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I was born in Detroit, and there are a lot of small Catholic schools in Detroit. I went to a small Catholic elementary school, and that was about three blocks from my house. I went there from first through eighth grade and was double-promoted between sixth and eighth grades. It was a community school, so you could excel if you wanted to, you could not excel if you wanted to. The teachers would latch onto students who were doing well and kind of cheer them on.

I went to a Catholic high school as well. This was a little bit different because instead of being in my neighborhood in Detroit and having a co-ed population, it was an all-girls' school—Catholic, privileged in a privileged neighborhood, and very white. So there was a little transition there. I didn't know anyone from my elementary school days at this high school. But because Detroit has a large black community, there were a few people I knew just from the community who did attend. So I wasn't completely by myself. This high school was also very small, and because it was a girls' school there was—although I didn't notice it at the time—much less of a barrier in speaking up in class, competing in science projects. When I think back on it, I was actually encouraged quite a bit to explore science, although the school had a very strong liberal arts standing. Most of my classmates went into the arts or business management. In fact, I was the only student who applied to MIT out of my graduating class, and I was probably one of about three or four students who were interested in science.

How did you find out about MIT?

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I knew about MIT's reputation from the media. I'm not sure how—I just knew when someone said “MIT” what it meant by the time I was in high school. It was one of those things—maybe in part too because my father has a Ph.D. in biochemistry and he has a science background. My mother is in health. She was the dean of a nursing college. So maybe I also heard it from them or from their friends and so forth.

The nursing college, was that in the Detroit area?

In the Detroit area. It was a community college in the Detroit area, that's right. She was very much a working mom. She wore a suit every day. She was the last one to get home at night. We would be home, then my father, and then my mother. She was always busy. There were three of us, so she was busy—three kids, two brothers.



Where do you fall among the three?
I'm in the middle.

You've had a lot of educational influences around you.
That's true, that's true. I did. Education was a given, I guess. It wasn't even a discussed item. We knew we were going to college and we just had to decide where. When we chose high schools, one of the questions asked was—who goes to college, how many, what percentage? When it was my junior year, I already knew everything that I had to take. At the beginning of high school, I had a sense of where my classes were taking me in part because my parents were the kind of parents who asked those questions. We also had a good guidance counselor.

The school was run by nuns who were very interested in what the students were going to do afterward. They claimed the students as their own, in a way. So a nun suggested that I make sure that I get some calculus in before I moved. The chemistry teacher was the one who suggested that I look into chemical engineering. In 1979-'80—I graduated in '80 from high school—chemical engineering was experiencing a huge rise in enrollments and also in the marketplace. There was actually a need for chemical engineers.

How did you know that?

I had found out about that from my teacher and my guidance counselor and also through my parents. My father was also involved in the NAACP in Detroit, and he had started to run this program called ACT-SO.

I'm very familiar with it. My wife and I have had students recommended to go to that program.

My father had us do it, of course. Once you're in that cycle you get pamphlets, you get those magazines that say, "Careers of the Future," you know. You start getting into all of that and you're aware of it. So everything came from different directions.

Who are the role models you've had and mentors who are very important to you, in those years?

My parents do stand out, I think, more than I would have recognized when I was in college. I was aware that there were other women scientists and other black scientists. This is, in part, because of the community in Detroit and my parents saying, "Well, you know, So-and-So's father is an engineer." So there's that kind of awareness. But at

that time, my parents were the ones that I was most aware of.

Talk a little bit about your being selected to come to MIT and those first days coming to MIT.

When I got admitted to MIT, I was ecstatic and thought, "This is it, I've reached the point." What happened when I arrived on campus was that I started to think about this. Was this a mistake? Would I have been much more at home going to Michigan and getting a big discount on my education, and not having to worry so much about the competition because MIT attracts the best and the brightest? Everyone's number one in their class. Michigan is close to that, but it's not that. It's broader, a broader distribution. I could have easily felt that I could hang at the top or the upper half of that curve and not worry about it at Michigan. Not only that, but the MIT atmosphere is so dynamic that you feel as if you are always doing something even if you're not. So the energy level that it requires is higher, I think, and so is the level of attention that you get.

I think my experience was that I got here and already I knew of people who would know of how I was doing at MIT. I had a sense of the Office of Minority Education, and I had a sense that they knew who I was and that they would know if something was going wrong. I definitely knew that. So it was not only my parents, but a sense that there were people who knew. That was good and yet it also created some kind of pressure for me. I felt the performance anxiety. I kept thinking that I was admitted by mistake, and I know other people have said that too.

Why did you think that?

Because I'd look at the material that we were getting in class and I'd look at how some people seemed very confident with it, and I'd think that I was not one of those people and that this was a mistake—"I'm not like these people who are answering questions in class or who seem just to have a confident attitude when they're sitting in the classroom." I didn't figure out until years later that some of that can just be made up—that you can assume you know what you need to know and your attitude comes off that way, that you know, that you belong. But if you have just a little niggling thought that you don't belong, then your attitude goes in the other direction.

So part of what I was seeing was real and part of it might not have been. At the time, I was afraid and I was very scared. I was doing okay, you know, and people would ask, “How do you manage doing okay?” I would say, “I’m just scared. If I don’t work really hard I’ll be dying.”

Scared to death, right?

Yes.

And you worked hard, right?

That’s right. Clearly, the fear incentive was there.

So that’s what you would say for your first year, right? Were you in Project Interphase or anything?

No, I wasn’t. I didn’t even know about it until I got to MIT. Certain people knew each other and I didn’t know that they knew each other, and I figured that out. So I didn’t have Project Interphase, although after the first couple of weeks we integrated as a group and got to know each other. People began to help each other out. But my freshman year was the fear experience—just getting through, no grades, let’s just see if I can feel like I belong. Sophomore year was also scary because it was our first year of grades and first year of chemical engineering.

The first time going into your field.

That’s right, exactly. It starts in sophomore year, so I was nervous about that. Not only that, but there was a group of us who all went into the first class, 10.213, and just started floundering. I remember the first exam and I think I got something like a fifteen, something like that. The class average was forty and me and some of my other friends were just like, “Oh my God, this is just incredible.” Thermodynamics was not anything like any other class I had ever taken. It incorporated other things, but it was its own entity and I had to struggle with that through the term.

Finally, I started getting to the point where I felt comfortable and I was able to switch my grade around. I ended up with a B, which was good considering where I was in the beginning. I had to go completely in the opposite direction, but I did have experiences like that. I was also pledging. I decided I was going to join Delta and that was the term they pledged—it was the fall term. It was a complex year. I pledged my sophomore year and that was also distracting. My sophomore year has the worst record. I was also going through the final

adjustment, I think. Sophomore year is where a lot of students decide not to stay at MIT or ask not to stay at MIT—somewhere between sophomore and junior year.

What do you think happens during that period of time? I think the comfort zone is gone and you know that now you are playing for real—that’s part of it. But also, you leave the freshman category and you enter your department. Departments don’t necessarily nurture the way the Institute nurtures. The Institute has OME, it has the Dean’s Office, which is very physical to students their freshman year. Once you’re into your department, you begin to feel that you have to make your own path because you can’t go to OME and have them say, “Oh, well I’ll talk to Bob or Jack, your professor, and set things straight.” That doesn’t really happen, whereas it does tend to a little bit with the 8.01 and those freshman classes. So you feel that your connections are gone, that you don’t have or you don’t know the right people anymore, so you’d better get in touch with the people in your department.

Departments have a different way of dealing with undergraduate students. They have advisor systems, but they’re not always as in-depth or extensive as they could be. Students don’t always know how to use an advisor, so in both directions there’s just lack of communication going on. Students end up figuring things out on their own. That’s part of what it is. There are students who don’t figure out until later that they should have taken this class instead of that class. There are students who don’t do well one term and then they double-load up the next term and end up falling on their faces.

When you think about the undergraduate period, are there any things that really stand out as pivotal for you in any fashion, whether it was academic or social?

I think a few things. I’m trying to locate exactly where it was, but at some point I stopped feeling so much like just an undergraduate in my department and I began to feel as if I could identify with some of the faculty. That probably happened around the time I did a UROP and I got to know one of the faculty members. I took a class that was kind of a special class. It was a polymer science class, an elective course. I got to know the professor associated with that. In the process of doing

this, I think I was consciously taking the second step. In the first step, you say, “Okay, I’m here and I’ll get a degree.” In the second step, you are saying, “I’m here, I’m going to get a degree, and I’m curious about what’s going on around me.” At some point I started to do that. I got to know some of the professors to the point where they knew who I was and they knew what my interests were.

That’s when I started to feel differently about my belonging at MIT. I went from being someone who was a mistake to being someone who was just one of the crowd—kind of a shuffling anonymous crowd—to someone who was a person in the department. So that made a difference. Before then, I don’t think I had very deep thoughts about chemical engineering and what I wanted to do as a chemical engineer. I was in the curriculum trying to figure out what it was, myself.

Engineering, though, was something you came in here thinking you wanted to do.

That’s right.

Where did you get that from?

My chemistry teacher in my junior year of high school—I was very good in chemistry and I had a good record in math and science—said, “You’d make a great chemical engineer and you’d probably like that. Check it out.” I think that she was speaking from information that she had picked up on what the marketplace needed. I began to hear more and more about engineering. This is the late ’70s and early ’80s—“Engineers, we need more.”

That sounds good, you know. I went into it knowing only a few things about chemical engineering, some of which were kind of ingratiating things—chemical engineers are the highest-paid engineers; you can get that statistic right quickly. And I got a sense of what petroleum engineering was all about. I got a sense of some of these things, but I didn’t really know the depth of the field to a great extent. When I was taking the classes, I’m not sure if I could have given a very clear definition of chemical engineering. I just knew what I was studying and why my professors said I was studying it.

What people stand out in your mind—administrators, faculty—when you were coming through?

As I mentioned before, I remember OME and I remember some of the people in OME, mostly

the administrators—1980–84, two black women who were like two black mothers.

Gloria Payne and Pearline Miller. One of them actually started the program called Secrets of Success, something like that. I was in charge of the office at that time. But those two women played a major role in working with students.

What about faculty members?

I remember the presence of Jim Gates and Wes Harris. I remember their presence. This kind of ties into the BSU tutorial, the TP. Both the fact that those faculty members had stopped by a few times and the fact that the TP was there, those were things that I have strong memories of. In terms of faculty members in general, I think I was probably more aware of who the black faculty were then than I am now, which is really kind of a switch.

How about anybody in your department? Was there anyone who stood out as influential to you or who really impressed you?

Yes, I think Bob Cohen and Ed Merrill, both of whom are in my field—they’re in polymer science. I ended up going into their field. Bob Cohen was the professor who taught the class I was describing. I haven’t figured out why I knew Ed Merrill; I don’t know whether I took a seminar, like a freshman seminar of his. When I think back, I think I only had one polymer science class on my transcript, but he knows me. He knew me by my maiden name when I came back. He said, “Oh, Paula Goodwin,” and I went, “Yeah, how do you know that?” I knew him and I just didn’t know how. Maybe I took a class that I forgot.

Both of them are characters. Bob Cohen is very friendly—very, very receptive to students. He smiles, he nods when you talk to him, kind of a very positive feeling that you get as a student talking to him. I went up to him after class and talked to him about polymers and things. I was then thinking, “I really like this. It involves some chemistry, which is one of the things I like about science.” And he seemed to like just talking. He influenced me. I always remembered him. When we would get these alumni newsletters, I saw that he started the polymer program, actually, and a couple of years later I came back through that polymer program.

You may think of something else from your undergraduate years, because I think that’s an important period as I

hear you talking. You finished your degree; had you thought about what you were going to do once you finished your undergraduate degree? What happened from that point?

This is a mixture of all kinds of things, because I had been trying to figure out whether I wanted to go to graduate school. I think on different career servers I put, “Yes, master’s—Ph.D., no,” I put down everything. When I was graduating—it’s hard to say what was in the mix then—I had met John, we had been going out, and we were thinking we were going to get married. Graduate school was not necessarily evolving in the plan—not because it wasn’t a choice, but because it just didn’t fit as nicely. I mean, you know, we were interviewing for jobs, collecting student loans, and there was kind of this feeling of ready to go out and adventure into the real world—just something real, you know what I mean? It was exciting to think about that.

So I didn’t actually apply to any graduate schools when I was in my senior year. I got applications, I never sent them out. I took the GRE—I never used it. I thought about it, but at some point I just decided I’d rather work. But I always had in the back of my mind that I wanted to go back to graduate school. I took a job at Motorola in Florida—we both went to Motorola in Fort Lauderdale, Florida. I was a process engineer. It was fun. I think I did need a period of time to live a real life because there is something about being in school for a long time that makes you feel cloistered, as if you really haven’t even left your parents. So I was feeling very independent and I wanted to have that feeling—buy a car and drive it, all of that stuff. We did all of that and we moved to Atlanta, where John was getting an MBA at Emory University.

So you left your job in Florida and went to Atlanta. Atlanta, that’s right. We spent two years in both places. So there was a period of four years. The first two years as process engineers we were both pretty miserable at Motorola. We didn’t like it. It was pretty bad. That’s a whole other story. But my division was one that had kind of, I guess, what in the beginning seemed like a friendly humor about the fact that they weren’t able to hold on to a woman engineer. During that time they had two women engineers and they both left within a one-year period after I joined. They both left—not because

they were getting married and wanted to do something else, but because they found something better to do with their time. I think they did not have a pleasant experience.

When you interviewed, that was a plus for you, I suspect, seeing that there were two who were there.

Oh yes, and when I interviewed I wasn’t sure what part of the company I would be in. I think I talked to them a small amount and spent a lot of time with Personnel, which was kind of interesting. I got placed there. They had heard about me more than I had heard about them. I think it was a strange beginning. I hadn’t turned twenty-one quite yet.

So when you graduated, how old were you?

I was twenty and my birthday is in September. I started in June. I was sixteen and then my birthday came. The week after R/O week I turned seventeen.

That’s a little early.

That’s because I was moved up that grade in elementary school. That’s what happened. When I started this job, I came walking in looking young and I was a black woman. There was a diverse mixture in the plant, quite a bit of women of color—mostly women in the plant in general. This is a microelectronics manufacturing plant. Motorola’s plant facility consisted of a large number of working-class women from many backgrounds, many of whom were black and many of whom were Hispanic. I walked in and I looked like I could be part of the assembly line, and people sometimes spoke to me as if I were. You know, it’s one of those things. I was young and on top of that there was apparently some talk, as I was arriving from MIT, “What, some kind of hot-shot?” A majority of the people there had gone to the University of Florida. They wore ’gater shirts, ’gater everything.

I also began to realize that although southern Florida is not the typical South, it is Southern and there are attitudes that people can get away with there that maybe they even can’t get away with in traditional Southern states. There were definitely some good ole boys in my division.

Give me some examples of what you actually witnessed.

Well, jokes. What people would joke about reminded me that they did not know how to deal with people of different races. For example, John

came by—this is after we had been married—as we were getting ready to go and celebrate someone leaving the department to go off somewhere, I think. There was another black man in my area who had had something to drink and had gotten kind of drunk at one of the parties. So my boss says, “C’mon, John, let’s see if black guys can drink.” I think he thought it was very funny.

Those things were typical. They would use humor as a foil for their inability to accept us as individuals. But on top of that, the black men who worked there—there were two black men in my area who worked there—would come back to me and report to me that our section leader would tell woman engineer jokes when there were no women present at the meetings. And they would be, how many women engineers does it take to screw in a light bulb? There were those kinds of jokes. There definitely was a feeling that women didn’t belong, definitely a strong feeling there. It was a very macho division. Things were run by the command of this vice president who was a very macho kind of guy, who had pulled himself up by his own bootstraps and made it to the vice presidency. He was not degreed and made a point of letting everyone know that. I felt like I was in kind of a western frontier of some kind—you know what I mean. There were a lot of guys who took on or adopted that attitude who did well in the company.

And on top of that I had some strange experiences. I had successfully changed a manufacturing process. All of this is very simple stuff. We went from printing the labels one at a time with a stamping process where people couldn’t read the stamp to screen printing because you get many at one time—they’re all on this grid. It was very clear and it was working, so I was to give a presentation. This was my first big presentation and I had special slides made up and so forth and so on. I left my carousel on my desk and I guess someone came along and screwed them all up, you know what I mean?

So there were things like that. You never know whether that’s race-related or just personality. It’s hard to know whether it’s personality or race, but I didn’t really have any direct enemies—no arguments with anyone, no hard feelings with anyone. But when I went to give the presentation the slides were in the wrong order and I had to kind of babble my way through the whole talk because I hadn’t discovered it.

You had not discovered it before you left to give your presentation.

And it was ironic. I went over the slides with my boss that morning and then left them on my desk. I was shocked. I could not understand, and then I thought maybe I had made a mistake. But they were so much in disorder that there was no way I could have done it.

And this was your first professional presentation that you were going to make in the company.

Exactly, exactly. There were weird things like that. I think they thought that I was being hot—I don’t know what they thought, if I was being too aggressive or something. There were also the more subtle things. I started with a black man and a white man. I and the other black man continued to do process engineering and so forth. Jack, the white guy, immediately was given a special project which involved him in process development. And I kept asking my boss, “Why can’t I? I’m really interested in doing something besides just watching the process. I’d be interested in doing a small project like that.” He said, “Oh, it takes special this, special that to do it. You have to be really good at it.”

Now this guy had only been here maybe a month before me and he was doing the project maybe in the second month. It gave him a lot of visibility. He gave several very good presentations on it and eventually moved to the area he wanted to move to and then went on to Harvard Business School. Bill, the black man who worked with me, and I continued to just drudge it out in process engineering and we had started at the same time. There was no attempt to even discuss how we could advance our careers. I talked to my boss—oh, it was just horrible. I could talk forever about that.

So you finally decided that you wanted to get out then, right? You and John decided that.

That’s right. He had even worse experiences. John wanted to go to business school, we moved to Atlanta, and I got a job in research as a research engineer at Georgia Tech Research Institute. That worked out well. I liked the environment. It was a complete change of environment. I realized, though I hate to think this way, that I went from working with unintelligent people with a bias—I don’t know if I’d put it quite like that—to working with intelligent people who, at least if they had a bias, could learn to deal with it. These were two different kinds of people.

I actually didn't encounter anything there. I had one negative experience—this is Atlanta, Georgia. One of the guys I spent a lot of time working on a project with, and had very positive interaction with, just came up one day with one of his friends to tell me that he had been talking to all of the black girls in the building and he's finding that they're all so upset because he feels that Jesse Jackson is an idiot. And they then began to talk about things. He said they had left the last woman in tears, you know, and they were just talking to her to elicit a response.

These are the white guys?

This is a white guy. This is a white guy whom I worked with on a project—not my boss, just a collaboration. This was kind of semi-academic, it's like the Lincoln Labs. We had some contract work. I was working with my boss, who was great to get along with, and we had some work that we needed to do from electrical engineering. He was very interested in it and we had never had a negative conversation before. This day he walked in picking a fight, talking about how when he was in his private school they made them open up to black people and black people started arriving and why was that. And I'm thinking, "And he just spilled all of this?" This was in 1986 or something like that—1986 to 1988 I was in Atlanta.

That was the only negative experience at Georgia Tech. I got to know my boss, I got a master's part-time, I did my dissertation jointly—it was on a work-related project with a professor and my boss. That was nice. I took classes and I became a part of the graduate chemical engineering community. That made it really nice, I thought. And then I realized that it was probably a contrast thing, but I really wanted to be in academia.

So between what you saw in Florida and then coming to Atlanta, with this nice combination of working in a laboratory along with being associated with a major institution of higher learning, that was like night and day.

It was very much like night and day. And I'm getting all of this negative feedback in Florida. When I'm ready for a promotion, I'm being told, "Well, the next time you get a promotion you'll have to work hard," as if it were a gift this time. At Georgia Tech, I'm getting all of this, "What a great presentation, your work is interesting, you have a very good approach." I was getting a lot of positive feed-

back, and I thought, "Wow." So I applied to graduate school, this time to MIT.

Is there anything special about Atlanta that you haven't said already?

Atlanta was an interesting place because it has a very strong black community. There were some parallels, because I mentioned in Detroit we had the same thing. So that was nice. There were some familiar aspects of it.

Say a little bit about what that does for you.

When you know that you can walk out your door and see peers who are also black, you know that you are not an anomaly, you know that it's an affirmation that everything is right, you know that you won't have to fight just to be who you are. When you go places there is an assumption that you too are interested in, say, the education of your child, or you too are interested in investments. The conversations that you have with people of any race are on a higher level because there aren't assumptions made beforehand about you. There are a lot of talented black folks walking around and the population is such that blacks are running things. People don't make the assumption when you walk into a room that you're someone from the bottom of the heap and that you don't have the same concerns that they have—as, say, upper middle-class white folks.

So there was a lot of that. Things get turned around. There's also this awareness, this cultural awareness, that you don't have to reach very far to get. So you can just say "Kwanza," and it's right there. You can pass it in the mall—it's just there in front of you, it's very different. You can name a black organization and people know what it is—if it's a fraternity or sorority, if it's NAACP, it doesn't matter. Everyone knows what it is—"Oh, yeah." So you feel very much like you're running your own show and that the people who go to recognize you know who you are, and you don't have to explain yourself. It's very different.

You really liked Atlanta, from what I hear, because knowing Atlanta and knowing Detroit, there are similarities there. What caused you to leave Atlanta?

Well, that was good, that was MIT. I had passed the qualifiers at Georgia Tech and I had also applied to MIT, and that was it. It was a difficult decision. John and I were making this decision to go to MIT or stay at Georgia Tech and live in

Atlanta. There was something missing. Georgia Tech is great and there are some very dynamic people there, but it wasn't the rich, exciting world that MIT is in terms of research and even people. I think the people are great, but you're not going to run into people of many different nationalities and ethnic groups just walking down the hall, all of them focused on these exciting areas of research.

I think I always was attracted to MIT, I think so. When I was at Georgia Tech, I kept comparing their student center to our student center and their this to our that. And there were things that were better at Georgia Tech. They had one library—everything's in one place. They had a better computer system at the time. Things have changed here. But I really missed the drive that MIT has, the pace, the feeling you got walking through the halls, and the degree of openness. Even though some may say that the student population is one that doesn't get involved, it's apathetic, I think what I see are people involved in many, many things that really average it out. It's hard to tell what direction it is. But you have everything here. There's something about that.

I have a theory that's quite like this, and it's because of some unique experiences you've had. You talk about Georgia Tech: You've spent time there, you've worked there, and then you also have been at MIT and you've seen MIT. Could you say a little bit more about what it is that made you see what MIT has that you didn't see in the first contact?

It's hard to describe, but you could say this place is hopping. When you come here and begin to look around you, just walking down the hall you run into all kinds of people. It's an experience just going down the Infinite Corridor. It's hard to explain.

At Georgia Tech, there is a series of brick buildings, all separated. When classes change, there's just kind of this parade of people who go across. The hallways have an occasional poster, but the student life is pretty much separate from the university. I didn't really feel a student life except in the sports area, which was very strong there. And, of course, the minority groups would get together, but it always felt as if we were getting together outside of the institution as opposed to as a part of the institution.

Here, MIT has a way of embracing everything. It incorporates everything into itself. Maybe

it's because so many students live on campus. Maybe it's because, for whatever reason, we have a large number of student groups and activities. A lot of the things I described could exist at another university, but wouldn't be a part of the other university. It would be there next to the university. So if someone says, "Describe MIT to me," I think—"Oh, there's the Pacific Asian Student's Club." There's a club for every student group, there's a club for every nationality, there's a jugglers' group.

You name it, right?

You name it—the sports. So just in terms of the diversity of the students and the way that they celebrate the diversity, MIT is unique. I haven't seen that at U of M either, Michigan. Michigan is diverse, but it's huge. I get the feeling that you do those things in your own time as a student and maybe it just isn't embraced by the university. The university isn't really concerned with it.

But there's more, too. I think the research and the science, the idea that some of the top researchers are here in this same space, actually has an effect. There are some very dynamic people here. When you hear them talk or even see them teach, you see things just light up. You see students attracted to them and there's this energy, this undercurrent that goes with that. I think there's enough of that here that you always feel that. As a researcher now, as a professor here, I feel that I can log into some of that stuff any time I want.

That's a very positive thing that we need to maintain.

You're back here in Cambridge. You decide to come back to get your Ph.D. Basically, how did you do that? What were the mechanics of doing that?

What happened when we moved was that I quit my job and got my master's. John got his MBA at the same time. He got a job at Polaroid and I moved up here after him—probably just a month after—and started in September. I was under a fellowship, you know, started with an RA. Actually, the polymer program had a fellowship program, then you go to RAs. So we just switched places. Whereas I was working before, John was working. We lived in Eastgate at the beginning and then became graduate resident tutors. So that was the basic mechanics of that.

Was there any professor who played a role in your coming back?

Oh, yes. I mentioned Bob Cohen, that I saw he had started this program for polymer science and

technology. When it got close to the time to decide what to do, I had contacted him. I had also used some of these professors I knew before as references for my application, and in doing so I had gotten back in touch with them. What really kind of surprised me was a couple of them wrote back at my request and said, “Oh, it was good to hear from you and what are you doing?” I thought, “Oh, they’re real people—they’re asking these questions as if they are really interested.” That surprised me. I thought, “Oh, they remember me,” because I had gone through all the trouble to re-explain who I was. Whether they remembered me or not, they were definitely good at exuding that feeling.

So I felt good about coming back. As a graduate student, I had a very different life than I did as an undergraduate, because I think as an undergraduate one of the things that was different was that all of my friends were African-American. When I was a graduate student, I had kind of this very random mix. I think that what was happening was two things. One, graduate students bond immediately when they begin to take the same courses. In undergraduate, there are so many people in the class and maybe some people are bonding here and some there, but you can be by yourself. In the graduate course and the qualifying exams, we just bond—immediately.

So that was part of it, and part of it was because I was older and I knew how to feel comfortable about who I was and also feel comfortable with other people. I knew how to express myself in a way that I felt comfortable. When I was an undergraduate, I was shy and not able to communicate as well and not as willing to take a risk to make connections with people. So a lot of those things changed and I got active, a lot more active. I was in the Graduate Student Council and the Student Rep Group, Faculty Policy Committee, and CJAC—Corporate Joint Advisory Committee—all these things. So I got to know two or three different groups of students. That was interesting as well. I got to know my professors on a much deeper level.

Was that because of getting to know your professors better, like Professor Cohen?

Yes, that’s right. I actually would go in and talk about my research problem and get suggestions. Later, when it came time to look for jobs, I’d get advice from them. I actually helped one of the

professors organize the students in the polymer program. So we helped each other out. In the beginning, he was new and he had no contact with the students. I helped round them up and survey them and get a social hour together and so forth. In the process of doing that, he came to appreciate that I could help him on those things and he also kind of pushed me into directions. He would say, “There’s this conference going on and, you know, maybe you ought to give a talk at this conference.” So things like that were going on.

It sounds like you really were making a lot of connections. Some of it started with Cohen.

That’s true.

And that’s something to be noted—your appreciation for his ability to show he didn’t mind talking to you and had an enthusiasm for what he was talking about.

Maybe you can tell us a little bit of how you developed your direction in graduate school, who helped you from your point of view, and sort of how you gradually became part of the faculty.

I chose an advisor who was working in an area that really excited me. He was a fairly young faculty advisor. He was going up for tenure probably the second year that I was working with him. That probably had an influence on me because I was able to see how the whole game worked in terms of getting publications out and getting visibility. It also pushed me because he needed to get as many papers out as possible, so even in my first year as a graduate student, I was writing a paper with him and another grad student.

I helped write a proposal. That was also useful. It also forced me to choose a direction in my research area fairly early. I started off with one direction and then I switched directions somewhere about eight months into the work, I wanted to move to something different. We worked that out. It actually worked out very well because I have this two-tiered Ph.D. experience in which I did a great deal of work on one material and then I moved to a new material, which I made myself and worked from there.

That was a good experience. In terms of people who helped me, my advisor was helpful in the sense that he gave good advice and he was kind of entering the game himself and giving me a lot of feedback. He was a very critical person, still is. Therefore, I was able to gain from his criticism.

When you look back on that kind of personality, so to speak, how do you feel about it now in terms of him giving that feedback, that criticism?

He did it well. It was helpful and I have a positive feeling from it. He never implied that there was something I just couldn't do well. Whenever I wrote something, he would look at it and say, "Look at this. This doesn't work and you can't do this. You need more of that." It was just very straight, flat-out—"More of this, less of that. Do this, don't do that," which I would do and he would be comfortable with that. In terms of research, he would tell me if he thought a certain direction was fruitless—he would definitely do that—and that was good.

One thing I did do with respect to that, most of his insights I followed. There are a few things that I was very interested in trying that he didn't really encourage very much, and I waited and I followed the path that we'd decided together. When I had spare time, I tried a different path. One case worked out very well because I tried a synthetic route that he was not interested in me pursuing, and which led to the basis of a big part of my thesis. And he was very happy when it worked out. He had no criticism. He did not have a problem with it. The key I had found was to figure out what was really worth my extra time—use my extra time, I mean, do what we had agreed on and find a way to fit this in. If it works, then tell him about it. If it doesn't work, then that wasn't it. That works out pretty well.

Other people helped who were on my thesis committee. Bob Cohen I talked to you a lot about before. He was on the thesis committee. Ned Thomas was on my thesis committee, and he is also pretty much in the same field as Bob Cohen. They both got a good sense of what my abilities were from talking to me about my research. I was very open with them about what my interests were in terms of a career. I told them that I was interested in academia. I told my own advisor that I was interested in academia, probably in my first or second year. I continued to remind him that I was, and that was helpful because if you just go to someone in the last year, they have to scramble. First, they have to go through a mental check to see how what you've done will compare to others who are applying for faculty positions and how who you are fits into their idea of what a faculty member should

be. If they don't have to do that mental scramble, that helps a lot.

I think that when I first told my advisor, he thought about it and he continued to look at me as if I were someone considering the position. When I first told him—as I told you, he's a critical person—"Oh, if you want to be a faculty person, someone whom I could recommend would have to do the best in that—something so unique and way-out, that's what you would need."

You started early, in the beginning, telling him that's what you wanted to do.

That's right. He would give me, either directly or indirectly, clues as to whether or not this was something that would really make a mark, or this was important or not important, and what you really want to do for it to be significant is this. That came, I think, as a result of my telling him. I've noticed that others who have clued their advisors in early on get more out of it too. They're people, too, and if you tell them at the last minute they're thinking, "What can I do with you now? Okay, is your thesis good enough?" They have to scramble because there are Ph.D. theses that train you well, but there are certain details you don't worry about if the person is going to be in R&D in a company. That company is going to interview you looking for certain things, they're not going to ask you if they can read all of your papers and so forth. They might look at your publication next to a model and that's it.

You stayed in the graduate program how many years?
Five years.

That's about average for your department.

That's right. Average for my department is 4.9 or something, so it's average. In materials science and in chemical engineering, I know, and in a few fields, five is about average. A few engineering fields, like electrical engineering, take longer.

How did you move from completing your Ph.D. to Harvard? Is that related to some of the things you're saying now?

It's kind of a strange thing because I didn't really plan on doing a post-doc. In my field, you can get a faculty position without a post-doc, but that's been changing over the past few years. At MIT, the last three or four new hires have had post-docs, whereas the previous ones didn't or they had some kind of three-month short experience. When I was

applying for jobs, I only applied for one post-doc position and that was at Bell Labs. I knew that that was something that could happen. So if people asked me if I was interested in a post-doc, I would either answer, "Yes, and this is the one I'm thinking about," or I would answer, "No, but I can consider it." In fact, as an aside, it turned out to be fairly important because there was one position I applied for in which I said, "No, I'll consider it, but right now that's not in my plans." They came back to me and said, "You're one of our top candidates, but we need someone who is going to have a post-doc experience. Our suggestion to you is that you do a post-doc." So that turned out to be important.

What happened was that I applied for all of these positions. As I got further into the interviewing process, my answer had been evolving into, "I'm considering post-docs but no definite moves about post-docs." When MIT made an offer, there was an understanding that if I were to join MIT's faculty it would really behoove me to have the post-doc experience and come back—not only because of the competitive environment of MIT, but because I was coming from MIT and I wanted a few experiences that would distance me from my research experience at MIT, so that I would look a little different.

So there were a couple of reasons why the post-doc was desirable. In terms of looking for a post-doc, I ended up at Harvard instead of Bell Labs. It would have been difficult for me to move to Bell Labs even for a good salary—with family, and that was a big issue. In the meantime, I started to look around at places here in the area that had post-docs that were related to one or two of my interests. I found a few which weren't very fruitful, it didn't look like there would be that much funding and so forth. One of the things that happened was that Bob Cohen, again, wrote a letter to George Whitesides, who was a very eminent professor in chemistry at Harvard and does a great deal of work that involves applied chemistry and a little bit of engineering, you might say. He's interested in engineers, although he's a chemist. I got a very positive response letter from George Whitesides, saying "My friend Bob Cohen told me about your record."

So I talked to him. He's a very picky person, so I felt lucky that I could join his group. In terms of funding, MIT helped me with funding in the beginning. They said, "Well, specifically if

you join us, then we'll help you put the money forward for your post-doc." When I joined Whitesides' group, he then had me apply for several fellowships. This was an interesting move because he could have just floated me on MIT's money all the way up until I started at MIT. But the first thing he did was give me two fellowships that I should apply for, and I applied for them. I got one of them, the National Science Foundation post-doctoral fellowship in chemistry. It required that you write your own research plan—not only to plan what you're going to do as a post-doc, but also some element of what you might do as a professor using the skills that you gained from that specific post-doc.

So what happened in this entire process—this was in October, I started in September—was that I had to think about what Whitesides was doing in his group that I might get involved in that would impact my research later. I came up with an idea that I'm actually using now as a research project, which is nice because it's completely mine. George later on let me try out the idea as I was leaving his lab. The last few months I got to get some experimental data and some results out and a communication that we did together, and now we're doing it in my group.

That's one nice outcome of just having done the application process. It turned out that I did get the fellowship and that definitely was a nice outcome because the funding was mine—not only because of MIT now, but because I was a fellow. That changed the perspective of my work and of how I was perceived by others. It also opened some doors. I think in doing so, people began to stand up and take notice—"Oh, this person also won the fellowship." In chemistry, it carries some weight. As a chemical engineer who delves a lot in chemistry, it helped me because people would listen to me.

The final nice thing about it was that the NSF post-doctoral fellowship has forty-thousand dollars that they give to you in addition to your university's start-up package when you become a professor and start working. So I had a forty-K additional amount to spend when I started. I did use it. It's all gone now, but I needed it.

Well, it was good you had it then.

Yes, definitely. So there were a lot of pluses to that, and Whitesides did not have to do that. He was a silent mentor.

Tell me a little bit of why you say “silent.”

Because with Bob Cohen, I had a very strong sense that Bob just loved everything I did. Michael was not going to go out and talk a lot about me, but over time he became sure of my abilities and more comfortable in promoting me. His criticisms and comments were fairly useful. George, on the other hand, is an intimidating person because he's eminent and well known, well respected, and he has a huge group. The post-docs are about half of his group. His presence can be intimidating because he seems to be on a different plane. He's very bright, and you worry that you're going to say something very stupid in front of him. You can usually see in his face, he spots it. People are scared of him, people want him to respect them.

We didn't have that many conversations, but in the conversations that we did have he gave me lots of advice. At the time, I didn't realize he was really directing this advice toward me because he knew that I was trying to learn how to succeed in academia and how to succeed at MIT. He knew where I was going, he knew where I was coming from. At the time—I think I realize it more now than then—you're just sitting and you're listening to him and you don't know, it's hard to tell whether he's saying or doing this with everyone, every post-doc in his office. And I don't think that's true. I think he tells people what he thinks they need to know and if he doesn't think you need to know it, then he doesn't tell you. But he definitely told me a lot about how to get around, and he also told me people that I should know.

I say “silent” because on a daily basis it wasn't as if his voice was there. It was only these occasional talks that he would give, and then the fact that I sensed that if I did things in the future he would be supportive of it. In that sense, I think he is a silent supporter. He will do things if he sees that there is an opportunity to do something, and I might not know. It was one of those things, you know.

It sounds like the type of mentor that you don't know really how much influence he will have, but you know he has a tremendous amount.

Exactly. And because we don't have a personal relationship, so to speak, I don't know how far it goes and how far not, but I know there's a positive versus a negative there. And that he has done—he

has used the positive. Even the post-doctoral fellowship, I thought it was strange what this man was telling me, but I did it. I never questioned him because no one ever questions him. I thought, “I have this paid ride and you're telling me ...” The stipend for the fellowship was smaller, by the way.

He also told me to make my post-doc longer. I made it six months longer as a compromise. He wanted two years and I wanted one year and this was eighteen months. But he would say, “Make your post-doc longer and apply for a fellowship.” And basically he was saying, “Turn yourself into this real post-doc that's going through this experience.” He wanted me to gain from the NSF fellowship, and I didn't even consider it when I came.

That's amazing, the information you had at the right time.

Yes, definitely. I think because I was an engineer and not thinking “post-doc”—biologists and chemists consider it much more often—that was a very good experience.

So this thing goes eighteen months. Was there any agreement here that you would come back as assistant professor?

Yes. In fact, this all kind of took place during and after the offer was made. So during my visit it was just a topic of conversation. “What would I do?” “I bet if you came here you would do a post-doc.” That sort of thing. When the offer was made, it was made in an open way, but there was already an understanding there.

I understand. So talk a little bit about your life as an assistant professor when you came back. It's now been—what?

One year. I started in February of '95 and it's now '96. I found it very nice to be on my own when I first started, because I had been working for someone for quite a while and even getting papers out takes forever when you're waiting for your advisors. You're just saying, “Get it back to me so I can please just submit it.” I found it exciting to start off on these projects that I had proposed anywhere from a year and a half to a few months ago, and to be able to recruit students and see whether they're interested and kind of cast the net and write proposals.

So the whole thing was very exciting, definitely. I had the money to spend to get new equipment and have everything set up. I had hired a post-doc whom I had met at a boarding confer-

ence. He's from China. He was getting everything set up in the lab and that allowed me the time to pursue the proposals and recruit students. I got my first student and then another one shortly after. So I felt very good. I had a lot of good feelings.

Any negative feelings that I had—definitely I felt overwhelmed. I was given the polymer science lab as my first course. I don't have to be there every minute the lab is run, but the lab is running Monday through Thursday from 1 to 5. This lab course has a lecture every week, not just in the beginning. It's a more intense lab than others in some ways, although in terms of grades, in terms of what the students experience, I don't think it's more intense. In terms of what the teacher or professor experiences, it can be, because we have fourteen lab experiments. The term is only sixteen weeks long, so we're changing the experiment every other lab set, lab period. This same lab used to just have, I think, six or eight experiments in it overall, which is more like a typical lab. The students have a lecturer who explains the lab, and then for about two and a half weeks they're doing that one lab with the same materials and equipment. Well, I had two TAs—one for each section—Monday/Wednesday and Tuesday/Thursday, I lectured two hours a week, and I gave three exams. So really all you need is to have one more hour of lecture a week and it would have been a lecture course. But it was a lab course. So you see, it was a bit of a lot. I was learning how to lecture in this experience. My blackboard technique has gotten a little better—bit by bit it gets better—but my handwriting and things still look strange.

So I had a lot of issues in getting that started, in getting that rolling, in getting the students in the lab, and making sure to have a good experience and keeping things running. The thing is that if it's changing once a week, then once a week you buy new materials. That was a lot of work, physically and mentally. I think I was tired. I felt overwhelmed in my office. To this day, it's still unorganized. I organized it a little bit more, and now my home life is disorganized. I feel like I have to take a pitchfork and go through that. So I think that I'm still recovering from the big bang of starting everything all at once.

You were talking about something very important that there are very few people I can talk to about—you know, the real pressure as a young, African-American

woman trying to make headway in a scientific field, first year as an assistant professor. Can you describe that? Why is it we don't see more women like you? Talk about some of the toughness of trying to be in the field that you're in.

I think part of it is being able to take some of the hard strokes. Both in graduate school and as a post-doc and as the professor, there's going to be something that comes along that's going to indicate that you need to do better, or you need to improve this, or you need to get this act together, or this is not working. I always get those signals. For me, the hard thing is that I'm very self-critical and to have that come on top of it, it can be crippling. I've had times where my esteem has been so low that I literally have to pick it up. I have to write, I have to go read my c.v. I have to actually list accomplishments just to make myself feel like I'm worthy to walk into the Institute. Sometimes I feel like I'm pretending.

That's another thing I feel, too. Some days you're in your own skin and you're working and you're doing things and you don't have a second thought about it. And then you have one of those low periods when you get up and you lecture, or you get up and you're talking to your research group, and you feel like you're masquerading—like someone who can do this, but inside you feel like you would really rather just roll over and just let things go for a while.

I think it's hard to face that feeling. The first time I really faced it was in grad school. I was in the middle of this project. The synthesis wasn't working out and I had this really low period. My advisor, who really could give at least some kind of perk, wasn't even giving perks. He was like, "You've been working on this for how long?" I think I remember asking him if I could submit something. I was always submitting for competitions of some kind. There was some kind of student paper competition. He said, "I can't write a recommendation for this until you have more results." I'm thinking, "Oh, God. That means he can't do that and I won't be able to apply to places." I felt really low.

So those periods of time, hard times, are when a lot of people decide not to stick it out or decide not to pursue anything higher. I know a lot of people who will say, "Well, if this is the way it feels I am definitely not going to go that way as a career."

It seems like a double burden, to be raising a daughter as well. Males at least don't have that.

That's a big deal too. Most women I know in my field, who are black women, certainly did not have children in grad school and possibly have children as they move on into their professional career—perhaps in their second or third year after being at university, perhaps later, perhaps right before or after tenure. Any woman can look and see that choices are made based on that career decision.

I have a daughter and she was born when I was in grad school. The fact that my time was so tightly relegated was hard—it's hard. You have to kind of be almost blind to it. I could talk about it at the time and I still kind of do it. I think about it a lot, but I try not to think about it too much because then you feel really limited if you think, "I have to do all of this and I have to do it between nine and six-thirty or eight and five-thirty or whatever." Then I have to go home and I have to do the parent thing and put her to bed and then do the teaching thing that I do—the writing, the editing.

It doesn't always work, that's one thing. It works, but on a daily basis you're not going to feel that daily success of, "I've done all of it, wow, and it's all worked." I've found that. I'm still dealing with this now and hopefully everything will work out. Things have been working out so far. But there are days when I say I'm going to write a paper in the evening and it doesn't get written. In fact, the most I can do is put her to bed and trace a thought on a piece of paper and go to sleep.

You're so worn out.

I know. That's the reality. Ideally, it works every night, but in reality it works every other night or every time that you really have to make it work because you have to do it.

Is there any advice that you would give to younger folks, when you look down the road and you see some other Paulas coming? Is there any advice you would give them if they're trying to follow the path that you have gone on so far?

Aside from the obvious advice that is related to looking for mentors and letting people know what your goals are early on and thinking about what interests you, I'd say for those times when the self-esteem is plummeting, you almost have to train yourself to understand that this is something that

will happen sometimes. You have to learn to recognize the situation and maybe find some backup for it. You have to find some backup people. People always make you feel that you are capable, and they may not always be the people at work. They'll be spouses or family members or people who know you from a different perspective in your organization, who just feel that you're wonderful or you can do it. You need to use them when you can.

You also have to find a way of reminding yourself that you have always been capable in your life. If you can do that, sometimes you can at least pull yourself together enough to get out of the chair. I've never had a miracle chair where the feeling just goes away. In fact, for me, the only thing that made something go away is *making* it go away—like getting up and writing the paper that's giving me so much of a hard time, or getting up and either doing the experiment or finding the thing that will work that will get me out of this situation.

Hard work, right?

Yes, hard work. The only absolute cure is to get whatever it is that you need to get out of there. If you're in a situation that is intensely oppressive, find a way out of that, too. When you're going through the self-esteem thing—and it is normal—you realize that this is a normal recognizable part of being where you are and working on the problems on the level that you are. If you can at least get yourself out of the chair to do the work and end the cycle of feeling bad and not wanting to work any further, then that's a start. Like I said, I would read my c.v. and say, "I remember I won an award," or "I remember I got a good GPA when I was at such-and-such school," or "I remember the kinds of recommendations people wrote for me to get here." You've got to find something.

To reward yourself.

Exactly—and to remind yourself that you fit, that you're doing what you're supposed to be doing, and that you're not incapable.

In terms of the family it's hard. I think you can do both and you can have a very healthy family, healthy children, you can have a healthy marriage. Although I'm separated, I still feel like all of those things are possible, but I think you have to understand where the concessions have to be made. You take into control, into your own power, when things happen, as much as you can—as

much as it is reasonable. So planning when children are born does make sense. There are times when it's more and less stressful, and you have to figure out what kind of time you can devote and when. It is true that if you're a career woman you'll never feel there is an easy time. You'll never feel there's an easy time until you're almost out of time to have a baby, but on the other hand there will be times that are better than others. So you try to find the most reasonable time.

And you believe that there are times that are better than others.

There are times that are better than others, and if you actually plan, it does work out. You, in planning it, have thought about it. You've thought about what obstacles will occur at that time and you plan for them. You know that you will absolutely have to have a twenty-four-hour nanny, and both of you will have to have the money for a twenty-four-hour nanny. If that's what you need, then you plan for it and you set the money aside. That's what you need and that's what you get.

So things like that, or you need to have X, Y, Z family member or person nearby to help you. If you can plan your network ahead of time, then do it. That's why planning is useful. In terms of marriage, I think you have to understand what the other person's needs are and that person has to understand what you need. You can't really hide who you are. I think a lot of black women, especially, were raised in a culture where we think we should be a certain way as wives. You have to be up front and say, "No, I'm not that kind of wife. I'm this kind of wife. If you really want that kind of wife, I'm not it." You've got to understand that you have to be really open about that.

I think that's a good approach. If you do it early, you can correct it, you plan on a very realistic basis—the two of you do.

That's true.

You're unique in a sense. You were an undergraduate and a graduate student, both of those here. If you had to give a group an analysis of your perspective on the MIT experience, indicate whether that perspective evolved over time—and if so, how?

I do have a perspective on my MIT experience. I think it is one that immerses you in huge amounts of opportunity without, necessarily, a reader to tell

you which opportunities are there. It's very empowering, but can be very overwhelming and threatening or scary as well. I think that's definitely MIT. It's many, many faces and many, many opportunities happening to you at the same time at a very high energy level.

Over time, I think I've come to understand that there's not anything that is not possible. I mean, there are so many things that are possible here that it is worth looking around and talking to different people and understanding where they're coming from and what the possibilities are with them. There are a lot of different combinations of people and projects and things that can happen. The way my perspective has developed and is developing over time is that you can connect events and experiences and begin to understand that there is a pattern. There are some things that are forever recurrent in the experience at MIT. I think that, in some ways, can only come with growth.

As an undergraduate when I was here, I think that all I could see was the speed of the place and the fact that people were very smart here. It was hard to really digest much of anything else. Only in coming back and looking at it from different angles do you see that there is a humanity here. It is so diverse that it is hard. It is not easily the first thing that you see when you come here.

What do you mean by humanity?

I mean there is a spirit here that is based on people, and it's hard to tell that because this is the Institute of Technology. And yet behind all of this, there are people. Definitely as a faculty person, I've seen that more than I did as a student. The people running the research programs, the people behind the lasers, the high-tech stuff—they are in the end making decisions based not only on excellence, but also on people's needs. There's something there, and you see it when you hear faculty talk about a grad student in their group or you hear a student talking about a mentor.

All of this kind of comes together and there are links. Perhaps all of it is driven by a search for technology or scientific answers, but why are we so excited about it? Because there's something innate in us that makes us curious like this. Why are we all so happy to be in this Institute, as many people are? Because everyone shares that same feeling—that same intense curiosity or striving for

excellence. So there's something shared and that gets passed on, carried on.

Well, you've been to a number of other institutions, either for a short period or a long time. How do we stack up?

I think that MIT stacks up very well. I think the other places that I've been have had different effects on me. I had another positive experience at Georgia Tech, for example, another technology place. The only difference was, I think, that MIT was more diverse, more opportunities, more of that spirit. But there were definitely similarities there. I've worked in industry and I have a strong appreciation for industry, but I've never felt anything like this at an industry, I have to admit. I have a strong appreciation for industry, they're sponsoring my work, and I know a lot of very bright people in industry. I just cannot get the same feeling, though.

I was just thinking about the Florida experience.
Oh God, now that was really awful.