PROFILES OF SWE PIONEERS

ORAL HISTORY PROJECT

Eleanor Baum Interview

April 1, 2003

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Eleanor Baum

Eleanor Baum is an electrical engineer who received her Ph.D. from Polytechnic Institute of New York in 1964 after undergraduate studies at City College of New York. She began her career in the aerospace industry working for Sperry Rand Corporation and General Instrument Corporation. Baum joined the engineering faculty at Pratt Institute in 1965 and became the Dean of Pratt Institute's School of Engineering in 1984, the first woman in the United States to hold such a position. She was later named Dean of Engineering at The Cooper Union and Executive Director of the Cooper Union Research Foundation. Baum has played leadership roles in numerous professional associations, including serving at the first female president of the American Society for Engineering Education and as president of the Accreditation Board for Engineering and Technology. She was awarded the SWE Upward Mobility Award in 1990 and was inducted into the Women in Technology Hall of Fame in 1996.

In her 2003 Profiles of SWE Pioneers Oral History Project interview, Baum explained how she became interested in engineering; her experiences in high school and college; her career in industry and academia; her involvement in the women's movement and SWE; and her thoughts on diversity in engineering, public perception of engineers, and the role of technology in society.

- July 2016

INTERVIEW WITH ELEANOR BAUM, TUESDAY, APRIL 1, 2003

LAUREN KATA: Good morning.

ELEANOR BAUM: Good morning.

LK: It's Tuesday, April 1st. This is an interview for the Society of Women Engineers, with Dr. Eleanor Baum. And this is Lauren Kata, interviewer for the Society of Women Engineers. Good morning, Dr. Baum.

Could you describe your family background?

EB: Sure. I'm the only child of parents who left Europe during the Holocaust. And one of the things that they were very, very hung up about when they indeed came to a new country, leaving everything in the old country and coming with nothing, was that you have to be in a position to support yourself, if you're a woman or a man, but certainly in my case if you're a woman, because you really don't know what life will bring. And that's why they pushed me very, very hard to become an elementary schoolteacher.

LK: Did you have early experiences with technology as a child?

EB: No, I really did not.

LK: When were you born?

EB: Long ago. Do you want to hear how I became an engineer, or how I thought in terms of engineering?

LK: Sure.

EB: Okay. Well, I did not have experiences -- I was born in 1940, by the way. Although I did not have experiences with technology, I was very good in math and science when I was in high

school. And I took these advanced science courses with mostly men. I don't remember other girls in those classes. And when asked what they were going to do, a lot of these guys said they wanted to be engineers. My mother was pushing very, very hard for me to be an elementary schoolteacher, and if I really didn't want to be an elementary schoolteacher, how about a high school math teacher.

I was always one of these really good kids. I did what I was told. You know, all of my parents' hopes and dreams were in me, so I had to behave. This was my big rebellion. One day she asked, after weeks of 'The Joys of Being a Schoolteacher' kinds of articles under my pillow, "So where do I want to go to be a schoolteacher?" And I said, "You know, I think I'm going to be an engineer." And her reaction was horrendous. She gasped, immediately said, "You can't do that. People will think you're weird, and no one will marry you." (Laughter)

EB: True story! This was great. This was power. So I said, "Okay." I went into school and went through the same routine with my guidance counselor and got a very similar reaction, except she wasn't worried about my getting married; I wasn't her daughter. I decided to be an engineer. And that's a ridiculous reason to choose a career.

LK: Do you remember what your teachers thought about that?

EB: Very discouraging. It clearly was not a field for a woman. I lived and grew up in New York City. One of the New York City schools wouldn't admit me because they had insufficient ladies rooms,

which is a bit lame.

I got accepted to City College in New York, and was very conspicuous, I'll tell you. I was the only -- we called them 'girl' then, we didn't say 'woman.' I was the only girl in my classes -- not a wonderful experience, by the way.

LK: So when you were taking advanced math and science courses in high school, and you went to Midtown?

EB: Midwood High School in Brooklyn, New York.

LK: And you were the only female?

EB: No. In high school, taking the advanced classes, there were other girls, I think, in the advanced chemistry. There were not in the advanced math or the advanced physics.

LK: And what was that experience like?

EB: It was kind of okay, because high schools are small enough so you know the people in your classes. Being the only girl in college classes was not wonderful. And the reason it's not wonderful is that you feel extraordinarily conspicuous, and you become all women. If I don't know something, then it's, "All women can't"...

And everyone was overly interested in my grades and things like that. I'll tell you, I'm quite amazed that I stuck it through. It was not a great time.

LK: But you did receive your bachelor's degree?

EB: I did receive a bachelor's degree in electrical engineering from City College, and went and got a job in the aerospace industry on Long Island. Hated the job. So I went back for a masters degree,

got a job, again, in a different company in the aerospace industry on Long Island. Again, awful, awful job. Those were the days of cost-plus contracts. And it means that you got paid if an engineer did a job, but if a technician or a secretary did, the company had to cover it. So they had engineers doing a lot of things that I hope that they still are not asked to do.

Then I decided to go back for a Ph.D. And a school came through with a fellowship for me. At the time it was called Brooklyn Poly [Brooklyn Polytechnic University]. I graduated from City College in New York, by the way. And Brooklyn Poly came through with a wonderful scholarship, one of these National Defense Education Act Scholarships. And it came up because I got awarded the scholarship almost when school was about to begin. So that most people who knew that they were going go on to graduate school were already settled in with what they were doing. But here they had a scholarship -- someone who remembered that I had been a good student, called me on the job, and said, "Would you be interested?" I showed up the next day, quit the job -- thank God -- and I got the Ph.D.

LK: What was it like looking for a job during the time when you were looking for your first job? What was that environment like?

EB: There were some very, very weird experiences. And one that I remember with enormous amusement was I was interviewed by a company that kept talking to me -- by the owner of the company, a small company, that he was looking for a woman engineer to fill a job because experience in sewing was very important. And I -- this is

crazy. What do you mean, sewing? And it turns out what he wanted me to do was be involved in some assembly of very small parts -- precision resisters, which most new young engineers don't even know the existence of. And he thought that the kind of manual dexterity that you get from sewing would help. I did not take that job. (Laughs)

But I wound up getting a job at Sperry Gyroscope, and that was okay. The problem on the job was, again, they were not used to women in engineering, so everyone assumed that I was a secretary. Things like if two men are talking to one another, they're having a business conference; if I'm talking to a man, "She's flirting with him." So you had a lot of that kind of stuff to put up with. And I'll tell you, you developed a thick skin, and a sense of humor. I discovered that a lot of times instead of fighting, laughing it off works as well, and even better.

LK: You need a good sense of humor.

EB: Yeah, yeah. You can't let every little thing bother you, because then you give other people too much power over your emotions.

LK: So how would you comment on the use of physical stereotypes to promote women in technology or women's roles in technology? For example, what you meant about the dexterity of small hands to do certain jobs.

EB: I think that -- and I've been very involved for a lot of years in trying to really recruit more women to the profession of engineering. So I think that physical models aren't bad if they're

seen as role models. And if they're seen -- if someone -- if a young girl sees someone that she can relate to as a positive role model, that's a good thing.

(Phone rings.)

(INTERRUPTION IN RECORDING)

LK: Okay. You were talking about …

EB: We were talking about role models. I think it's very important for role models to exist. I think that over the years a lot of parents have -- and teachers, by the way, have a picture in their mind of who an engineer is, and that picture very often is male. So that if you see women who are mothers, may work, women who are young, women who are mature and have had lives that they're happy and satisfied with as role models, then you get a feeling that this is an all right profession, this is a profession that treats women well, this is a profession that has opportunity for women, and look, I can relate to that person. So what I think you need is a variety of role models. And in the role models, you don't need everyone to look like a glamorous model, but rather like a real person. And I think in role models you have to be very careful that you have a diverse set of role models; diverse as far as ethnicity, race and even age.

(INTERRUPTION IN RECORDING)

LK: Did you have any role models while you were working on your degrees?

EB: Actually not. I knew, I think, when I was in college, one

or two women who were engineers, but I can't really say that I had role models. But I was very lucky. I had some male mentors.

LK: Can you talk a little bit about your male mentors?

EB: Yeah. When I was in undergraduate school, a couple of male professors were very supportive and very kind and very encouraging. And what was interesting was, at the time, there was a female professor at City College, who was very, very harsh, and very forbidding, I thought, and not at all a role model to me.

In graduate school, again, I had male friends who were supportive, and I had several male professors, again, who took an interest in me. And took an interest means encouraging you when you're down, convincing you that, yes, you will finish your thesis one day, and just a shoulder to cry on, or someone to say, "'Atta girl." And that was very, very helpful.

LK: Do you remember some of your favorite courses when you were working on your engineering degree?

EB: Yeah. It's funny. I'm an electrical engineer. And I decided to become an electrical engineer for, I think, a ridiculous reason. I had disliked high school chemistry. I had a vision of civil engineers as people in hard hats and tattoos that bossed work crews. And I really was afraid of machines. I mean, I had not grown up on a farm; I lived in cities always, and did not want to deal with machinery. And that was my vision of a mechanical engineer. But, I had plugged things into the wall, (Laughs) so electrical engineering seemed reasonable. And that, believe it or not, is a

true story. I mean, it's silly.

I found that engineering was always interesting, and a lot of the courses very, very challenging. I tended to prefer theoretical courses to lab courses, because in a lot of lab courses I was relegated to being the data-taker while the guys did the work, especially anything dealing with large rotating machines and things like that. Favorite courses were in an area called systems and control, and in fact, that's the area I went into when I went into doctoral work.

LK: You knew that you could work with electrical materials. Did you know exactly what you were going to be doing on the job as an electrical engineer?

EB: I really did not. And I had never really had a picture of what it was like. My first job was at Sperry Gyroscope, and I remember that. It was in Great Neck, New York, which is a great coincidence, because now I live in Great Neck, New York, so it's a full circle kind of thing.

The day I came to work for the first time, I sat in the car. I got there two hours early, and I memorized electronics formulas. I thought that was going to be the workplace, and that's nonsense.

Of course that is so silly. What I was surprised at -- and Sperry was a big defense contractor in those days, and what was very, very strange was that it was in a huge facility where as far as the eye could see, there were partitions about so high (holds hand at chin level) with engineers behind all of the partitions. It was a

bit daunting.

LK: A bit intimidating.

EB: A bit daunting, not a perfect work environment. But no, I did not know at all what the workplace was going to be like, and in fact, I was incredibly disappointed in my first job because I was naive enough in the interviews, I didn't ask them. I should have talked a little bit more about what I wanted to do and what the job would entail.

LK: Do you think students today are counseled to do that?

EB: Oh, yeah, I think students today are much more sophisticated. And certainly, in my school, we do a lot of guidance counseling about how you take an interview, the things you look for, the things you make sure they know about you and your interests and your goals -- absolutely, absolutely. I mean, I went into this very, very immaturely, and it's too bad.

LK: You think you would have benefited with more guidance about the job, or …

EB: You know, benefiting is a very, very difficult word because I've had a very interesting career, and I've had a very good career that's been very satisfying. But it might have taken a very different direction. I would not have fled from industry if I had had very positive job experiences in those early jobs. But I did flee from industry. I mean, I really was not happy at all with the jobs that I had early on in the career, and it sent me back to graduate school.

And in graduate school, by the way, one of my mentors, a wonderful man, Tony Giordano (phonetic) at [Brooklyn] Polytechnic University, insisted that everyone who got a fellowship had to teach a course. Now, you understand, I went into engineering because there was no way I wanted to teach. And here I was in the position of having to teach a course, and it was real course. I wasn't just a TA, teaching assistant. I mean, this was my course. I taught a section of Circuits One. And I fell in love with the process. It was wonderful. My mother wasn't so dumb, I wasn't bad at this teaching. But of course, I was teaching at a university and teaching engineering, and it was quite different than what she had envisioned, but it was marvelous.

And my aspirations at that point, after teaching several times became, from going back to industry to someone who very much wanted to stay in academia, to do research and to be involved in education. There is something so thrilling about teaching a difficult concept, and seeing the light of "I've got it!" in the eyes of students. It's great.

LK: How many students did you have when you were a graduate student teaching that first class?

EB: Brooklyn Poly ran classes of about thirty-five, so I had thirty-five.

LK: Were you teaching any young women when you first …?

EB: No, no. I didn't have female students for years, not then, not when I was a graduate student, I did not. Early on in my career

at Pratt, it became one of my missions to recruit women to engineering, and there we did.

LK: So let's talk about how you joined the faculty at Pratt Institute. What was that experience, after you received your Ph.D.?

EB: All right, I'll tell you the story. I got my Ph.D. when I was extraordinarily pregnant.

Like the commencement is in May, and I had a baby June 1st, so that when I say pregnant, I was pregnant! And it was clear that I would, for a few months, stay home and nurse the baby. Don't forget, this was a different world. This was a time when working women were not the norm. I mean, it was okay to work if you needed the money to feed yourself and the family, or if you were alone: no husband or divorced or a widow. But if you were a working woman, particularly a mother -- very frowned on for you to be out of the house. So what was expected, really, was an interruption of your career, and you were going to stay home and be a wife and be a mom, and that was it, and maybe go back to your career later, and probably not in those days. Thank goodness things have changed, and they really have.

So I knew that I wanted to go back to work. And I understood that if you're away from technology for a long time, it's very, very hard to go back, because technology changes quickly. Even then it was changing quickly, there were advances. And I was, in fact, more concerned about forgetting what I knew, losing all of the networking contacts and all of that. So I was asked at my graduate school by my advisor to stay on and work for him, of course at no salary,

because after all, I had a husband.

So I was so enraged, I stomped out, stopped at the office, and said, "Is there another engineering school nearby?" And they said, "Yes, Pratt Institute is also in Brooklyn." I called Pratt, made an appointment, had an interview. The person who at the time was chairman of electrical engineering, who's still a friend of mine, Harum Marooth (phonetic), hired me on the spot. And so I had the baby in June and started working in September.

LK: Oh, how wonderful.

EB: So I was very lucky. It worked out well.

LK: Do you remember how you felt when you received the news that you were going to be hired at Pratt Institute?

EB: You know it's funny, I never doubted it for a minute. I just -- it was a good interview. It was something I wanted very much, and I just felt very comfortable about it. It was good, it was really good. Now, the question of childcare became a major issue, because it was not obvious how you did that in those days. Fortunately, my husband, who had worked at Grumman, had just decided himself to go back -- he's a physicist -- he decided also to go to academia, so he was at Queens College. I was at Pratt. So we had some flexibility in the hours, and we were very, very lucky. I found a marvelous lady, who I have to tell you, worked for me for eighteen years until the kids were grown. So we were very lucky with the childcare situation. There was not a situation as there is now of day care available and --

It was not common. In fact, my husband's mother was so embarrassed that I was working that she wouldn't tell people. She thought that it reflected badly on her son. I mean, why would I work? Clearly because he can't support me. And that was not at all the issue. The issue was that it was something that I wanted to do. And I was very early in the women's movement, feeling that women have a right to do things that make them happy and fulfill themselves.

LK: Did your parents ever -- and your in-laws come around after you …

EB: My mother came around very quickly, and my mother was fine with it. My father was absolutely delighted it worked out, he was very proud of me. And my in-laws: not really, not really. And my mother-in-law, who's now ninety-four, still asks me each time I see her, "You're still working?"

(Laughter)

EB: Not a woman who changes her mind easily.

LK: You mentioned being part of the women's movement -- I mean, by example, and by the fact that you were an only and a first. How else were you involved in the women's movement during that time?

EB: Oh, my dear, everybody was. It was a revolution. It was a major societal upheaval for women of my age and who were educated, and obviously, not educated women. Most of my friends were people who had degrees in psychology or education, because those are the things that women were supposed to study, but we're not working. And the women's movement hit them, and hit them very hard. So among the

social circle of people that I knew: many divorces, many people going back to school, many people going back to work, women's support groups and counter groups of finding yourself.

And it's very interesting, because Paul and I had, through all of this, probably the most stability in our marriage of all of our friends, and mainly because I had always worked. So while I could be supportive of friends who wanted to change their lives, I wasn't going through this enormous upheaval myself in my life, my marriage, my relationship. So it really was interesting.

I mean, there were ten couples who we were enormously close to. We had kids the same age. You know, groups of us would go on vacations together, our children played. And of the ten, we're the only ones still married.

LK: Were you the only engineer?

EB: Oh, yeah, yeah, at the time. And we were always the ones who bickered, so it's kind of interesting. So maybe if you let it out, that's a good thing, because what you saw was what there was, not a lot of bad under the surface.

LK: Oh, that's great.

EB: And I've been, really, very, very lucky. Paul is a physicist, has a Ph.D. in physics from the University of Illinois. We married, and he understood that I was going to have a career, that I really wanted to do interesting things with my life, and he's been incredibly, incredibly supportive through all of this. And it hasn't always been easy to be supportive, and he's been wonderful. So I'm

very, very lucky -- so is he.

LK: That's right. Let's shift gears for a minute. How did you first hear about the Society of Women Engineers? Was it when you were starting your career?

EB: I joined the Society of Women Engineers -- oh, boy -- long ago. I think I was at the end of college. I think women from the Society of Women Engineers came to campus. And I was more involved with SWE, really, later on, when I was teaching, because that became something that I felt for my students was enormously important, because again, SWE, at that time, could supply role models. I mean, years pass, things change.

Don't forget that in 1984, when people started talking about more women going into engineering, women were something like four percent of graduating classes, and then -- that's not true. In the '70s, it was women were like, three or four percent of graduating classes. By '84 it was up to fourteen percent. So as people were graduating and as SWE gets more members, it became easier to utilize SWE in terms of role models, in terms of networking, in terms of meeting a group of women who were having similar kinds of problems. And the networking is very valuable.

LK: And you remember--

EB: There was a New York SWE chapter.

And I think by the time -- you know, and I don't really remember exactly which year, but I remember there was a chapter formed of the Society of Women Engineers at Pratt. And don't forget, this is

something that I had been really, truly pushing, trying to get more women into engineering. In 1987, when I became Dean of Engineering at Cooper Union, we were at something like five percent women. We're more than thirty-five percent women here now.

So encouraging women to go into engineering is like a passion of my life. And I do it because I really believe that it leads to an interesting life. It leads to a life where one can earn a decent salary, and it leads to the kind of life where you can really improve the condition of society. So that combination, I think, is a very powerful one.

LK: When you were working on receiving tenure and working as a professor at Pratt Institute, you were involved in several professional associations?

EB: Yes.

LK: Including SWE?

EB: Yes.

LK: And can you talk about--

EB: I was a member of the IEEE [Institute of Electrical and Electronics Engineers] and the Society of Women Engineers. And very early on in my teaching career, became involved in the American Society for Engineering Education. Now, one of the other -- we were talking about influences on your life. Pratt was a small school, as is Cooper Union. And it's primarily undergraduate and masters degree. It is not a very high powered research university, where women have different kinds of pressures on them, where perhaps had

I been at one of the major research universities at the time, the tenured process would have been much different.

At Pratt, the fact that I was a really good teacher, the fact that I was really interested in students, the fact that I was writing papers and doing some research, there was no problem for me in going along in the tenure track. It was also a small enough school so that I knew most of the faculty, so that it was very comfortable to be there.

And one of the messages that I really would like to leave with a lot of young women who are finishing up Ph.D.s now and thinking of academic careers: A lot of times, when you get your Ph.D., obviously it's at a research university. And you think in terms of teaching at a school like the one where you're getting your Ph.D. That's not always necessarily something that's going to be the best thing for you, depending on who you are and what your outlook is. Because a lot of times if you're involved in a smaller school, in a place that's more student-oriented, it may be a better situation for you. So you have to evaluate yourself, but I think a lot of women don't realize there are options.

LK: Is that outlook something that's promoted within the profession?

EB: Again, I think that if you're involved in research at your graduate school, you very often have tunnel vision, and you think only in terms of going to another school where you can continue with your same research, and you see that model of high power research

university as the only model in education. It's not. And hey, that's a model that's good for a lot of people, but not for everyone, and at least women should be aware there are other kinds of places.

I mean, there are wonderful smaller schools: Harvey Mudd [College], Rose Hulman [Institute of Technology], Cooper Union -- marvelous, smartest students I've ever seen in my life. I mean, I'm in a school where about half the freshmen class enters with perfect SATs. Think about terrifying -- I mean, these are really smart kids. And you can do wonderful things educating these students. No, we don't have a Ph.D. program.

LK: When you became Dean of Engineering at Pratt Institute, do you remember how you felt?

EB: Yeah. It was wonderful and frightening. Frightening from the point of view that I was not at all sure how my husband would react to the added time demands that it takes. I didn't know how it would affect my family life with the kids. I was absolutely sure that I could do a good job as dean, and really was looking forward to the challenge.

Don't forget, I came from a time at Pratt where I was able to take summers off. I was able to do some research, but I could be home based. My husband was doing research with a group in Dartmouth, so we could go away as a family in the summer. When I became dean it was a twelve-month job, so you no longer did that. So most of my fears of being dean dealt with lifestyle issues rather than the job responsibility issues.

I had been a department chairman. I knew I could supervise men, I knew I could supervise women. I knew I could supervise, by the way, technicians. So this was not a problem. Those aren't the things I worried about. What I worried about were the effects on my own life.

LK: And how did you balance your personal life with your professional?

EB: It's not always easy. And I would love to tell you that it's been a bed of roses all along. It hasn't been a bed of roses. There are times I missed school plays, which wasn't wonderful for my children. I look forward with great nostalgia to a life of summers off, which I have not had since. I became Dean of Engineering at Pratt, I think in '84, so I've been doing administrative things for a long time.

But for the record, I do a lot more than education. I've always done consulting for industry, and I've always been very involved with the real practice of engineering, so I don't feel I'm in an ivory tower.

LK: And what does it mean to you to be the first, the first female dean?

EB: What I think it means is it's going for be easier for people who come after me. And I think that indeed has been the case, that there are now a bunch of female deans of engineering. And several of them have been people who I feel I mentored, and I beam like a proud mother when I see them. I feel really good about it.

I mean, it's kind of: You break through the barrier, and then it's not a big deal anymore. So that's really, I think, what it meant.

LK: And what does being a member of SWE mean, in the sense of mentoring and networking -- if you can expand on that a little bit.

EB: Well, let me talk about how SWE has evolved. I think SWE now is very different than what SWE was in the 1960s, when I first became involved. I think now SWE has active chapters. I think SWE does a lot of outreach to high schools. I think SWE professional women do a lot of outreach and mentoring of college students. And I think that makes things better, and certainly real-er to women studying engineering, because they're meeting women who are doing it. And that's very important. And by the way, they have to hear not only the good, but the negatives. And they can. And in everything there are negatives, but you can overcome negatives. So I think SWE really serves a very important role and important function.

LK: Did it ever mean anything that SWE was interdisciplinary, or cross-disciplinary, for you personally?

EB: No. For me, I think it's a strength of SWE. Because I think that's one of the problems of engineering all together. I think that one of the reasons that more women don't go into engineering is that most people simply don't know what it is that engineers do. Everyone's met a lawyer, everybody's met a doctor, but a lot of people have not met an engineer. And if they have -- if you meet an engineer, they so tell you, "Well, I'm an electrical engineer, I'm an mechanical, I'm an industrial, I'm a biomedical, I'm

a biomaterials engineer," that what we have done is made engineering, rather than a generic profession, instead one that is so involved in all of these specialties. And each of these specialties has their own society, and in big universities, their own building and their own faculty. And they don't always talk to faculty in the specialty next door. So I think explaining what an engineer is has not been easy.

And it really is a simple, simple message. I mean, engineers really -- I hate to use the tired cliché of 'problem solvers,' but we really are. We're trained problem solvers. And the kinds of problems we deal with -- I at least like to think of as improving society. We do things that make better lives for people. And I think that it is those fields of engineering that have made that message very clear that have been successful in attracting women, by the way. I think that's true in biomedical, where the connection is very true and very, very clear. I think it's true in environmental, where it's very clear. And it is less clearly made as a connection by most of the other fields of engineering, but whenever we do, it attracts women, and I love that. I think that is absolutely great.

LK: That is wonderful.

EB: Did I answer your question? I'm not sure on that one.

LK: You did.

EB: Okay.

LK: I think you did.

EB: So SWE, by the way, being interdisciplinary is important.

I would like students to have a role model of a woman engineer, not necessarily a woman mechanical engineer. And in SWE, by the way, she will have an opportunity to meet women who are mechanical, civil, et cetera. And by the way, modern engineering -- you know, engineers now work in interdisciplinary teams. So meeting women in these other fields is a very, very good thing.

Want to hear my pet peeve about SWE? My pet peeve about SWE on campus is when the campus Society of Women Engineers invites a female speaker to campus. They have all the female faculty show up. Most of the young women who are students show up. Even female high school teachers will show up. But they don't invite a lot of men. And just as I think that it is important for women to see successful female role models, I think it's important for men to see important -- to see successful female role models. So I urge groups, when you have a female speaker on campus, invite male students. It's important for them to hear the message as well.

LK: And that's funny, that was going to be my next question, how do you feel about male membership in SWE?

EB: I think it's great.

LK: And are there many male members on your campus?

EB: Here? No. On our campus there are enough women that we've been advertising it. And by the way, it's run by students, essentially, so there are enough female students that it is women. But they do invite men to the meetings, and certainly to the events.

LK: You've been involved in several initiatives within the

profession. One of them is accreditation? Can you talk a little bit about the importance of accreditation?

EB: Oh, yeah. I've been very, very lucky to have been involved in engineering on a national and on an international level. And one of the ways that I got involved in accreditation was really through having met Harriet Rigas, who was a member of SWE who passed away. But Harriet Rigas, when I was a young assistant professor -- I couldn't have been -- I guess I was a department chairman at Pratt -- who said, "You know, you really ought to get involved in ABET," which is the Accreditation Board for Engineering and Technology. And she recommended that I do that, and I followed her advice. She was one of my role models. And I actually did. I moved up to ABET, got involved, and in fact, wound up being president of ABET, which was really very interesting.

Accreditation matters. In this country, one of the big strengths of engineering education, and of U.S. education in general is that it is not government regulated. You go to other countries, and even curricula are government set. There is a ministry of education, and it says, "Okay, this course, thermodynamics, you will teach this." We don't do that in this country. In this country, what we do is peer evaluation, and peer accreditation. Accreditation teams visit university programs. ABET tries very hard to have it made up half and half of academics and practicing professionals.

And what accreditation does is not rank programs and not rank universities, but say, "Yes, this group meets" -- and it's a terrible

word, but I'll explain why it's important -- "the minimal standards required." And most places, of course, exceed those things. But what it does is it says, "Yes, what you are graduating is a person who is really grounded in engineering, has the kind of background that can go on to either professional practice or onto graduate school. But there is no attempt made to rank schools.

It is so important that the profession is involved in this, rather than inviting the government to come in and set standards. I think engineering is so much more creative in countries where the government does not strictly regulate the details of the classrooms.

LK: That's very interesting.

EB: The other thing that I have been involved with is something called the Washington Accord. The Washington Accord is a treaty, an agreement between the English speaking countries -- the primary English speaking countries -- the U.S., Great Britain, Ireland, New Zealand, South Africa -- help me, what am I missing? New Zealand... Anyway, the primary English speaking countries. And now Japan has joined the Washington accord. And the point of the Washington accord is that we agree that if you have an accredited degree, accredited by the accreditation group within that country, it is equivalent to taking a degree in a school that is accredited in one of the other member nations. So that if one of our students from the U.S. wants to go to a Ph.D. program in England, the British are assured that they come from an accredited university.

LK: Oh, that's wonderful.

EB: Yeah, it really is, because it increases international mobility of engineers. And I think these days when so many countries provide the market for engineering products, I think these days when many companies are global, it's very important for engineers to have that kind of mobility. I think it matters.

LK: SWE has had an international arm, or been involved in the International Conference of the Women Engineers and Scientists, ICWES. I mean, women engineers collaborating internationally, how do you feel about that?

EB: I very much approve. I think it's the right thing to do. And I think what is most interesting at meetings like this, is you find the same problems all over the world -- the same problems, the same sort of interests. And I do a lot of speaking on college campuses, and to women's professional groups at various companies. And the kinds of things that women worry about -- would you be interested in this?

LK: Absolutely.

EB: The kinds of things that I hear women expressing concern about: Women tend to worry about what do you do in case of harassment. In the U.S. it's very easy: harassment is against the law. If you're harassed and you resort to that kind of solution, will it harm your career? Yes, it really will, unfortunately. Got to do it sometimes, it's the right thing. But will it have a bad effect on your career? Yes. And that's true in many parts of the world.

So how do you handle harassment? Well, I think that you have to separate really serious harassment with someone who walks around with antennae that are so sensitive that any well meaning but klutzy guy can make a comment that sets you off. So I think that if it's from a well-meaning klutzy guy, you can deal with it with a joke. You can deal with it by asking one of your male coworkers to talk to him. I think by just talking to whoever your supervisor is will very often end the situation.

There are more serious kinds of harassment, though. And the more serious kinds of harassment, you may very well have to resort to way more serious means. And when that happens, you have to do it, you don't have a choice, but it will damage your career, it really will. It's sad. It's a reality of life.

Other things women worry about: If I take a number of years off to have children, can I come back to my career at the same kind of level? And I think that what has made that so much easier now is the possibility to work electronically at home in many fields, and the ability to continue education at home, you know, this online learning. And there are engineering courses online. I think that societies like SWE and the various professional societies do have professional speakers and do have regular meetings, so if you're home and you're away from work, for goodness sakes, go to professional meetings, find out what's happening in industry, find out what's happening in the technology, and stay professionally informed and alert. And if it's possible -- and in many companies, it is, for

several women to share a job, or to work part time when you're home, or to work from home, even if it's a different kind of job, I think that's a very good thing to do.

LK: Do you think industry is moving more into that direction?

EB: I think so. I think that's very positive, and it's very good for industry that they're doing it, as well.

The other big concern that a lot of female engineers have -- and many female engineers are married to someone who's an engineer as well -- is the whole two-career family problem. By the way, this is true for women in engineering, as well as women in many other fields. I am New York based. I have been able to change jobs several times, and my husband has been able to change jobs several times, both in industry and academia. Listen, I don't want to give you the feeling we can't keep a job. But it's been wonderful that we've had the flexibility to change jobs, because this is a large metropolitan center, and there's a lot of industry, and there's a lot of academic institutions here. So we solved the problem by saying, "We have made a decision, we're staying in New York. Our families are here. At this point my children are here, aged parents are. We're staying." And it's given us the flexibility that we need. You don't have that kind of flexibility in a lot of areas.

What do you do if you as a woman in engineering get this wonderful job offer, which is five hours flying time from where your husband is working? That's a very, very big problem in our society. And it's true again, not only for engineers. And how you handle that

problem varies. It depends on your relationship. It depends sometimes on the ages of your children. It depends on availability of supporting relatives and sometimes grandparents to help in raising the children. And sometimes, frankly, it leads to divorce.

I've heard more people say, "Oh, we commute every other weekend, and we see each other, and it's so romantic, and it's so wonderful because we're away from each other, and it's like getting engaged all over again and being newlyweds all over again." And then the thing you hear, sadly, is unfortunately, the divorce.

(INTERRUPTION IN RECORDING)

LK: -- here with Dr. Eleanor Baum. You were talking about the challenges of balancing personal family life commitments with your professional commitments, and also the need for flexibility.

EB: Flexibility -- ah, all right. There is a need for flexibility on all kinds of levels, and you know, I can go off on that. The flexibility that you're talking about is not walking around with a chip on your shoulder all the time so that you're so difficult to deal with that you come across as angry, prickly, and someone people just don't want to deal with. So you have to learn a little bit to laugh at yourself. But hey, there are limits. And I insist on being treating professionally, and insist on being treated with proper respect, but there are times I can really laugh at myself. And I think that's been a very valuable tool.

But when you talk about the need for flexibility, I think that's terribly important in an engineering career, because engineering

careers now are no longer what they used to be. And employers expect engineers to be flexible, professionally, to be able to work on perhaps a much wider variety of problems than they were expected to in the past. And to me, the exciting thing about a career in engineering is that you continue to learn through your whole engineering career. And that's what makes it so much fun, you're not just doing the same thing all the time. As you continue to learn new things -- in my case, I'm working with different kinds of people, different people, and I'm growing, and I love that in engineering. But that now has become one of the things employers expect. They expect engineers to be more flexible. So your question raised several levels of flexibility.

LK: Do you think that the more serious cases of harassment, that's where laws are necessary?

EB: Hey, you bet. You bet. And there are serious cases. I'm on a corporate board, where within -- I mean, the company, it was a situation that was so serious it was even reported to the board. The person was fired, legal action was taken. I mean, yeah, oh, yeah, there are times when you absolutely -- there are things no one should have to tolerate, plain and simple.

I mean, I'm even annoyed that I sit at my computer and get all of this gratuitous messages that are semi-pornographic, the spam that is just so irritating. And what's funny, with the spam that I've been getting because I'm at an engineering school, I get spam both meant for women and for men. So I've never had trouble with gender

identity, but this is hilarious.

(Laughter)

LK: But there are more subtle concerns or situations --

EB: Absolutely. And some of the subtle concerns are concerns that women think of as unique to them, that really need not be. For example, one of the things that has changed about engineering education, and the almost need that employers have for engineers, is an ability to work in teams. And when you work in a team, you have to prove yourself. And I talk to young women graduates who talk about this feeling of they're part of a group, working on a problem, and they have to prove themselves. Well, young men come back with the same problem, and they don't realize it. See sometimes, you know, when you talk about networking, you have to network not only with other women, but with also other engineers at your level at the company, because you will find that there are indeed similarities.

And when you work in a team, the team dynamics vary. There are times on a project when you are leading in the team, there are times when you are following. There are times when your solution is not the solution the whole team will agree to, and you cannot tie that up so much with your ego and your feeling of your own self worth.

And I think that those are things that you have to learn and you have to work on all the time. I mean, some of that stuff comes up even when you're not so young. You know, there are disappointments, and you have to learn to deal with it. That's part of being a person. Move on.

LK: SWE is one of several organizations that work to gather information on women and minorities in engineering, and you're a strong supporter of that as well.

EB: Oh, yeah.

LK: Can you talk about the survey that you introduced here as Dean of Cooper Union?

EB: Yeah. It was actually not a Cooper Union survey -- I mean, it was financed by Cooper Union, we did it at Cooper Union, but it was really a national survey. And it was a national survey of engineering students, and another one of professional women who were working in engineering. We did it in 1984. And it had some -- no, '86, I guess? What am I talking about? '89.

LK: '89.

EB: '89 -- the survey. And some of the things on the survey aren't so different now. For example, it was very clear in the survey that of the women who go into engineering, two-thirds had a family member who was an engineer, primarily a father. So that goes back to what you and I were talking about earlier, that if you know an engineer, and you understand what that person does, the whole field is not so mysterious, that you perhaps can think of becoming an engineer. Now I'm happy to say I even have female students whose mothers are engineers. In fact, I have male students whose mothers are engineers, which is absolutely wonderful.

At the time of the survey in '89, it turned out that more and more women were going into management positions. And some of them

were quite concerned about supervising men. Well, it turns out, I think, that a lot of men going into management positions are also worried about supervising people. And if they have women in the group, they worry about supervising women. So those tend to be common threads.

But what's interesting to me as I travel around and I visit companies and I travel and I visit universities, is that more and more women are moving into leadership positions. More women are, slowly. Not at the very top, although, happily there are several engineering companies, major companies that have CEOs that are women. And certainly Lucent [Technologies] and Hewlett-Packard are examples -- just two examples of this. There are more female engineering deans. There are more female department chairmen. I think that's wonderful. So I think we're doing great things.

And I think on the academic level, part of it, tells us that women who go into engineering still are the very top. They're women who have a very good self-image. They're women who see themselves as excellent in school. They are women who have, frankly, the guts to go into what is a nontraditional field -- and it still is a nontraditional field. I think we will not have a problem when a high school girl with a C average, just as many high school boys with C averages, decide to become engineers, where it's kind of matter of fact. I'm looking forward to that. My faculty groans when I say something like that. But I really think it will mean, you know, that it becomes a field that women will not hesitate to enter.

LK: How do your colleagues feel about that? Do they agree with you?

EB: I think that setting a supportive environment for women at a university is something that I am very, very involved with. The environment here for women is supportive. And you know something, when it's supportive for women, it gets better for all students.

So I think that's a very, very good thing. I'm happy about that. But you know, Cooper Union is a small school, and it's like a microcosm of what goes on in the world. But as I told you, it's the only school in the country with completely free tuition, so we get really extraordinarily gifted students here, both male and female. And the fact that we are thirty-five percent women, and I hear almost forty percent in the new incoming class, that is amazing and wonderful. And the faculty are just delighted, because they feel the classes are much more interesting with the bigger mix of women.

You know, one of the things about diversity is that you don't get involved in diversity in your company, and you don't worry about it in your classroom, because it's the right thing to do. You do it because it leads to a much more creative environment. I mean, why would you want to cut out the creativity of half the population, in the case of women, for goodness sakes? A lot of the faculty say discussions are just so much more lively and more interesting with more women in the class.

LK: And it seems so obvious.

EB: It's not obvious to a lot of people, but you're right. It

is absolutely the right thing to do for -- the right thing to do for not the reason of doing the right thing, but it's good business for companies when they have a more diverse workforce. I garbled all that.

LK: (Laughs) It's good stuff. Going back to the survey, I mean, is pushing for diversity, is that related to why it's important to do these types of surveys, to get a big picture out about--

EB: I think getting the big picture is important, and I think you can learn from it. And I think that when you learn from it, perhaps you can do things to change the climate. The survey we did in '89 indicated that a lot of high school guidance counselors and high school math and science teachers still were not encouraging women to go into engineering. And I think that, again, is a place that we need to do more outreach, because they really are people who meet with high school students at a time when serious decisions are being made.

I think we need to do more things with parents who still are worried about their daughters doing something that is seen as unconventional -- you know, my mother's comment about weird, which, you know, makes a good story. But still today, I think there's a lot of that feeling around. You want your daughter, very often, to go into something very mainstream, safe -- safe in the view of the parents understand what kind of job it is and understand what she'll be doing, and understand how she will be viewed by the world.

LK: Do you think that the public media is shifting toward

representing the diversity of women?

EB: I still see a lot of reporting triumphs of science, failure of engineering. I still see engineers having a not very positive image, I think a lot of times in the media. Thank goodness for Star Trek and the female science officer, you know, bless B'Elanna, she's wonderful in that series. But I still think that engineers are not viewed positively. And what bothers me a lot is that a lot of educated people think that engineers are very narrowly educated, and don't find them interesting.

You know, someone here was joking that at a cocktail party you'll be talking to someone and they'll say, "What do you do?" And you say, "I'm an engineer." And they said, "Oh," and walk away. I mean, 911 has changed that a bit, because they may ask you why the building fell, or something about the fuel and the jetliner. But I still think that engineers really do not have the positive self-image that really they should have because of the wonderful things that engineers do, and the importance of engineering to society. Now, is that a SWE problem? I think it's a SWE problem, but I think it's a problem of the profession. And I think that SWE, working with other engineering societies can help it a little, but I think it's going to take a long, long time.

The other very big problem that I see is, essentially, the technological illiteracy of the public. You know, if you have a Nobel Prize winner talking about an environmental issue, and you have Jane Fonda, the world believes Jane Fonda, who has no science

training, as an example, because she will get the -- not only the cleavage, but the air time. You know, there's something a little off about that.

I think that to be an educated person in today's world, you have to know something about technology. You have to know something about technological decision-making. You have to understand a little bit about how people and technology approach problems. And still, while most college students in liberal arts programs have to take, you know, the required science course, most schools, and almost, I would say, ninety-five percent of liberal arts school still do not have a required technology course. And no, how you use a computer is not what I'm talking about.

I'm talking about technology impact on society, a serious kind of course on technology. We still don't do that. And there are a lot of people now who study engineering -- a lot of my students study engineering, and in the end don't wind up getting jobs in engineering. For example, chemical engineering is an absolutely wonderful preparation for medical school and dental school. Wall Street hires a lot of our graduates, particularly since we at Cooper Union have had a special emphasis on teaching verbal and written communication skills to engineers. In fact, we work with not only professional writers, we bring theater people in to help students do presentations better.

And I think that if you look at the years ahead, instead of what was seen as a preparation for life and further study, which was the

liberal arts background that people had, that perhaps engineering really is the new liberal arts, because if you look at the world, it's becoming more and more technical. And if engineering curricula change so they allow more flexibility, they allow more ability for electives, they allow more liberal arts humanities and social science courses to be selected within an engineering program, I think they're really going to reshape what we consider a kind of background education for people will be.

LK: That seems like a really progressive view.

EB: Oh, I hope that happens.

(Laughter)

EB: But all in all what I would say about a career in engineering, because you're talking to me as a pioneer -- good grief -- and I think of myself as twenty, still -- it has been, for me, a really good life. It has enabled me to live on an economic level that I never dreamed I would. It has enabled me to travel, and professional travel, and to learn to work with people from other countries in a way that has so enormously enriched my life. It has enabled me to, I hope, influence the lives of a couple of generations of students, and influence their lives by direct contact and indirect contact by changing environment, by influencing curricula, by changing attitudes. And it has always been interesting.

It hasn't always been easy. You know, change is -- being someone who pushes change can be very frustrating, can lead to a lot of backlash, can lead to a lot of resistance. But when that change

comes and the change is positively viewed, wow, what a trip that is. You feel great. And engineering, for me, has been a really exciting, fulfilling life.

So when I suggest a career in engineering to young women, I can't even imagine what their futures are going to be, but I just want them to be able to dream and to just make it wonderful for themselves. And I think this kind of background, where you have real knowledge, something really solid in your background, so you can attack real problems, you can really serve your country, you can really serve the world, you can do wonderful things in society, I can't imagine a better profession than that. It's been great.

LK: How young do young people need to be, do you think, to receive that message? Is that a message that can be given at high school, or--

EB: I think certainly it has to be given in high school. But I think for a lot of inner city kids, high school is too late. And I think it is a message that has to be given -- it's almost a societal message. And the obvious things that we've heard over the last twenty years: Yes, women can do math; women can do science.

You know, this is funny, we were talking about the women's movement before. And to me, a kind of side effect of the women's movement, which no one anticipated: When I was deciding to study engineering, all of my friends, the brightest, best women I know, all thought in terms of becoming elementary schoolteachers, because there were no options. You became an elementary schoolteacher, you became

a nurse. Now the best and brightest young women I know don't talk in terms of teaching young children, they go off into careers. And of course, and they should.

But the results, I think, on our school system is a very serious one. And I think that we have to talk about raising pay for teachers. I think the respect that certainly teachers of young children get has to improve so that we can attract people who can in turn teach math, teach science to youngsters, and bring an excitement about math and science into the classroom. So I think the message has to start coming early, but I think it has to be to the population as a whole.

I think parents still have a very strong effect on choices that young women make, certainly. And if they are not comfortable with the image that they have of the engineer, then they're not going to be comfortable with their daughters going into that field.

LK: Do you think that there's a quote, unquote, women's movement today?

EB: I think there are lots of women's movements. Which one are you talking about? I mean, I'm thinking Mothers Against Drunk Driving. I'm thinking about --

LK: Well, actually, that's interesting. Can you expand on that, the variety of women's movements?

EB: I think that the world now, as the world always was, is full of very smart women. And I think that women are happily, in this society, taken far more seriously than they used to; they go

into fields that they will find fulfilling and interesting; and they make a powerful voice. And I think they bring a different perspective on a lot of issues than men have. And I think that's terrific. And I think that's true in many parts of the world -- not in all cultures, certainly, but in many parts of the world.

LK: And what about within the engineering profession?

EB: I think that there are a lot of women in engineering, especially as they're starting to move up a little bit beyond entry level, who are uncomfortable being viewed as a woman engineer, and therefore resist becoming members of SWE, and would much rather become members of one of the traditional engineering societies so they are not viewed as a woman engineer, but rather, an engineer who's a woman. Evidence of this is certainly the presidencies of several of our major engineering societies, now, are indeed women.

EB: I told you, these bright, wonderful women go into engineering. But I think it's a mistake not being a member of SWE as well, because I think that SWE deals with issues that some of these other societies really don't. And I think that the interdisciplinary nature of SWE, the pure networking and let your hair down nature of SWE is very, very helpful. And I think you can be a member of more than one society.

LK: What would you say, or how would you comment to the statement that "Engineers don't really participate outside of their professional societies, whether it be an outside woman's organization or another social organization," to that stereotype or that image?

EB: I think that goes very much along with the image that a lot of people have of engineers as not very interesting people. And I think that a lot of that comes from the narrowness of a traditional engineering education. It used to be, and is still in many schools I'm sad to say, an education which is so heavy math, science and pure technology, that many people just haven't had a chance to grow in other areas.

I think, for example, that you're going to be a much better engineer if you read newspapers, if you read books, if you know something about art. You know, making an object is great, but making an object that is also esthetically pleasing is good. Making an object that's ergonomically more comfortable is also a good thing. So that I think that a broader viewpoint for engineers is very important. And I think the time that has to start is in college. And in college, too many universities are still viewing engineering as very, very narrow, and it's really not. And they use the excuse of accreditation. But with this new engineering criteria 2000, that just doesn't hold water. It's just a resistance to change.

So I think you're a better engineer if you understand the world better. I think you're a better engineer if you'd had experiences traveling aboard. And frankly, when you move up in engineering, I think you're a better manager if you have more experience in dealing with people of different cultures, if you know how to laugh, if you know how to relax. And as you continue to move higher up in the corporation, in the corporate world, even to the board room, all of

these experiences which give you a broader view really help you in making technology kinds of decisions.

So I think the day of thinking of engineering as: Here's this tiny technical problem, solve it -- that just doesn't hold anymore. Here's this tiny technical problem, solve it, but solve it being aware of the costs, being aware of: How do you get rid of it once this device is no longer used, who will buy the device, and where does this device fit into a big project?

That was one of the problems when I worked in the aerospace industry, by the way. I talked to you before about my terrible jobs. When you worked in certain companies, you worked on a very tiny part of a problem, and you never were shown, and you never understood the big picture, that: You're doing this, but it's important because this is the thing that we're working on and this is why it matters, that systems viewpoint.

Very important. And I think that engineers need to have that kind of systems viewpoint to understand why their contribution to something, albeit small, is still very important.

LK: How do you think non-engineers will be able to better understand that while more of that needs to go on, some of that is already going on. How can the public become more aware of that?

EB: I think that's going to be one of the main challenges of the profession. And that's something that not only SWE has to be involved with, but I think professional societies.

And one of my pet peeves: Don't have guidance material for

young kids written by engineers, have it written by people who know how to make things attractive to young people. Because we have a tendency -- "Oh, you need guidance material? I'm an engineer, I can solve any problem." There's some problems you shouldn't be solving. There are professionals who do that kind of stuff really well.

LK: Do you have any final thoughts?

EB: Just that it's been really a great pleasure to talk to you, and that it is very daunting to think of oneself as a pioneer in anything, my goodness. (Laughs)

LK: Well, you certainly are a pioneer.

EB: Oh, thank you. It's been good. It's been a good life.

LK: Thank you.

EB: And a good association with SWE, so that's been nice.

LK: Well, SWE appreciates you participating in this for their educational programming.

EB: My pleasure.

LK: Thank you very much.

*** END OF INTERVIEW ***