

**INTERVIEWER:** Today is November 17, 2010. I am Karen Arenson. This interview is part of the MIT 150 Infinite History Project. We are talking this afternoon with Sheila E. Widnall, a professor of aeronautics and astronautics at MIT, and one of the Institute's 14 current Institute professors. She served as Secretary of the Air Force from 1993 to 1997, and was the first woman to head a branch of the American military. She was also the first MIT alumna appointed to MIT's engineering faculty, and the first woman to serve as chair of the MIT Faculty. She earned three degrees in aeronautics and astronautics from MIT: a Bachelor's, a Master's, and a doctorate, and served briefly as associate provost at MIT, and also as president of the American Association for the Advancement of Science. She holds three patents. Sheila, thank you for talking with us today. What has it been like to be the first woman to do so many things, and did you ever set out to be first?

**WIDNALL:** Well, it has been quite a ride. No, I don't think I ever set out to be first. I clearly had an incredible experience at MIT-- I'm still having an incredible experience at MIT-- and some of these things just seemed to happen naturally. I think I came at a time when many organizations were looking for women for their boards, for various positions in the organization, and I think I was the beneficiary of a lot of that.

**INTERVIEWER:** Some women who have made it to the top have not seen a need to help those following them. But you've worked to help other women make it in engineering and science. Why did you think that kind of help was important?

**WIDNALL:** Well, I think women can make a very special contribution to engineering and science. I think they, in many ways, have a slightly different approach. They're more multi-disciplinary, they're more multitasking. I think they bring a set of skills, and I think those complement, in many ways, their colleagues' and so I think they do bring something very special to the table, and obviously our society can benefit enormously if we use the brain power of our entire population.

**INTERVIEWER:** Do you think, as an engineer and scientist, that you were that different from your colleagues when you talked about multitasking and so forth?

**WIDNALL:** I really do. I mean, I think that many of the things I did were very traditional, but on the other hand, a lot of the committee work I did, a lot of bringing groups together, a lot of building consensus, teamwork, leadership, I think those are sort of special styles that I brought to those tasks, and so I think I really did benefit from a slightly different approach to things.

**INTERVIEWER:** You've described your life as, quote, surfing on the leading edge of a wave--

**WIDNALL:** Yes.

**INTERVIEWER:** Of heightened sensitivity and activity to increase the role of women in science engineering. You've also said that you were very fortunate. But it takes skill to stay on a surfboard and to ride big waves. What do you think were your most important skills, besides what you were just talking about?

**WIDNALL:** No, I do think the real belief that a decision made in a consensus manner is in fact a better decision than a decision made by single individual really allowed me to lead groups of people to accomplish a common goal. So I think that that was a skill that I find very useful. Also I'm obviously very enthusiastic about the things I did and about the many many organizations that I was involved with. So I think the enthusiasm, brought together with the leadership style, I think enabled me to do a lot of things.

**INTERVIEWER:** Was the leadership natural? Did you practice it growing up? Were you a leader in school? Or did you take any courses or read any books? Or--

**WIDNALL:** No, I never really thought about it. I'm not one of these people who had a life plan. I didn't have a series of steps that would bring me to some particular place. I should really share this with you, because when I tell people this, they always laugh, but my father rode bulls in the rodeo. And my mother was a juvenile probation officer. So I think that bringing those two genes together sort of gave me a certain leadership style. So I'm very quick to grab the problem or the issue and try to take it to the next level.

**INTERVIEWER:** Did you ever ride a bull?

**WIDNALL:** No, I never did. But I've done a lot of horseback riding.

**INTERVIEWER:** Was there a fearlessness? I mean, did your father have a kind of risk-taking attitude?

**WIDNALL:** He had to have one. I mean, you don't ride bulls if you're not willing to take risks. I mean, I can't think of very many things that are as dangerous as that.

**INTERVIEWER:** And you somehow had that kind of an approach too?

**WIDNALL:** Well, willingness to assert oneself. Willingness to take risks. Willingness to sort of assess the situation and decide what should be done. That's probably a useful skill.

**INTERVIEWER:** What role has MIT played in your career? What's been the tango you and the institution have danced?

**WIDNALL:** Well, MIT has been my life. I mean, I came to MIT as a freshman in 1956, one of 23 women entering the Institute, and at the time I came, it never occurred to me that there would be only 23 women at MIT. And it never occurred to me that houses could have windows on only two sides. I mean, those were total surprises. But, OK. So I saddled up, and became a freshman, and did all the things that are expected of freshmen.

**INTERVIEWER:** How did your professors treat you? And your male classmates, how did they treat you? What was it like to be one of those 23 out of 900 plus students?

**WIDNALL:** It was highly variable. I think my freshman adviser asked me why I had come to MIT, which I considered to be a little startling. On the other hand, there were certain members of the faculty who went out of their way to help me. I think my freshman math instructor brought me cookies when I was taking the final exam. That was very interesting. So I think there were a lot of people who really went out of their way to be helpful, and I think overall it was a very good experience.

**INTERVIEWER:** Did you ever feel discriminated against or picked on in any way, as you made your way through, both as a student and later as a faculty member and professional?

**WIDNALL:** No, I really don't think so. As I say, there were always a few people who would go out of their way to help, and so with that balance, then I could sort of overcome some of the other things that many people might have taken as slights. So overall, everything was fine.

**INTERVIEWER:** There were some small glitches, I think, along the way. When you started out, for example, I think you've talked about how somehow you ended up with one year contracts and maybe the pay wasn't quite as high as some of the men in the beginning.

**WIDNALL:** Oh, you're talking about as a faculty member. Yes, no, it was an interesting-- no, I think it was interesting. I can remember there were various times when MIT began to look seriously at the question of pay equity, and it was probably not a coincidence that in those years I always got a raise. So I thought, OK, I think I know what's going on here.

**INTERVIEWER:** Did you face more skepticism about being a woman in engineering outside MIT than inside, and were there ever men who didn't want to work with you?

**WIDNALL:** Not so much that, but I can remember-- you know, because I clearly had a very active consulting role, and I can remember being very well appreciated by the people who that I was actually consulting for-- but then, occasionally, people would come into a meeting and say, you know, who's that? Because I was a woman. But it didn't take very long before they began to understand the contribution that I was going to make to the problem at hand, and so I think he could overcome that pretty fast.

**INTERVIEWER:** There are many more women students and faculty members at MIT now than when you came as a freshman. Do the numbers surprise you in any way, either that there are so many more than fifty years ago, or that there're still so few tenured women faculty or women in engineering?

**WIDNALL:** Well, I think it's actually gratifying, and I would claim that I played a huge role in increasing those numbers. I mean, I was always very active in the whole question of the admissions of women, and there were various key moments in our history where we began to learn a little bit about issues such as is the math SAT a predictor of women as well as of men? Art Smith did some studies, and he determined by looking at the statistics that the math SAT underpredicted the performance of women. And MIT, being very data driven, made the obvious decision to take that into account on the admission of women, and the numbers reflect that. I think in one year, we went from 26 percent women to 38 percent women in one year.

**INTERVIEWER:** This would have been in the 1970's or 1980's, probably.

**WIDNALL:** I don't remember. Something like that. 1970's or 1980's. And so that was based on the data, and it was based on my strong belief that the women that we should be recruiting were the women that we were not admitting. That we had the pool, and we just had to do a better job of making the admissions decisions. So the numbers went way up. They went to 38 percent, and obviously there was the McCormick Building and the McCormick Dorm, and then of all the dorms went co-ed, so it didn't make any difference, and so MIT has went through all these different stages. I still think MIT, relative to other universities, is just way ahead in the percentage of women in engineering. I mean, there isn't another university in the country that has the same percentage of women across the engineering departments that MIT has. And I don't think most of them have any idea how we did it or what it's like. And I guess the other thing I think, is that the women undergraduates have transformed the faculty, and made it possible to not only increase the number women undergraduates, but increase the number of women graduate students and increase the number of women faculty. So I think that women undergraduates have been transformational.

**INTERVIEWER:** How? In what way?

**WIDNALL:** Well, I think basically, what happens is that the faculty get used to treating women as students. And there's a bit of a step there. You know, if you think about women in a different way than you think about men, you might not treat them the same way. But once you've got-- they're students, they do substantially excellent work, and so you start expecting the same quality of work from women that you do from men, and it becomes a natural mode of thought. I've talked to women graduate students who've come from other places, and they express surprise at the level of acceptance of women in the graduate school. Now this was maybe a few years ago, so it's probably even better now than it was when I talked to them, but then that feeds over into the recruiting and searching that the departments do for women faculty. So I lay it all up to the women undergraduates.

**INTERVIEWER:** Besides the presence of more women, how different does MIT seem now than when you first arrived? What do you think are the biggest differences?

**WIDNALL:** Well, of course I think MIT has moved with the developments in science and engineering, so when you can look at what's exciting now, how do people work together, probably a lot more interdisciplinary work, probably a lot more work at the interface between science and engineering and policy. Our lives are much more complicated than they would have been in the mid 1950's in terms of what does it mean to be an engineer, what kind of work do you do, how do you interact with the outside world. But MIT's moved right along with, and in some sense, led some of the changes that have gone on in engineering. So MIT is a very different place, but I think it's appropriately linked to society.

**INTERVIEWER:** Do you think its role in the world is different from what it was fifty years ago?

**WIDNALL:** Well, I think it understands the way it's viewed by the outside world. MIT, on a global scale, has got just a very unique reputation. I mean, people in other countries thinking about engineering, the first name that comes to mind is MIT. The second name may be something completely different and unpredictable. It could be Michigan, it could be CalTech, it could be Stanford, but when they think about the number one, it's MIT. And so I think our stature on the global scale is quite unique.

**INTERVIEWER:** Why do you think there aren't more women in science and engineering even today?

**WIDNALL:** Well again, I guess what I would recommend if people are thinking about that question, is I really do believe that women are motivated by the contribution they can make to society. And so I think the motivation to study engineering, you have to visualize the contribution you could make to society, and that's fairly complicated. I think maybe for a young man-- and I'm not sure that this is true today, as it was in earlier years-- is that they see engineering as a very fulfilling career in terms of the work you do and in terms of the salary that you make and the economic benefits. I think women think in slightly different terms. I think they think about the interaction that they can have as a professional with some of the important problems in our society. So I think it's up to us to demonstrate to women that they can make a quite significant contribution to problems of engineering, the environment, energy, new materials, new industries for our nation. And so I think you have to think about it in those terms. That's the case to be made, if you want to convince women to go into engineering.

**INTERVIEWER:** At one point, you and Professor Mildred Dresselhaus tried to attract more women to engineering at MIT with a special freshman seminar.

**WIDNALL:** Yes, we had a good time.

**INTERVIEWER:** Tell us about it. What did you do?

**WIDNALL:** Well, again, I think that's the same philosophy, is that we wanted the women students to gain an understanding of what engineers did. So we simply had this freshman seminar, and we had an enormous-- I mean, we must have had 90 students. And we would just bring in people who said they were engineers, and they would basically talk to the class for an hour. Some of them were professors, some of them were recent alumni. That was very effective. Some of them were people in industry. And we just gathered these people from all over, and the main mission was to talk in some detail about what they did, what their contribution to society was, what were some of the important problems that they saw, how did they attack them, how did their engineering education give them the tools to make some progress in some of these areas. I think it was very effective.

**INTERVIEWER:** And the students were all women? Or a mix of men and women?

**WIDNALL:** It was a mix. It was very interesting mix, because obviously we would welcome any students that wanted to take it, but it is the case that it was women and minorities. I think the minorities may have had some of the same sorts of questions. How welcoming was engineering as a profession? How could choosing engineering help our society? And so I think it was effective from that point of view. And we did it for several years. Hopefully somebody took it over and continued it.

**INTERVIEWER:** Do you know if it's still going on?

**WIDNALL:** No, I don't think specifically it's still going on, but hopefully MIT's moved to a slightly different place where we have other ways of talking to students about those issues.

**INTERVIEWER:** Do you know if the seminars succeeded in bringing more of the women and minorities into the engineering school?

**WIDNALL:** I don't know specifically, with respect to the individual students, but again, I still remember being blown away in those times. When I learned that, in chemical engineering, 73 percent of the undergraduates were women, and I just thought, wow. I couldn't imagine another engineering department in the nation having an enrollment that was 73 percent women.

**INTERVIEWER:** What was it about chemical engineering? Do you know?

**WIDNALL:** Well, I don't know. I mean, maybe it had something to do, again, with the kind of contributions you can make. This was before the revolution in biology, so it wasn't the interface with biology, but it was having to do with the kinds of work that you could do, maybe the kinds of contributions you could make. I think at this point, and I haven't checked it, but I think women are a majority in chemical engineering and material science--

**INTERVIEWER:** At MIT.

**WIDNALL:** At MIT. And probably civil and environmental engineering, and my guess would be biological engineering, but I haven't checked it. So that's half of our departments. And I think that's quite substantial.

**INTERVIEWER:** In the 1990's, MIT issued a report saying that women in its School of Science had been the victims of pervasive, if unintentional, discrimination. And I believe that there were subsequent studies at the other schools that found similar things. Were you surprised by these findings? Here it was, the 1990's?

**WIDNALL:** Well, you know, I think it's an issue that you just have to keep on the front burner. In any school at MIT, in any department at MIT, there is enormous-- what's the word-- competition for resources. You have new faculty coming, they want start-up salaries. You need space for laboratories, you need new equipment. If you're not in some sense always putting yourself forward as someone who needs the help of MIT in order to accomplish your goals, you might be on the second bench. And I'm not saying that women have a tendency to do that, but I think women are deeply committed to their careers and the contributions that they can make, and maybe are not banging on the door as much. And I give MIT a lot of credit for undertaking those studies. And, in some sense, it's an example. If we look at the history of women at MIT, it's a set of steps. It's not a smooth ramp. It's, you know, up, and then we do something else, we go along, and we do something else, we go along, we do something else. And it's been a series of steps. And I think that was one such step. And there've been quite a few.

**INTERVIEWER:** So now, MIT has a woman in the president's office.

**WIDNALL:** Right.

**INTERVIEWER:** Do you think much else has changed since that step occurred?

**WIDNALL:** Well, it isn't just a woman in the president's office. I mean, we have women department heads, we have senior women in all the schools. There's just a lot going on. So I think women-- and in some of the searches, we've hired a lot of new women faculty. And so I guess it's something I think we're keeping our eye on and continuing to make progress.

**INTERVIEWER:** Let's go back and talk about your own path into engineering. Where were you born, and where'd you grow up? And what was your childhood like?

**WIDNALL:** Right. I was born on the final approach to McChord Air Force Base. And so, what that means is that the sky was full of airplanes. I'm basically from Tacoma, Washington, and of course Boeing in Seattle is one of the region's largest employers. The sky was full of airplanes, either Air Force airplanes or commercial airplanes. I guess my near-term career goals were always to finish my Bachelor's at MIT and go back and work for Boeing. I never in fact did that, but that was always the vision that I had.

**INTERVIEWER:** Once you were at MIT.

**WIDNALL:** Once I was at MIT.

**INTERVIEWER:** You didn't think in those terms as a child, though.

**WIDNALL:** Well, I was very good in math, and I sort of identified science and mathematics as a place I was going to go, and so I ended up at MIT, and then link that together with my interest in airplanes, and--

**INTERVIEWER:** Did you ever want to be a pilot?

**WIDNALL:** No. Well, not really. I mean, I love flying, but-- No, I really wanted to be an engineer. Wanted to--

**INTERVIEWER:** Are you a pilot?

**WIDNALL:** No. I'm not a pilot, but if you take off, I can fly.

**INTERVIEWER:** And you've done gliding.

**WIDNALL:** I've got gliding. Yeah, I've done gliding. I've pulled 9 G's, I've flown F-15's and F-16's and lots of different airplanes. I did land a trainer once, and I've taken other airplanes off, but obviously I'm not a pilot. I always have a pilot with me.

**INTERVIEWER:** Many of the men who went into engineering were tinkerers as children. They played with ham radios, or cars, or more recently computers. Did you tinker in any way?

**WIDNALL:** Yes.

**INTERVIEWER:** How?

**WIDNALL:** Yeah, I was a tinkerer. Well, this is a common pattern among women in engineering. I was the oldest child in a family without boys. So I was the boy. I was my father's right hand man. We painted, we did electrical work, we did plumbing, we did our--

**INTERVIEWER:** So he was very handy.

**WIDNALL:** He was very handy. Yeah, he was very handy. I was 21 years old before I found out that you could hire people to come into your house and do things. He did everything. Of course, our greatest contribution was when we painted the front porch the day my mother was having a dinner party, and everybody had to go in the back door. She was not very happy about that. But we were constantly doing things, and so I have a lot of hands-on experience about building things. And you know, it's not that you can't become an engineer without that, but if you also have that in addition to all the other skills, it really makes putting things together a lot easier.

**INTERVIEWER:** Did your girl friends, when you were growing up, do any of this? Were you conscious of the difference?

**WIDNALL:** No, I don't think so. I mean, I was different. But I was totally accepted by my friends. I mean, there was no sense of being isolated or by myself or something like that.

**INTERVIEWER:** So you were a tomboy too, you said.

**WIDNALL:** I was a tomboy. Yeah, I was a tomboy.

**INTERVIEWER:** Which meant what?

**WIDNALL:** Well, it meant basically that there were no girls in my neighborhood, so my playmates were boys. I guess that's what it means to be a tomboy.

**INTERVIEWER:** Did you play football and baseball?

**WIDNALL:** Yeah, I did play football. At a very young age. I didn't play football for a long time, but I did. At eight, nine years old, I did play football.

**INTERVIEWER:** Was your father still riding in rodeos as you grew up, or did he stop at some point?

**WIDNALL:** No, he stopped. He wandered around the West, riding in rodeos, and then he ended up in Tacoma where he had an uncle. And so he sort of settled down in Tacoma and met my mother, and they just basically settled down there. So he had stopped the rodeo thing when I was born.

**INTERVIEWER:** But his family had come from a ranch that didn't do well or something?

**WIDNALL:** Yeah, no, it's an interesting story. His family had a ranch in Colorado, and they lost it in the Depression, and he was sent out into the world with one horse and one saddle. Probably had a hat, too. And he was probably 18 years old, 17, 16, I don't know what, but he was sent out into the world on a horse. And no other resources. So clearly, he was going to be a ranch hand.

**INTERVIEWER:** And what was he doing by the time you were growing up? What kind of work--

**WIDNALL:** Well, he was working. I think he was going to college. It's a little hard to remember, because of course I was very young, but he worked at the shipyards during World War II. He was a sort of coordinator. He's very smart and very mathematical, so he was the one who would decide whether the construction crew was following the blueprints to put in a staircase or railing or whatever it is they were doing to build these aircraft carriers. There was a very large aircraft carrier shipyard in Tacoma, and that's basically where he worked. And he was going to college part time, so he got his Bachelor's degree, and then did a variety of things.

**INTERVIEWER:** Did he ever take you to any of those jobs sites?

**WIDNALL:** No, I can't remember ever going to the ship-- I was very, I mean, I was six years old. So I wasn't at any of those.

**INTERVIEWER:** And where did you go to school when you were growing up?

**WIDNALL:** I went to Catholic school. Grade school, St. Patrick's, and then I went to a Catholic girl's school. And there's probably something to that, because it is often said that women who go to school at girl's schools end up more independent, with more leadership qualities, less docile. No one's ever called me docile.

**INTERVIEWER:** But there was enough math and science for you to get a good grounding in them?

**WIDNALL:** Oh yes. I had fantastic teachers. I had the nuns, my algebra teacher, my principal-- extremely bright-- my chemistry teacher-- no. Very, very good education. I did, once I had decided to go to MIT, I did have to go to the local public high school to take physics, because physics was not offered in my high school.

**INTERVIEWER:** How much of a culture shock was that?

**WIDNALL:** Oh, it wasn't too bad. I mean, I was single-minded at that point, so it was--

**INTERVIEWER:** Were you the only girl in the class?

**WIDNALL:** I don't remember, actually.

**INTERVIEWER:** Probably one of a few.

**WIDNALL:** One of two or three. Something like that. But clearly I had a purpose, and I was sort of single-minded about that.

**INTERVIEWER:** Since you were growing up, you didn't ever get the feeling that girls weren't supposed to be good at math and science.

**WIDNALL:** No. And probably the girls' school helped with that. And my mother helped with that, my father helped with that, so no. I never had that view.

**INTERVIEWER:** How did you come to apply to MIT?

**WIDNALL:** Well, I actually joined at the-- I entered the science fair, and I won the local science fair at Tacoma.

**INTERVIEWER:** This is when you were a junior in high school?

**WIDNALL:** Junior in high school. And I went to the nationals in Cleveland, on a train, with Sister Albertine, my chemistry teacher. And there were a couple of other people who went with us. I mean, we picked up some guy in Montana and we had this big train full of high school kids that were on their way to Cleveland to go to the nationals. So I went to the science fair, and in connection with that, I think one of the judges was at MIT, had a PhD in civil engineering. And so he started kind of mentoring me, and he said, you should go to MIT.

**INTERVIEWER:** And this was a judge who lived in Tacoma?

**WIDNALL:** He lived in Tacoma. And a civil engineer, had a pre-stressed concrete firm, built big bridges and stadiums and all sorts of big things. And so he said, you know, you should go to MIT, and I said where's that? And he said that was in Boston. And so he basically ram-rodged that whole thing through and got me a scholarship. I was awarded the scholarship from the Seattle alums. There were thirty of us who were coming to MIT, and of course they were all boys, and I was the only girl, and they gave me the scholarship, so I thought, that's good. And so I came to MIT on a scholarship that the Seattle alums put together.

**INTERVIEWER:** And you've said that you had never heard of MIT before then. Had your parents or your teachers? Were they aware of what--

**WIDNALL:** No, not at all.

**INTERVIEWER:** Wow.

**WIDNALL:** Not at all. I think, in terms of the schools that I thought about, I probably would've maybe gone to Reed College or possibly University of Washington. But then, by the time I thought about MIT, then I also thought about University of Chicago, and by then I was thinking quite seriously about several different universities.

**INTERVIEWER:** What was your science project, and how did you come up with it?

**WIDNALL:** Well, my uncle had given me a big chunk of uranium. He worked for a big company in Colorado, I can't remember their name -- Union Carbide. He worked for Union Carbide in Colorado, and he had given me a big chunk of uranium.

**INTERVIEWER:** This is radioactive?

**WIDNALL:** Well, mostly the ore. I don't think it was terribly radioactive. It was mostly the ore, the uranium ore. It would have to be processed to make it really interesting from the point of view of being radioactive. But anyway. So he gave me that, and I thought, well, we could develop some kind of science project around the whole question of radioactive decay of uranium. It was not a science project as much as it was a demonstration project. I build models of atoms and kind of explained to people how the atoms decayed from uranium into the other substances. I think by today's standards it probably would not have won a prize. But Tacoma was just getting started in the science fair business.

**INTERVIEWER:** Today you might have done a very different project.

**WIDNALL:** I might have done a very different project. But anyway. So that's how I came to the attention of MIT and sort of launched my career at that point.

**INTERVIEWER:** Did doing the research for the project give you some kind of thrill or make you feel that this is what you wanted to do for the rest of your life? Was there any kind of ah-ha! experience connected with that?

**WIDNALL:** Well, I think so. Just the fact that scientists had a framework where they understood what was happening and what the implications were, and that it was a reliable predictor of the behavior of the materials. So I think it gave you a sense that there really was something here that one could build on. That there was knowledge that could be built on to develop things. So I think it gives you a sense of confidence that there's a body of knowledge that can be reliably acquired and can be used in a reliable way.

**INTERVIEWER:** And this obviously was way before the internet. Did you have guidance from your teachers or your parents? Or you went to the library? How did you find?

**WIDNALL:** I probably went to the library. I don't think anybody that I was involved with knew where to look. I'm sure I did all with the library.

**INTERVIEWER:** And that was probably a pretty cutting edge topic at that time?

**WIDNALL:** Well I think so. Certainly for a high school student. Certainly for a high school student, to learn about things like that, and what that meant for physics and what that meant for nuclear reactors and atomic bombs and all the other things that--

**INTERVIEWER:** Which weren't that old by then.

**WIDNALL:** No. By then they were not. They were not that old. So it was the beginning of thinking about science and engineering as sort of quantitative fields.

**INTERVIEWER:** But it didn't make you either a nuclear engineer or a material scientist.

**WIDNALL:** No. Not at all. Not at all.

**INTERVIEWER:** What were your first impressions of MIT when you arrived on campus? Do you remember?

**WIDNALL:** Well, first of all, the small number of women was just amazing. It didn't feel like a welcoming place for women, and I made a kind of conscious decision that I would worry about that later. That I wasn't going to take on that issue as a freshman or a sophomore. That I was just going to put that on the back burner, and I was going to get my degree, and then I would think about whether women were welcome in engineering. And I just postponed those questions.

**INTERVIEWER:** What about the experience made you conclude that it wasn't welcoming? Did this go back to-- well, you mentioned your freshman advisor.

**WIDNALL:** Well, yeah. Freshman advisor, people sort of saying, well, why are you here? Why do women come to MIT? Et cetera, et cetera. I just thought those were not very welcoming kinds of questions. But as I moved into the department, into the aero department, I got a lot of really good support from faculty, and so it sort of transformed the issue into excitement about the field.

**INTERVIEWER:** Did the women all stick together in any way? There was so few of you.

**WIDNALL:** I don't know if I'd use words stick together. I think I was always in a position where I was trying to help the other women students. I, as a sophomore, I became a TA. I stayed in the undergraduate women's dorm, I stayed in the freshman dorm, and kind of played the role of a big sister, kind of advising and mentoring the freshman that came in.

**INTERVIEWER:** Within the girls' dorm.

**WIDNALL:** Within the girls' dorm.

**INTERVIEWER:** Which was across the river?

**WIDNALL:** Yeah, Bay State Road. It was only like 20 people in the dorm. It was very small. So I stayed as an upperclassman, and then when we moved into Bexley Hall, I think I also stayed as an adviser. So I think most of the time when I was an undergraduate, I stayed in some kind of mentoring advising role for the new freshmen for the undergraduates. And that was something I did for my whole career.

**INTERVIEWER:** So there actually was a residential option for women upperclasswomen on campus, and that was Bexley?

**WIDNALL:** Yeah, that was Bexley. And I don't remember all the details, but yes. There was a wing at Bexley that was for women students, and I had a room in there with a roommate. At least once, maybe twice. It's hard to remember.

**INTERVIEWER:** How well prepared were you academically, once you got to freshman physics and chemistry and math? Did you pick up at a run, or did you--

**WIDNALL:** Oh, I would say medium. Medium. Certainly in my high school-- and I think this may have been very common in those days-- there was no calculus. I mean, we didn't do anything like calculus. We did algebra. We did algebra, we did trigonometry, we did physics, but it wasn't the physics with math that's done at MIT. So it was all new. It was all new, and I worked hard. And actually, one of the benefits-- you know, when you try to teach someone else, you learn more than they do. So when I was a freshman, I was always giving quiz reviews to the other freshman and trying to help them work through the problems, and I was the one that benefitted from that. I mean, I didn't do it for that reason, but it's a natural outcome of that.

**INTERVIEWER:** You've previously described taking I think it was the first physics tests and having an ah-ha! experience. Can you tell us about that?

**WIDNALL:** Well, yes. On my first physics test I got a very low grade. It's really hard to remember what that grade was. I don't remember. It might have been a 60. It might have been a 30. I actually don't remember what it was. But it was well below where I needed to be in order to do well in the course. And of course, that time was a time when freshman courses were graded. So this was definitely not a good grade. But I looked at that, and I tell the freshman this. When I'm a freshman adviser, I tell the freshmen this. I looked at that, and I did sort of have an ah-ha! And I said, oh, that's what MIT expects me to be able to do. Namely to solve problems that you hadn't seen before. Not to apply formulas, but to get to a deeper level of basically constructing a solution to a problem that you hadn't seen before. And that was really very important. And I think after that I did very well.

**INTERVIEWER:** How easy is it to judge high school students on their ability to make that kind of leap? I just wonder what the Admissions Office faces, if they're getting-- I don't know if they still get this-- but students who are used to plugging in formulas. But now you're really looking for a different kind of mind experience.

**WIDNALL:** Well, you know, hopefully some of these standardized tests are very helpful at sort of eking that out. A lot of the students that we get today have quite extensive internships, examples of projects that they've actually carried out, and so I think the students that we're seeing today are going well beyond just kind of plugging in formulas. And hopefully the high schools have improved, so that a student who's only able to do that is not going to get an A in his physics course. And I think that we're challenging the students a lot more. But it is a little overwhelming. I mean, MIT is getting an enormous number of applications, and trying to sort that out and choose the 10 percent of the applicants who should be MIT students is very challenging.

**INTERVIEWER:** How many of the other women students in your class made it? Did most of them stick with it? Or did all of them drop by the way?

**WIDNALL:** Yeah, it's hard to remember. I guess my gut reaction to that is certainly at least 50 percent graduated. Maybe more. Maybe 60 percent. I think a couple flunked out. I think a couple left for various reasons. I think at that time only one-- of course, this was a time when women didn't go to graduate school. Actually, engineers didn't go to graduate school. It was very unusual for an MIT student to go immediately to graduate school. Most of them went out to work. And I think it is the case that only one other woman went immediately for her PhD. There was only one woman. So that would leave maybe ten to twelve women who went out into the workforce.

**INTERVIEWER:** Were you involved in any extracurricular activities when you were a student?

**WIDNALL:** I think so. I mean, it's very, very hard to remember. Very hard to remember. I was--

**INTERVIEWER:** Did some student government, maybe?

**WIDNALL:** I did some student government stuff. I think I was in charge of something called a Public Relations Committee. We published a newsletter, we did interviews with faculty, and I'm sure there were other things that I was involved in. As I said, the whole issue of mentoring other women students was a big part of the activities that I was involved in.

**INTERVIEWER:** Was the social life for the few women good?

**WIDNALL:** Oh, it was good. Yes, it was very good.

**INTERVIEWER:** And you ended up marrying a classmate?

**WIDNALL:** Somebody who was actually a year ahead. Yeah. A year ahead. No, I think the MIT women students, obviously, we all had a good time.

**INTERVIEWER:** How did you and your husband meet?

**WIDNALL:** We didn't actually start going out 'til I was a senior and he was a graduate student. But we knew each other for the whole time. Anyway, he was a fraternity brother who lived across the street dance, and I sort of knew him, but we didn't do any dating until really the end of my undergraduate years.

**INTERVIEWER:** You were just finishing up your doctoral work when McCormick Hall was built to house women undergraduates.

**WIDNALL:** I'm not sure that's true.

**INTERVIEWER:** Well, it came online--

**WIDNALL:** When did McCormick come?

**INTERVIEWER:** In about 1963 or 1964.

**WIDNALL:** Really? I thought it was much earlier than that.

**INTERVIEWER:** Nope.

**WIDNALL:** Yeah. I mean, because that was the big-- well no, I guess that's right. That was the big issue with respect to the admission of women students, up to the--

**INTERVIEWER:** And then they built the second wing in 1968 I believe it opened, and then dorms went coed in about 1970.

**WIDNALL:** Yeah. Right. I think earlier there was this feeling that if they couldn't house the women in women's dorms, they were not going to admit women, and so then they got the contribution to build McCormick Hall and then they were able to increase the number of women and then the coed--

**INTERVIEWER:** Were you aware of all that discussion? And did you have any reaction to it, and to the decision to build the hall?

**WIDNALL:** Oh, I was very much in favor of it, obviously. Yeah, I was aware of it. And I can't remember how or why, but yeah. No, I was fairly active as quote a representative of women students to the higher administration. I mean, for example, when Killian became science adviser, I was within that small group of students to whom he made the announcement. Again, it had to do with student government. And so I was an interface between students and the central administration, and so yeah. I was very well aware of everything that was going on.

**INTERVIEWER:** When you entered MIT, was aero and astro your plan in terms of major?

**WIDNALL:** Well, probably not. Again, coming in as most MIT students did in those days, I probably was thinking physics and that related to the science project that brought...

**INTERVIEWER:** Even with Boeing back home?

**WIDNALL:** Yeah.

**INTERVIEWER:** McChord and--

**WIDNALL:** Right. But by the end of my freshman year, it was clear that I wanted to go into aeronautics.

**INTERVIEWER:** And you said the department was generally pretty welcoming?

**WIDNALL:** Yes. Very, very welcoming.

**INTERVIEWER:** And you had mentors there? Or--

**WIDNALL:** Yes. I had several mentors. Professor Holt Ashley was an adviser. Professor Jimmy Moore was an adviser. They were extremely welcoming.

**INTERVIEWER:** Do you have any sense of whether aero and astro is any different from other engineering departments in its welcoming women?

**WIDNALL:** No. I really don't know. I suspect that every department has got several faculty who are very welcoming, and others that don't even notice.

**INTERVIEWER:** And how much do you think it was a matter of your being a very, very good student, and their delighting in very, very good students, and how much do you think it was wanting to reach out and be more inclusive and you were so unusual in that respect?

**WIDNALL:** I think probably being a good student was a big part of it. I truly was one of the top students in the class, and so obviously I got a lot of encouragement for that. No, my adviser sort of said, well, you should definitely go to graduate school. Which obviously is very uplifting for any student. If your advisor picks you out and says you should go to graduate school, there's obviously a very nice message in that.

**INTERVIEWER:** Was that a hard decision, to stay and go to grad school? Did you think twice?

**WIDNALL:** No, not really. I think at that point I understood that, if I wanted to accomplish what I wanted to accomplish, I needed another layer of courses, and that what I got as the undergraduate, although very valuable, it wasn't all there was. And I needed, I wanted more.

**INTERVIEWER:** And your notion at that point of what you thought you wanted to accomplish? How would you characterize that?

**WIDNALL:** I never looked that far ahead. It just seemed to me that going to graduate school was the right thing, and working with these particular professors was obviously the right thing, and I really had great enjoyment. I can't say I even looked beyond that. I mean, I didn't think about being a faculty member. I just, again, probably thought I was going to go to work for Boeing. I thought, OK, we'll get this PhD, and then we'll go to work for Boeing.

**INTERVIEWER:** And by then you were married.

**WIDNALL:** Yeah, I was married by then. I was married by then, and I think it's true that you're not so mobile when there are two of you. And so it probably would have been a much more complicated career decision to sort of weigh what could the two of us do together that would make sense.

**INTERVIEWER:** What was your experience like as a graduate student, and was it very different from your undergraduate years?

**WIDNALL:** I don't think so. Again, I was working with the same faculty that had been so supportive with me as an undergraduate. I think the issues were intellectual. I got plenty of intellectual support. I really enjoyed what I was doing. Taking a lot of good courses, graduate school. Several of my classmates were people I had gone to undergraduate school with, so we were very good friends. We could take courses together, we could compare notes, and help each other make decisions, so it really was a very supportive environment.

**INTERVIEWER:** What was your dissertation about, and how did you choose the topic?

**WIDNALL:** My dissertation was about unsteady aerodynamics having to do with the forces on oscillating airfoils. And in some sense, it was the topic that my thesis adviser had the financial support for, which is always the situation with graduate students, that you have a research assistantship and you're basically being supported to do work on a particular project. Where it goes is really up to you in terms of the directions you take it. So it's some combination of where the research contract felt we should go and where I thought the most exciting topics lay.

**INTERVIEWER:** Did you work at Boeing every summer while you were in school as an undergrad or even as a grad student?

**WIDNALL:** Yeah, I worked for Boeing pretty much every summer. Pretty much every summer, even starting with my freshman year. And it was always a lot of fun. I really always got really good experiences at Boeing. I learned things at Boeing that I didn't learn at MIT, so it was very complementary, and I think even after my senior year when, I was going to graduate school, I think that summer I also spent at Boeing. And of course, as you say, by then I was married, so my husband was also working at Boeing. So the two of us were both out there, and living at home with my parents and working at Boeing.

**INTERVIEWER:** Were there other women in the Boeing engineering crew?

**WIDNALL:** Oh, yeah, I'm sure there were other women at Boeing. It's hard for me to remember, but, you know. Not a large percentage, but, certainly a few.

**INTERVIEWER:** Were they role models in any way?

**WIDNALL:** No, I can't say that, because they were probably so distant, working in groups that I had no relationship with. I would just see them. But no. There were no role models.

**INTERVIEWER:** But the men didn't accuse you of taking jobs away from men or anything.

**WIDNALL:** No. No, at that point, engineers are still a very valued quantity. And I don't think it's a situation where people feel you're taking a job away from somebody. I think it's a situation where they're very happy to have you in their organization.

**INTERVIEWER:** You had your first child before you received your doctorate. Was it hard to juggle having a baby and working at MIT?

**WIDNALL:** Yeah. I mean, it's challenging. When you find yourself in that kind of situation, you have to set priorities. You have a list of things that you have to do, and you have a list of things that you have to give up. And so you set priorities, you make choices. My husband is extremely supportive, and obviously the two of us were going to do this together, and if you don't have that situation, you can't make it work.

**INTERVIEWER:** What do you think you gave up? What are the trade offs?

**WIDNALL:** Oh, I think probably our social life was not as active. We didn't give a lot of dinner parties, we didn't go on a lot of vacations, we didn't go on a lot of trips. We sort of focused on basically our two careers plus our children. You kind of narrow the focus a little bit.

**INTERVIEWER:** When and how did you decide to stay at MIT and teach?

**WIDNALL:** Well, again, throughout my career-- in fact, I tell people this, that I have never learned to say no. And so I think somebody said, would you like to stay, and I said yes. And so I was made an offer, and I accepted the offer, and so I started out as an assistant professor. It was a very interesting situation, because both of my thesis advisors, all of a sudden it was almost like a collision. They went in opposite directions in the same year.

**INTERVIEWER:** But they both left MIT.

**WIDNALL:** Yeah. One of them went to Sweden where he had been a chaired professor, and the other one went to Stanford. Bang bang. They were both gone. And so that kind of opened up a need for somebody in the field that I had been working in.

**INTERVIEWER:** Which was fluid dynamics.

**WIDNALL:** Yeah, fluid dynamics. Unsteady flow. Air foil theory. And so I was sort of offered a position at that point, because of a departmental need. I think if that hadn't happened, it isn't clear that I would have stayed at MIT, because then we would have had three faculty members in the same field, and that's fairly unusual.

**INTERVIEWER:** So you filled four shoes instead of two?

**WIDNALL:** Yeah, something like that. At least at the early stages. At the early stages.

**INTERVIEWER:** Was there any fuss or celebration over your being the first alumna to join the department's faculty? Or maybe the first-- were there other women teaching in the engineering school at that point?

**WIDNALL:** I'm not aware of it. I had this vague feeling that there was a lecturer in electrical engineering. But there were no other women faculty.

**INTERVIEWER:** Were you conscious of being such a rarity, and did it matter to you in any way, terms of women on the faculty?

**WIDNALL:** Well, maybe I had a slightly different approach to it. It certainly didn't bother me. In other words, I was fine. But I felt that I should be doing things to help other women. To increase the number of women, women students, women faculty, women graduate students, to kind of make it possible for them to succeed at MIT. I mean, I felt very confident that I knew what I was doing, and, well, I'm very tough.

**INTERVIEWER:** I think there were, perhaps, about ten women on the total MIT Faculty at that time, and most of the others were in the humanities. Did you know them, or get to meet them at some point? I think I did. I mean, we had various mechanisms for meeting them, but we had a group of women faculty in the humanities who were sort of forming the women's studies program, and they were doing research on issues affecting women, and so there were not a lot of us on the faculty, so we did kind of bond together in various ways.

**INTERVIEWER:** In terms of your own department, and your being the first woman there, did that change anything? Department meetings or gatherings or?

**WIDNALL:** Well again, I wasn't feeling that somehow I wasn't being treated well. I obviously was in a position to mentor women students, and also to give advice to my colleagues about how to make sure that the treatment they were giving women students was effective and furthered their careers.

**INTERVIEWER:** Did there begin to be more women students in aero and astro?

**WIDNALL:** Well, there were always a small number, but I think the number of women students in aero basically grew with the number of women students at MIT. And I don't know what our numbers are. They're someplace between 25 percent and 35 percent at this point. And we have actually have quite a substantial number women on the faculty. I think we have eight women on the faculty in aero, out of a total faculty of 35 or some number like that.

**INTERVIEWER:** You were involved with the women's forum. What was that?

**WIDNALL:** Well, that was an organization that we began to put together that involved all of the women faculty at MIT, and one of the focuses of that was to sort of educate women about the tenure process. We felt that women needed to have some understanding about what they had to do in order to be successful at MIT. How would they be evaluated, the importance of outside reputations, outside letters, the opinion of peers, the opinion of experts in your field. And so we wanted to be very straightforward about those issues, and so we met together, I think we met once a month for lunch, and we would have discussions of various issues, and then sometimes we might invite Paul Gray or somebody else to come and somehow give us a lecture about some particular topic. And I think we felt we were basically serving MIT. And I think we expressed those ideas. That we weren't there to sort of undercut MIT, that we were there to make it possible for MIT to succeed. And I remember our discussions with Jerry Wiesner and Paul Gray and Howard Johnson, and I think we even met at the president's house, basically saying we're here to help. We're here to make MIT more effective. When Howard Johnson was president, I think that was the time when universities needed to explain their recruitment of women. They needed to justify that the hiring was fair. They needed to have success. And so basically, we said we are here to help you with that agenda. And so we felt we were partners.

**INTERVIEWER:** And he was receptive.

**WIDNALL:** I believe-- yes. Yes, they were.

**INTERVIEWER:** And all of them were.

**WIDNALL:** Yeah. I think they were. I think in particular Howard Johnson, Paul Gray, Jerry Wiesner, I think they were all very receptive and very genuine. And that may be in contrast to the university presidents from other schools, because I felt MIT was genuinely willing to make that kind of commitment. And as the women's forum, one of the things that we resulted in that was the hiring of Mary Rowe, who came in at that point as a kind of an ombudsman or a mentor in some sense, a member of the senior administration, to make MIT more effective in this whole area of the hiring and mentoring of women faculty. And of course she's been at MIT now since those times.

**INTERVIEWER:** So even though her role was to be an ombudsman, it was also a piece of it that was specifically aimed at helping women faculty and staff?

**WIDNALL:** Yes. I think her role really started out focusing on women faculty and staff, and then as MIT began to be successful in those and sort of saw the issue in broader terms, then I think her role was brought into the issue of ombudsman. But I think she's still in a position to talk to women faculty and students about issues that concern them and sort of give them advice about how to go about getting issues like that dealt with.

**WIDNALL:** Do you remember writing a proposal that helped create her job?

**WIDNALL:** No, I don't remember.

**INTERVIEWER:** No. I think you backhanded it as part of the women's forum.

**WIDNALL:** But I probably did. I mean, I can easily imagine doing that.

**INTERVIEWER:** I wondered where the idea had come from.

**WIDNALL:** No, I think it was a combination of what happened in the women's forum, and I think Millie was obviously a part of that. I was a part of that. But I don't remember the details about writing a proposal.

**INTERVIEWER:** These were your years also as assistant professor. What were your responsibilities, and what were those years like?

**WIDNALL:** Well, typical assistant professor. I was responsible for teaching, I was responsible for research, advising graduate students, raising money to support those graduate students, so it was a very typical assistant professor job.

**INTERVIEWER:** Had you done much teaching before you became an assistant professor, beyond the tutoring you did in some of the dormitories?

**WIDNALL:** No, I don't think so. But that's pretty normal. Some of the courses that I was teaching were courses that were basic courses in the department. They had pretty good frameworks, it was not too difficult to sort of step in and say, OK, I'm going to teach this course, and this is what we're going to cover. Et cetera, et cetera. Pretty straightforward.

**INTERVIEWER:** How would you characterize your teaching style?

**WIDNALL:** I'm not sure. I'd rather have the students characterize my teaching style. I do love teaching, so I try to present a clear lecture. I think that obviously a very important part of an MIT education is problem sets. I know that drives the students crazy, but in some sense it is the working out of individual problems that lead them up the ladder to being able to do the whole thing.

**INTERVIEWER:** And what about your research? What would you say were your most important achievements in your research career?

**WIDNALL:** Well, I think for somebody in fluid dynamics, it's always nice to have an instability named after you. That's a great honor. And so there is an instability called the Widnall instability.

**INTERVIEWER:** And what's that about?

**WIDNALL:** Well, it deals with the instability of vortex flows, and it affects both vortex rings and also the wakes of aircraft, and so I think that that's kind of a fundamental contribution. I also worked on aerodynamic noise, primarily with helicopter blade-vortex interaction, and airfoil theory, wing theory, things like that. Those are the areas that I taught.

**INTERVIEWER:** The Widnall Effect, what was the research underlying it? Did you do it as an assistant professor, or later, and were you conscious at the time of doing something very foundational?

**WIDNALL:** Well, it's kind of hard to remember all of that. I don't actually remember, but it actually was research that was done over a period of years. I mean, there was an initial graduate student, he was doing some experimental work in this field, and we made some observations about the character of this instability, and then there was a series of maybe two or three graduate students that came after that. One of the applications of this kind of fluid mechanics is in the question of how long do aircraft wakes live, and that's kind of important, because if you land a plane after somebody else has landed, then you could get caught up and your plane would tip over and you would fly into the ground and be killed. So I mean, it is kind of a technically very important issue that totally controls the separation of aircraft landing at airports. So we did a whole variety of things that were both on the practical side and on the fundamental side, and then it finally culminated in some really basic work that was published in the *Proceedings of the Royal Society* that kind of put the hammer in the final stages of the analysis.

**INTERVIEWER:** Are you doing any hands-on research at this point, or did that get left behind as you moved up in administrative positions?

**WIDNALL:** No, I think I'd have to say I'm not really doing any research. I mean, at this point in my career, I'm doing a lot of teaching because I think that at this stage I really enjoy the teaching and I think I can relieve some of the teaching responsibilities from some of the younger faculty, who are in that different stage of their career where they're running around trying to get support to do the research and support their graduate students. I am serving on a few PhD committees. But mostly I'm focused on teaching plus a lot of the other activities that I'm involved in, faculty committees and other kinds of things.

**INTERVIEWER:** Your years as an assistant professor were a period of great upheaval over the Vietnam War at MIT and elsewhere. Did either the war or the protest against it affect your work in any way, and were you involved in any of the activity for or against the war?

**WIDNALL:** Not specifically, although during those years there was something that was put together by Howard Johnson called the Commission.

**INTERVIEWER:** The Pounds Commission?

**WIDNALL:** The Pounds-- No, I don't think it was Pounds.

**INTERVIEWER:** The Pounds Panel?

**WIDNALL:** No, it was Hoffman.

**INTERVIEWER:** Oh, the Education Commission.

**WIDNALL:** It was the Education Commission. And I think it had a more formal title, but I don't remember what it was. Basically I think it was called the Commission on MIT Education or something like that. And so that was an activity, and it was running in parallel with a lot of the student upheavals and a lot of the protests. It's interesting that I was working with a small subset of that group on some specific recommendations, and we actually recommended that there be a dean for undergraduate education. And then twenty years later, there was a dean for undergraduate education. I'm not sure most people connect that with the earlier commission, but that was one of our main recommendations, and all the reasons for doing it are exactly the same rationale as the ones that were finally used to create the dean of undergraduate education.

**INTERVIEWER:** Was any of your research in the 1960's connected with the Defense Department or military applications?

**WIDNALL:** Well, I think so. The military supports very fundamental research, and my research on aircraft vortex wakes was supported by the Air Force. I would say that's more of a safety issue than a military issue. I actually had a good friend who was killed when his light plane hit the trailing vortex of an aircraft, and he was a colonel, so I guess that's Air Force. I guess that's military. But the Air Force office of scientific research sponsored extremely fundamental research that had broad applications beyond just military.

**INTERVIEWER:** And was any of that disrupted by the campus protests, either at MIT or elsewhere? And was there any pull-back in funding, or--

**WIDNALL:** No. No, I don't think so.

**INTERVIEWER:** Or protests outside of the labs or anything?

**WIDNALL:** No. I don't remember. There may have been things going on in other parts of MIT, but none of that really affected me. I remember one very funny incident, because I really was close to a lot of the students. So I remember coming out of my office, and I needed to go across the street to Kresge Lot to pick up my car and drive home, and there were some student protests going on in the street. And one of my student friends said, oh, here, Professor Widnall, let me take you across this way so we can avoid the tear gas. And he was a student protester, but obviously he cared about me and cared about getting me across the street so that I wouldn't be affected by what was going on in the protest. So in some sense, the students remained students.

**INTERVIEWER:** Yeah. And did the protest-- your husband, at that point, was working at Draper?

**WIDNALL:** Yeah, he was working at Draper. Right. They were doing the Apollo Project.

**INTERVIEWER:** And did the protesting affect those activities at all?

**WIDNALL:** Well, the protest affected MIT's relationship with Draper. MIT made the decision that they would separate from Draper. That had primarily to do with some of the military projects having to do with missile guidance and stuff. Bill was working on the Apollo Project, which I don't think the students had any--

**INTERVIEWER:** Which just continued--

**WIDNALL:** It just continued. We even went to the moon, and I don't think the students had any fundamental objection to the Apollo Project. But they were protesting about the involvement of Draper in some of the military projects.

**INTERVIEWER:** Coming back to the Hoffman Educational Commission that you mentioned. Do you know how or why you were chosen for that?

**WIDNALL:** No. I guess-- I'm thinking about this-- I guess I was the only woman on the committee. So I was an engineer, I was a woman. I think when they looked at the balance that they needed to bring to the committee-- and they also basically deliberately chose younger faculty. If I remember, there were two of us from the School of Engineering, myself and Sam Bodman. I don't know if you remember Sam Bodman, but he later was Secretary of Commerce. And he was a chemical engineer, extremely prominent. So Sam and I were both chosen. And then Lester Thurow was on the commission, and then Dan Kemp, who is a fantastic teacher in chemistry, and Arthur Steinberg, who was a major figure in humanities, and then Erik Mollo-Christensen and Ken Hoffman. So there were only two senior faculty.

**INTERVIEWER:** And then a few students.

**WIDNALL:** Yes. Two or three students. Yes, I remember the students. So I don't know how we were chosen, but it was certainly a good, strong committee.

**INTERVIEWER:** It was very time consuming, if I remember hearing and so forth, and it lasted I think a couple of years. Were you concerned that it would get in the way of your research and your--

**WIDNALL:** Well, what I remember about that was that I was sort of excused from teaching responsibilities. I had a couple of graduate students working at that time, and I did the very best I could to keep up with what they were doing, but they understood that I was just much less available than I had been in the past.

**INTERVIEWER:** How did you react to your being named to this commission? Did you welcome it, or did you say oof!

**INTERVIEWER:** I always welcome these things. I was always up for a new challenge. That's a personal characteristic, is that I--

**INTERVIEWER:** Do you remember what the commission recommended, beside the dean for undergraduate education that you mentioned a few minutes ago?

**WIDNALL:** No, I actually don't, because I was on the small subgroup with Dan Kemp and Arthur Steinberg, and we were kind of fixated on that whole issue of undergraduate education. And so I can't remember the sole breadth of recommendations that the commission made. In some sense, it occurred at an unfortunate time, because of the student protests and the transition from Howard Johnson to Jerry Wiesner, so I think many people feel that it did not have a major impact on what was going on at MIT.

**INTERVIEWER:** I think Jerry was supposedly less interested in having that commission than Howard was, and there he was, inheriting it.

**WIDNALL:** Yeah. So I think that's probably right. I was just gratified that ultimately our recommendation in fact was enacted. And so, I mean, that's success.

**INTERVIEWER:** Somewhere along there, you won tenure. Did that change your life at all?

**WIDNALL:** No. I mean, it would have changed my life if I hadn't gotten tenure, but I think at tenure time, you are fundamentally an associate professor. But again, it's very hard for me to remember the details. Some time during that period, I went to Washington.

**INTERVIEWER:** In 1974.

**WIDNALL:** Yeah, for the Department of Transportation.

**INTERVIEWER:** You had tenure by then, I think, and--

**WIDNALL:** It's a little fuzzy to remember all those different things.

**INTERVIEWER:** I think you became the director of University Research for the Department of Transportation. How did that come about, and how did you think about do I want to do that? Aside from you like to do everything and you don't say no?

**WIDNALL:** That's exactly how it happened. First of all, the offer came from a man who was named Bob Cannon, who was a faculty member in the mechanical engineering department.

**INTERVIEWER:** At MIT.

**WIDNALL:** Yeah. But he was, at that time, Assistant Secretary for Transportation. And it was quite specific. I was down at the NOAA meeting. I had been awarded the Outstanding Young Man of the Year award by the AIAA and I was up on the podium in my black tie accepting this award and Bob Cannon came up to me and he said, I would like you to come to Washington and be director of University Research. And what did I say? OK. I mean, I never really thought twice about it, because, you know.

**INTERVIEWER:** Although you were going to have to move your family down and disrupt your husband's career.

**WIDNALL:** Yeah, right. Move the family, go down to Washington, yup. Absolutely. But it's one of these situations where somebody makes you an offer and you say OK, I'll do it. And then, that was--

**INTERVIEWER:** How much of a learning experience was being down there that year?

**WIDNALL:** Well, actually, it was particularly challenging, because I think this AIAA thing was in February and I was scheduled to go down in August. So I was all set to go, and then Bob calls me in May, I think. And he tells me, well, I'm just in my car, driving out of Washington, I'm talking to you on the phone. I have just been offered the position of dean of engineering at CalTech and I have accepted it. Have a good time. So here was the guy who hired me, and he wasn't going to be there. So I moved into the office, and I had a new secretary, and the Secretary of Transportation was just turning over. I had a new Assistant Secretary to report to. I had this office and stuff like that. It was probably the best thing that could have happened to me, because I had nobody to rely on. I had to make my own way. I had to create my own stable of supporters. I had to make interactions with all of the Assistant Secretaries, because they were the ones that made the judgments about our research program. I became very good friends with the Deputy Secretary of Transportation, he was John Barnham, who has in fact remained a close friend ever since. The Secretary of Transportation turned over, and it's a guy named Bill Coleman, who I've seen from time to time. So in some sense, that was a real career building experience, to suddenly find yourself in charge of an office. It's always nice to be in charge. Then there's no question about who's in charge. So if you're in charge, OK, I'm in charge. But then I had to have these interactions with all of the Assistant Secretaries and the Undersecretary and the Secretary to accomplish what the program had to accomplish.

**INTERVIEWER:** And was a year enough to do it?

**WIDNALL:** Well, it was all I was willing to spend. But no. I think we accomplished a lot. Moved the program forward, and certainly I got a lot out of it personally.

**INTERVIEWER:** Do you think of yourself as a political person? It sounds like you have instincts that say make contacts, build a base, that are in essence political.

**WIDNALL:** No. Well, I made sure I defined them as political. I think of political more in terms of people arguing about what should be the outcome of some election or some debate in Congress. What I think of it more as leadership and consensus building and interaction and kind of getting people all on the same page to sort of work together. I don't think of that as political.

**INTERVIEWER:** When you came back to MIT after that year, did you see it differently in any way because of having spent the year away or having spent the year in Washington?

**WIDNALL:** Probably not at that stage, but I think those skills that I brought back with me were then going to be helpful later on.

**INTERVIEWER:** Do you think it helped your career in the way you were viewed at MIT? I think you were promoted to full professor after you came back.

**WIDNALL:** Yeah, I think that's right. But I think during that next phase of my career, I was an academic. I was a researcher, I was doing fundamental research, I was doing, again, some of this most important research that has extremely fundamental character. So I didn't make any change in direction of my research after I got back from the Department of Transportation.

**INTERVIEWER:** It was only a few years later, however, that you became chair of the faculty, and not only were you the first woman in the post, but you were pretty young. You were 40 or 41. How did that come about?

**WIDNALL:** Well, beats me. I was actually telling Susan today, because we were meeting on it--

**INTERVIEWER:** Susan Hockfield.

**WIDNALL:** Yes. We were just talking about chairs of the Faculty, and I just said, well, you know, one day, I'm sitting in my office and Ken Smith comes and knocks on the door and he said, you know, I'm chairman of the nominating committee, would you be willing to be chairman of the Faculty? And I said OK. Which is always what I say any time anybody asks me a question like that.

**INTERVIEWER:** Did you say what does the chair of the Faculty do?

**WIDNALL:** No, I just said yes.

**INTERVIEWER:** So what does the chair of the Faculty do? And what were you able to do in your case?

**WIDNALL:** OK. So the chair of the Faculty, at that time, chaired the faculty policy committee. Also--

**INTERVIEWER:** Educational policy.

**WIDNALL:** Educational policy. Also, a little fuzzy. Well, I think it's broader than educational policy, but it is the voice of the Faculty. It is the voice of the Faculty. I think now it's called the faculty policy committee. I think then it was called the educational policy committee. But I think you also appoint all the chairs of all the faculty committees, so you kind of keep in touch with the committee on curriculum, the committee on academic performance, the committee on discipline, all the different committees that are operating. We actually did some really important things. We did some major revisions of the MIT curriculum. We are the ones that put in the biology requirement. The two terms of chemistry were then replaced by one term of chemistry and one term of biology.

**INTERVIEWER:** No, it was one term of chemistry by then. I think the bio came out of the three science distributions. It went down to two.

**WIDNALL:** Well, that may be, but we were the ones that said--

**INTERVIEWER:** That made it bio.

**WIDNALL:** One chemistry and one biology was now the requirement. We started the writing requirement. And obviously that's morphed a little bit, but we basically started the writing requirement. We made the-- I can't remember actually how we did this-- but we sort of made the physics requirement for entry a little optional. And going back to my high school days, you could see why I might want to do that. Because I had to take physics at another school. So we loosened up a little bit the question of whether or not--

**INTERVIEWER:** For admissions.

**WIDNALL:** For admissions. For admissions, whether or not you had to take physics. It's hard for me to remember some of the other things we did, but we're the ones that really took a look at the MIT curriculum and made some really fundamental changes in the undergraduate requirements.

**INTERVIEWER:** Did you find that, as Faculty chair, you were suddenly privy to all the policy issues that MIT was facing, and a broader perspective of the other schools? I think you probably sat in on Corporation meetings.

**WIDNALL:** Sure. And also Academic Council.

**INTERVIEWER:** And Academic Council.

**WIDNALL:** And I think we went through a transition, and I think I was one of the ones that kind of pushed us in this direction. It used to be that MIT would meet once a year with CalTech. And so we saw ourselves, in some sense, in that way. That this was our partner on the West Coast.

**INTERVIEWER:** This would be, like, the academic councils would meet?

**WIDNALL:** Yeah. Yeah. The academic councils would meet. And I don't know exactly how it happened, but I'm pretty sure I was one of the ones that suggested that we also meet with Stanford. Because it seemed to me that, in some sense given our breadth, that I think we had more in common with Stanford. So we began meeting with Stanford. We began--

**INTERVIEWER:** Separately, or it became a threesome?

**WIDNALL:** No, no. No. Twosome. And so we began meeting with Stanford, and we talked about admissions, we talked about undergraduate curriculum, we talked about all the things that you have to talk about. And I think the general view of people was that we had at least as much to interact with Stanford on as we did with CalTech. So I think that was a change in the way we saw ourselves.

**INTERVIEWER:** So you saw the top administration, up close, really under two different presidents, because I think Jerry Wiesner was followed by Paul Gray in the middle of your term.

**WIDNALL:** Yeah. I guess so. I think that's right. Again, it's a little fuzzy.

**INTERVIEWER:** Were they very different as presidents? How do you recall their presidencies and maybe changes?

**WIDNALL:** I knew them both pretty well. They were very different kinds of people. But I can't connect with specific things that were going on as presidents.

**INTERVIEWER:** Maybe it was the trajectory really was not so different as the men themselves.

**WIDNALL:** No, I don't think it was really different. I mean, they had slightly different interests. Paul was very deeply committed to diversity, and he made that a real theme of his administration. But I think they were both great presidents.

**INTERVIEWER:** Were you involved in the selection of Paul as successor?

**WIDNALL:** Yeah, I think I was. Again, it's a little hard to remember, but--

**INTERVIEWER:** You've been on a lot of committees.

**WIDNALL:** Yeah, I've been on a lot of committees. I was on the faculty committee, and I think one of the important things that happened then-- and I'm not going to remember who was on the Corporation committee-- but I think we as a faculty committee, and I think our chair was a guy from chemistry. I'm not connecting it. But I think the really important thing is to establish that the faculty has an equal voice. That we were not a subcommittee to the Corporation, but that in some sense we were an equal participant in the process. And that came to fruition with the committee that selected Susan, because at that point, it was a co-committee. We were a single committee with a chairman-- co-chairmans. My name remembering is terrible, but Jim Champy and one of my best friends from physics whose name has totally slipped. But in any case, we had made the point that the faculty was an equal player, and so then we'd reached the point where everybody understood that we were going to choose this as a single committee, not as a faculty advisory committee who met occasionally with the Corporation selection committee.

**INTERVIEWER:** But you're talking about that having happened with the committee that selected--

**WIDNALL:** Yeah, with the Paul Gray thing. Well, we moved the ball during that time. I think the Corporation committee probably met individually and we met individually, but our joint meetings were obviously the most important things that were taking place. And so we sort of moved the ball along towards that.

**INTERVIEWER:** Did any of the top administrators, presidents or provosts, ever talk to you about what it was like to be a woman on the MIT Faculty or the MIT engineering faculty?

**WIDNALL:** No, I can't say that that ever happened. I can't remember that ever happening.

**INTERVIEWER:** After you stepped down as chair of the Faculty, you led a number of MIT committees, and one was admissions and financial aid. Getting more women students, and the question of whether to look at the math SAT scores as that important was one of the things you did at that point, maybe?

**WIDNALL:** Actually there was an earlier step that was at least as important. I chaired the search committee to find a new director of admissions. And I think the person that we hired was really excellent, and in fact, was looked up to by all of the colleges that we interact with.

**INTERVIEWER:** This is Mike Behnke maybe?

**WIDNALL:** Mike Behnke. Yes, it was. It was Mike Behnke. And the interesting thing about Mike was that, in many ways, he was more quantitative than his predecessor, Pete Richardson, who had graduated from MIT.

**INTERVIEWER:** Interesting.

**WIDNALL:** So here we had a guy from--

**INTERVIEWER:** Tufts, maybe?

**WIDNALL:** No, he was from Davidson? Is there a Davidson or something like that? Coming in, to a place like MIT, and actually bringing a more quantitative point of view. So he was extremely accepting of the data that Art Smith pulled together on the math SATs, and he was willing to make the change in a single year. I'm not sure Pete Richardson would have been willing to do that.

**INTERVIEWER:** Maybe because Pete came from MIT, and he--

**WIDNALL:** Yeah, I mean, he kind of had, yeah.

**INTERVIEWER:** He was more wedded to this is how we do things, whereas Mike had no preconceived notions.

**WIDNALL:** Yeah. No, I think that's right. So, in some sense, that was an extremely important step, to bring him in as the director of admissions.

**INTERVIEWER:** And he was indeed--

**WIDNALL:** And he was willing to--

**INTERVIEWER:** Very highly regarded.

**WIDNALL:** Highly regarded, and he was willing to take that step. And so we really accomplished that. And then of course I did serve as director of admissions, and there were issues of financial aid--

**INTERVIEWER:** For the head of the faculty committee on--

**WIDNALL:** Yeah, head of the faculty committee on admissions.

**INTERVIEWER:** In 1992 you became associate provost at MIT. What was that about? It wasn't a long run, because you got--

**WIDNALL:** No, I went to Washington. No, I think there were a set of issues having to do with faculty, faculty retirements, there was some ethical issues, conflict of interest, procedures. One of the things that I had done earlier at MIT is not just the faculty committees. It's the committees that are established by the administration to deal with certain topics.

**INTERVIEWER:** Like discipline?

**WIDNALL:** Well, no. No, I'm thinking of at an earlier stage in MIT, there had been in an incident where a department was closed without any substantial notice.

**INTERVIEWER:** [? Horst ?] Clinic? Nutrition?

**WIDNALL:** Yeah, something like that. And the faculty went bananas. So I chaired a committee to lay out procedures that should be followed in the event a department was closed. So anyway, I did that. And then there was the scientific misconduct issue that just flamed throughout the nation and Congress and all of that, and I chaired the committee for MIT to develop the procedures on handling issues of scientific misconduct. So there were several situations where there were kind of strong ethical issues that needed to be handled by a faculty committee. So I chaired a lot of those faculty committees.

**INTERVIEWER:** Did you ever say, why didn't I take more philosophy courses?

**WIDNALL:** No, well, isn't that interesting. You'd think, as an engineer, I would be somewhat hesitant about taking on these issues, but I wasn't at all.

**INTERVIEWER:** You left the associate provost office because you got nominated to become Air Force secretary. How did that come about?

**WIDNALL:** In the meantime, when I was doing all these things at MIT, I was also doing a lot on the outside, which is sort of typical of MIT Faculty. In no particular order, I had been appointed by President Carter to serve two terms on the Air Force Academy Board of Visitors, which is kind of like being a member of the Corporation. Although it's a much smaller group. It's, I think, three citizens and nine Congressmen or Senators or something like that. So it's a very different structure. But I'd been on that, and then I had been on various advisory committees to the Air Force. Going back to my relationship with John Barnum who was the Undersecretary of Transportation, I served on a policy committee to develop policies for working with airlines in such a way that when the military needed the transportation, that they would have already made the commitment to fly our troops to Iraq or wherever they needed to go. And so I'd met a lot of Air Force officers in connection with that. So I had all these experiences. Then I was a member of the Aerospace Corporation, which does all of the engineering assistance to the Air Force in managing its space programs. I was also a member of the board of the Carnegie Corporation, and the Carnegie Corporation had a special activity called the Carnegie Commission on Science, Technology, and Government. And again, it's all networking. Members of that commission were Bill Perry, who later became Secretary of Defense, and Norm Augustine who is widely known, and John Deutch and Jack Gibbons who became the President's science advisors. So there was just all these people that I knew, both on the Air Force side and on the public policy side. With respect to the Carnegie Corporation, I was sort of vice chairman of the board, and the chairman of the board was Warren Christopher. Warren Christopher was chosen by President Clinton to staff the cabinet, and Warren later became Secretary of State. I got a call one day from David Hamburg, who was the chairman of the-- president the Carnegie Corporation. And he said, Sheila, I've got this great idea. And I said, well, David, what's that? And he said, well, we think you should be Secretary of the Air Force. And I said, David, that is a great idea. And so it came about as a result of all this networking. And when the Air Force heard it, they were ecstatic. Because I'm an aeronautical engineer, love airplanes, knew all these generals that I'd served with respect to the Air Force Academy, with respect to the board on transportation for military missions with respect to the Aerospace Corporation. So I had all these connections. And as soon as the name was floated, the Air Force just, we want her. We'll take her. Thank you.

**INTERVIEWER:** They didn't say, she's not a boy and she's never served in the military.

**WIDNALL:** Never worried about that. That never was an issue.

**INTERVIEWER:** And when you arrived, they hugged you.

**WIDNALL:** They hugged me. They hugged me.

**INTERVIEWER:** How did you get up to speed for that job? Despite all those things, it must have been a very challenging post to walk into.

**WIDNALL:** But the Air Force does a very good job with that. They really give you all the support, all the support for your leadership. I had an excellent relationship with the chief of staff, General McPeak. He was my true partner, and we developed a common agenda, and you know. I mean, I'm not saying it wasn't a challenge, but it actually went well. It was great.

**INTERVIEWER:** What do you think were the most important things you accomplished or the highlights of your four years down there?

**WIDNALL:** Well, there were lots. The Secretary of the Air Force has an enormous set of responsibilities.

**INTERVIEWER:** Besides being a role model.

**WIDNALL:** Yeah. Being a role model, I was in charge of court martials-- which is not unrelated to the discipline committee here at MIT. I was responsible for all senior promotions and appointments. I was responsible for buying airplanes and buying spacecraft and buying satellites and all of those things. One of the things I did, which I think has had a real lasting impact on the Air Force, is when I was on the Air Force Academy, I was extremely familiar with the Air Force Academy core values that they really instill in all of their students. And basically, it's integrity, excellence, and service before self. And so, at some point, I was wandering around the Air Force making speeches about the importance of values, and kind of leaning on the Air Force Academy core values, because you don't want to make up a new set, for Heaven's sakes. Half of our officers already had lived through that. So I was down in Texas at a base and giving a speech, and one of the officers said, you know, we should emblazon those core values on the entrance to every wing headquarters. And I said, hey, that's a great idea. So I came back to the Pentagon and I put a little working group together and I said, I want you to go in that room and I want you to come out with the following set of core values for the Air Force. And they did. I didn't give many direct orders in that way, but that one was a direct order. And so they came back, and we instituted the Air Force core values, spread them throughout the Air Force, worked them into basic training for all enlisted personnel and all officers and Air War College and all the different parts, and when I went to the dedication of the new Air Force memorial-- The Air Force is always changing things. They're a modern organization. They're always changing things. But I couldn't resist sneaking away from the main event and looking at the wall where the Air Force had chiseled in things that were important to it. And one of the things that was chiseled in this granite wall was the Air Force core values. So I said to myself, OK, I think we're good for a few years. They're not going to take that wall change those words.

**INTERVIEWER:** The Widnall Wall.

**WIDNALL:** The Widnall Wall. So I think that that, from a point of view of the human beings involved in the organization, I think that was a very important step forward. And in terms of some of the programs that we started, and from the technical sense, the kinds of equipment that the Air Force needed, I think we did a good job there.

**INTERVIEWER:** When you finished your time with the Air Force, did you think at all about staying on in Washington, or going somewhere else besides MIT when you were done?

**WIDNALL:** No. No, when you go to Washington, I think you have to have a very clear idea that it's a temporary job. And certainly, the job being Secretary of the Air Force is definitely a temporary job. I mean, there's turnover about every four years. And so I never had any misunderstanding about the nature of the job. I was going to do it for four years, then I was going to come back to MIT. And I didn't really have any desire to do something else.

**INTERVIEWER:** You didn't feel like, been there done that, what am I going to do that'll feel new and different?

**WIDNALL:** Oh no. It's always new and different. I mean, that's the essence of MIT, is that it's always new and different. So you come back, you get back involved with students, get back involved with teaching, get back involved with research programs, yeah. So, no. It's always new and different.

**INTERVIEWER:** How did you shape what you did once you returned? One of the things I think you joined up with was the Lean--

**WIDNALL:** Aerospace.

**INTERVIEWER:** Engineering.

**WIDNALL:** Right. Lean Aerospace Initiative. The Lean Aerospace Initiative was a consortium that was sort of housed at MIT, but it involved the Air Force, especially those parts of the Air Force that are acquiring new equipment. Which is a very demanding and expensive and difficult process. And the various aerospace companies that are essentially providing that equipment. And the question is, how can we do this job better? How can we manage the interface between the Air Force and the aerospace industry, and the whole process of setting requirements of determining what is going to be built, of interacting in a technical sense and a contractual sense. And so, basically, I was very much involved in that when I came back. And the project is still going on, but as everything else at MIT, it's kind of morphed, and now it's broader than just the Air Force. It involves all of DoD, and so it just kind of keeps changing. But I thought, at that time when I came back, it was a very appropriate thing for me to do, because I had the experience of what were really the important issues in that field, and I knew a lot of the people, and so we could kind of get into high gear on some of those particular issues. So I think it was definitely time well spent. I think it was a good program.

**INTERVIEWER:** And you also have continued to serve on outside panels and commissions. In '03, there was the Columbia space shuttle accident.

**WIDNALL:** Yes. Right. That was, again, very exciting. Obviously very rewarding, very time consuming, and I basically-- well, they asked me if I would serve and I said yes, which is always what I say. But it took me away from MIT for basically half of the year, because I left in February. And I would come home every weekend, but I would fly to Houston on Monday morning every weekend, and I'm basically full-time down there, working with the engineers who were trying to analyze many many of the issues that were involved with the Columbia accident. And plus travelling to places like NASA Langley in Washington, and places like that. So it was really a full-time thing, all the way from February to probably August.

**INTERVIEWER:** But you were back in the lab in a funny way, I guess.

**WIDNALL:** Well, I could come back, although pretty much during the early time, I was there pretty much full time.

**INTERVIEWER:** In Texas. Right.

**WIDNALL:** Yeah. And I wasn't teaching. I told the provost, I said, I'm going to take this responsibility, I'm not going to be around, but I'll be back as soon as--

**INTERVIEWER:** And you were an Institute professor by then.

**WIDNALL:** I guess, yeah. I guess I was an Institute professor by then. Yeah, no. I think that's right. I became an Institute professor almost the month I got back from the Air Force. It was almost exactly at that time.

**INTERVIEWER:** Which builds in some of that flexibility.

**WIDNALL:** Yes. Right. Right.

**INTERVIEWER:** More recently, this year you were named to Toyota's Independent North American Quality Advisory Panel, which was a group of experts, Norm Augustine, again. I mean, there are some old names, charged with advising the company and its North American affiliates on quality and safety. Following serious problems with some of their cars. How's that going?

**WIDNALL:** Well, I think we were established in April, and basically we have a two-year life. We have extremely good people on the panel. We have, like Norm Augustine, who has extensive experience in the aerospace industry in developing and delivering extremely complex systems. We have a woman who was the vice chairman of the National Transportation Safety Board, so she's really an expert on safety and accident investigations. So we have some very good people. It's not without challenge. We're all doing it as a part-time job. None of us are doing it full-time. In fact, we were at Ford yesterday, in Detroit, meeting with some of the senior executives of Ford, talking about issues of product development, product testing, product verification, and then the issues of safety. So we basically travel a couple of times a month to go visit various places. We're focusing on preparing a report for senior Toyota executives, which I think we may deliver an interim report about in April. The issues are very challenging. I think one of the important issues has to do with the introduction of electronics into automotive control systems. We're way past the automobile as a purely mechanical engineering device. It is a complex hybrid of mechanical and electrical disciplines. And I think there are some major safety and product development issues that we're working through.

**INTERVIEWER:** So on that panel, do you come back to MIT and go huddle with engineers in other departments and say, you know, I came across this interesting problem, can you help me think about it? Or do you come back and say, you know, I came across this problem and are you guys teaching about it, or building this in? Or how does it interact?

**WIDNALL:** Well, no. OK. There was one major interaction with MIT, and I think it really was tremendously valuable for the panel. At the end of September I organized a workshop at MIT, and we spent an entire day at the faculty club, and we listened to, oh, I don't know, eight? Nine speakers? Most of them from MIT. And we talked about a range of issues having to do with basically product development, corporate structure, corporate culture, safety, electronics and automobiles, human factors, issues of older drivers and how older drivers are reacting to some of the challenges of some of these new automobiles. So it was an extremely broad set of topics. Most of the people who spoke were MIT Faculty.

**INTERVIEWER:** Not just in engineering? People from Sloan?

**WIDNALL:** Oh no. No. Sloan. Sloan, and yeah. Sloan, ESD, a lot in engineering, but Sloan. And it was extremely valuable. We had a quite significant number of senior executives from Toyota. It was not a private meeting. I mean, everything was kind of open and we shared the results with everybody, but I think the Toyota people got an enormous amount out of it. I think they got some new ideas. I think they had an opportunity to express their views on certain issues. So it was extremely valuable. With respect to the work of the panel, I think at this point we're trying to develop information from Toyota itself. I'm not really interacting with any MIT faculty members on any specific technical issues. At some stage, I can imagine doing that for specific issues, but it's not going on now.

**INTERVIEWER:** But MIT gains perhaps by getting exposed to something like this September panel, September symposium.

**WIDNALL:** Yes. I think very much so. Dan Rus and I are talking about maybe forming some kind of consortium. I think there is a lot of interest among members of our faculty. Michael Cusumano has written two books on Toyota, and we basically got him back-- I mean, literally, he flew in that afternoon from London, where his new book on Toyota was being released by Oxford Press--

**INTERVIEWER:** He's a faculty member--

**WIDNALL:** Sloan. Yeah, he's a faculty member at Sloan and he's basically worked in Japan for six years in the early part of his career, and he's basically written a couple of books that deal directly with the culture of Toyota and his recommendations for what the important issues were, what the problems were. And so we actually arranged the date of the symposium so we could get Michael as he flew back from England. I mean, literally he landed and came immediately. But it is an example of the breadth of MIT faculty, and again, the fact that MIT faculty are definitely connected to the outside world, and this was just one example of bringing them all together with the Toyota executives and trying to work a problem together. It's kind of classic.

**INTERVIEWER:** You've done many different things in your career, but also managed to have a family and pursue outside interests. Do you still sail? Bike? Climb mountains? Play the harpsichord?

**WIDNALL:** Well, yeah. Not quite. No, we do sail, we're very active in sailing. I don't climb mountains anymore, but we try to remain active. My husband's running the Boston marathon, and so he's staying very active, and I'm getting ready to have a Thanksgiving dinner on Wednesday before Thanksgiving for ninety cyclists, following a fifty mile bike ride, which is kind of something we do every Thanksgiving. It's kind of a tradition. So yeah, we have a number of things that we keep going.

**INTERVIEWER:** What else are you engaged in? Have we left out any important stuff?

**WIDNALL:** I don't think so. The thing I really enjoy at this point is teaching. I'm very much involved with the undergraduates in our department. I'm basically teaching two courses. I'm teaching a course for juniors, and then I'm helping faculty colleagues supervise the undergraduate projects lab, and I'm getting ready to offer a graduate course in astrodynamics in the spring semester. Which is going to be really challenging, but I think it's important for our department to have our graduate students have access to this material. And so I'm willing to put the time in to pull it all together and get ready to give it.

**INTERVIEWER:** Do you think you teach differently because you've had so many of these other different experiences along the way, or is it still pretty much the same prepare well, communicate well?

**WIDNALL:** Yeah, because I guess what I think is that teaching should be designed for the student, rather than for my experiences. So I really focus on the students. Where are they, what do they need, how is it best presented? So it is nothing to do with the fact that I was Secretary of the Air Force or on the Toyota panel or anything like that. It really has much more to do with the students.

**INTERVIEWER:** But your perceptions of what they need to know, or the context that might be useful, hasn't changed significantly?

**WIDNALL:** Well, it's related very much to a particular discipline. I'm very aware of where our nation is in space, and what the students need who are going to work in space science and in space engineering, and so my whole focus is basically, what do they need to know to make a contribution in that field? I mean, they all think gee whiz, when I remind them that I've pulled 9 G's or that I got a hug from various Air Force officers. But that's just kind of the gee whiz part of it.

**INTERVIEWER:** The icing on the--

**WIDNALL:** It's kind of the icing on the cake.

**INTERVIEWER:** Do you have any parting words of advice for young women thinking about science or engineering, or about MIT?

**WIDNALL:** Well, first of all, I think MIT is a tremendously rewarding experience and I think engineering is a career that offers young women an opportunity to make a real contribution to society. And I do think that women have special talents that they should bring to engineering, so that engineering itself is more effective at tackling this range of problems. **INTERVIEWER:** Do you work with your male students, or women who don't show these characteristics so much, to develop them? Is there that opportunity in any of your courses?

**WIDNALL:** Well, I'm very open to students. I spend a lot of time with students. And basically, again, I really focus on the students. What does a particular student need to be more effective? And I'm willing to put that time in with a student to kind of help them to shape who they are, where they're going, what they need. Because at this point, I have benefited enormously from my relationship with MIT and in some sense, it's kind of time to give back.

**INTERVIEWER:** Aside from there being more women, do the students seem very different from the ones you were teaching when you were starting out as an assistant professor?

**WIDNALL:** Well, I think they do have a much clearer image of the complexity of our society, and I think they have a commitment and an understanding of the kinds of things they want to contribute to, and what it might take to make those contributions. So I think they're more well rounded. Certainly they come to MIT with a more well rounded set of capabilities. And in some sense, that's part of the competition that's going on in the high schools. It's part of the recognition that some of the very best students need to study these fields, and so the competition to get into a place like MIT is just extraordinary.

**INTERVIEWER:** Do you have any suggestions for MIT in the coming decades with respect to women, or to anything else?

**WIDNALL:** Well, again, I guess the way I think about it is that the presence of women students at MIT, especially undergraduates, has really transformed the faculty. And I think obviously we should keep our eye on the ball, and we should continue to kind of push that along, but I don't see the need for any major changes. I mean, we've got women in very senior positions around MIT. I think there's no question about MIT's commitment to the advancement of women. And so I think each woman here is in a position where she can just sort of live out the implications of her gifts, and focus on the accomplishments that she will be able to make in this environment.

**INTERVIEWER:** Teach them how to stay on surfboards when waves are big?

**WIDNALL:** Whatever. Yeah, whatever.

**INTERVIEWER:** We are about out of time, Sheila. Thank you so much for talking with us--

**WIDNALL:** Very good to see you.

**INTERVIEWER:** And all your service to MIT, the country, the world.

**WIDNALL:** No, it's been my pleasure. I've been extremely lucky.