining characteristics in chemical engineering is this cohesion. Maybe because it's small, it's much easier. So that defines it. And the quality of the faculty.

So if you ask me, what makes it fun to come to work? It's the quality of your colleagues and the quality of your students. You know, it's fun to interact with both of them. And we just got terrific students and terrific faculty, so we belong highly ranked.

INTERVIEWER: I've asked you nearly all the questions that I have. I'm wondering what we haven't talked about that you would like to cover.

SMITH: Well, the thing you-- your charter I guess is to somehow understand the history of the place. And I think we've largely done that, but past is prologue and what will MIT be like? What will higher education be like? What will chemical engineering be like? I don't think we've figured a lot of these things out. I don't think there's a consensus on what a lot of these should be. INTERVIEWER: Do you have hopes and expectations for what will happen at MIT in your area?

SMITH: Some things are easy, some things are hard. I think in my area in chemical engineering there will be-- it's easy to say that there will be a continuing growth in the emphasis on what happens at the molecular level. That certainly will happen. I hope we don't lose that connection to the macroscopic level because that's more endangered. So these are the kinds of issues. Some parts are easy, some parts are not so easy, and how do you make that connection and make it meaningful?

Energy. You touched on energy earlier. Energy's a good example. We certainly need good science, but we also need good engineering at the macroscopic level. And how do we keep those connected? How do we keep the commitment? What are the data? Never mind the appearances, what are the data? As you get bigger and public relation machines become more important, that commitment becomes more and more difficult to maintain. Those are some of the issues.

INTERVIEWER: Anything else?

SMITH: I don't think so.