



Oral History of Jean Bartik

Interviewed by:
Gardner Hendrie

Recorded: July 1, 2008
Oaklyn, New Jersey

CHM Reference number: X4596.2008

© 2008 Computer History Museum

Gardner Hendrie: Today [July 1, 2008] we have Jean Bartik, who has graciously agreed to do an oral history for the Computer History Museum. Thank you very much for being with us, Jean.

Jean Bartik: Thank you for having me.

Hendrie: I'd like to start with a little bit of your family background, if you don't mind, where you were born and a little bit about the family you were born into.

Bartik: Oh, well, I come from a long line of school teachers and farmers. My father was a school teacher and a farmer. And I was born in Gentry County, Missouri, about two miles outside of a little town called Hanthus Grove. And it had a population of 104. So I'm the sixth of seven children. I have three brothers, had three brothers and three sisters. And all of them are now gone except me. And so I was the sixth of seven, so I grew up in a big noisy family. And it's, kind of, interesting. Even though I grew up in a big family, I was, sort of, lonely. And the reason I was lonely in this big family is that being the sixth, nobody ever listened to me. Because everything that I was doing, they'd already done a long time ago and they weren't interested in my stories. And I used to go out in the pasture and lie down in the grass and look up at the sky. And then, I could just imagine anything I liked and nobody had anything to say. So I really liked that.

And, actually, I never acquired any fame of any kind in my family, until it turned out I was a good softball pitcher. Because it was interesting. I went to a little one-room school, and you know that they have enough kids to play on a team. We played, you know, softball from the time we were in first grade. So it turned out that when I got to be in sixth and seventh grade, I could pitch better than anybody else. So I used to pitch. And I used to practice. I flattened out a tin can and nailed it to the smokehouse. And then, I used to go out and practice my control pitching at it. So then, finally, the manager of the team in Stanberry, Missouri-- now, this is a town of about 2,000 that was nine miles away-- heard about me. So he came and asked my father if I could play on the team. So I did. And I was quite a star. So there used to be, you know, stories about me in the newspaper. And when I would go to town with my mother, people would stop me on the street, particularly men, and tell me what I'd done wrong in the last game and how I should do things. And one time, I was in town with my mother. And the owner of the pool hall came out and started telling me what was wrong with how I pitched the week before and blah, blah, blah. So I didn't even know the man. But my mother said, "I'm not going to town with you anymore if you're going to have those ornery old men come out and talk to you." But many people stopped to talk to me that I didn't know. So anyway, that was my first time that I got any particularly recognition in my family.

Hendrie: And this was a girl's softball team?

Bartik: Yeah. Well, they were very, very popular, because it was before TV or even very much radio. So everybody came out when the girls played. In fact, the boys liked for us to play a double header with them. Because then, everybody in town would come out and they would see their game. Because they were very interested in this. And we went around to other little towns and played in the area. And we would go by a truck or, sometimes, in a number of cars. And one time, we were in a truck. We went to Tarkio, Missouri, and the truck, he thought he knew a shortcut. And it broke through a bridge. So I mean, they tried to get it out, and they couldn't get it out. And they, finally, had to wake up some old

farmer to pull him out with a team of horses. So we didn't get home until about five o'clock in the morning. And when we came into the town of Albany, where we had left our car-- because my sister could drive. I mean, I wasn't old enough to drive. But my older sister would take me to the games and she would drive. So we got there. And there was my father standing out there by the car. He said, "Get in the car." And he said, "That's the end of your softball career." So he drove us home, and he made us do the chores and everything else before he'd let us sleep. And anyway, one of my uncles, Uncle Fred, came up and said he would take me to the games. And anyway, my father finally relented and let me play again.

Hendrie: He was just angry at the moment.

Bartik: Yeah, well, he was scared. I mean, he was frightened.

Hendrie: He didn't know what was going to happen to you. Yeah.

Bartik: Because he had no idea where we were or what had happened. I mean, we should've been home, you know, by about one o'clock in the morning. And he woke up in the middle of the night and realized we weren't home. And he had walked to my uncle's house to have him get the car, you know, to go out and look for us. So anyway.

Hendrie: Now, when would that have been?

Bartik: Well, I, actually, quit by the time I was a sophomore in high school. So it was when I was about 10, 11, 12 years old.

Hendrie: And what year would that have been?

Bartik: Well, I was born in 1924, so in...

Hendrie: You would've been ten in '34.

Bartik: If I was 10 or 12, it would've been '34, et cetera, in that era, '34 to '36.

Hendrie: Now, was your mother, basically, stayed at home?

Bartik: Yes. But my mother-- well, we were all good in math in my family. So the fact that I was good in math wasn't particularly noted. And my mother, she had just graduated from the eighth grade. And her family, they lived out in the country. And it's, kind of, hard for people to believe how hard it was for kids to even go to high school. 'Cause my older brothers and sisters, there were no school buses or anything, and they had to live in town. And you leave home. I mean, my brother had rooms with other people and

some of them, brothers and sisters, stayed with my grandmother. And one year, two brothers and a sister had an apartment. And we didn't have...

Hendrie: So they could go to high school?

Bartik: So they could go to high school.

Hendrie: My goodness.

Bartik: So anyway, my mother had not-- she just went to the eighth grade. But back in those days, the state would pay for those farm kids to go to school, even to grammar school, two years beyond if they wanted to. And my mother did. And she was very good in math. I mean, she was great in Algebra and Geometry. She was as good as my father. And so she was a wonderful-- she could do anything. She built a room on the house. They lived in a small house and had these children, so she just built a room.

Hendrie: Oh, my goodness.

Bartik: I mean, yeah, she was a wonderful woman. And she could sew better than Christian Dior. I mean, she could make patterns, and she was unbelievable in that respect. And cook and everything. I mean, she was talented in all different directions, plus, she was a wonderful mother. I mean, she never jumped on you when you were down. She always said, "Well, I know you'll do better next time," and all this kind of stuff. I mean, I know a lot of parents, you'll see them when something bad happens to their child. Then, they'll begin to tell them all the bad things they know about them. But she never did that. Never did that.

Hendrie: Well, that sounds like she was a good influence and good role model.

Bartik: Well, it's, kind of, interesting, and we used to tease him about it. Dad was 20 years old when he met her, and she was 26. And she had gone around with this young man since she was young. And in fact, she had a ring. He'd given her a ring. And so anyway, she met Dad and, apparently, it was just-- you know, they just fell for each other like a ton of bricks. And so he told her to get rid of that ring. So she went out and threw it in a well.

Hendrie: Oh, my goodness.

Bartik: And we knew where that well was located. We considered that very romantic. And so anyway, when they were married, she was 26 or-- I mean, because they were married, you know, within a year. So I think she was, like, 26 and he was 20. And we used to tease her about robbing the cradle, and she didn't mind, but he did. My father didn't like it when we said that. But anyway, so...

Hendrie: So she was six years older.

Bartik: Yeah, she was. And they adored each other. I mean, it was really wonderful. Yeah.

Hendrie: It's wonderful to grow up with a relationship where your parents really like each other...

Bartik: Yeah, that's true. That's true.

Hendrie: What are your earliest memories of what you thought you might want to do when you grew up?

Bartik: Well, I had a brother named Bob, who was third from the top. And he always said he wanted to be a doctor, so he always took care of any sick animal. Or he used to caponize chickens and I used to help him. And he was always going to be a doctor. So I thought, well, gee, you know, I'd be a nurse and the two of us would go out and cure everybody in the world.

Hendrie: That's wonderful.

Bartik: But I mean, it was because I particularly liked him and enjoyed being around him. And so when I was in high school, a lot of medical terms come from Latin, and my school didn't teach Latin. So my English teacher, named Ms. Madeira, had had Latin. So she said if I would come over one night a week, we could study Latin. So I used to go over to her house one night a week. And we would study Latin, and I would tell her all these wonderful dreams I had. Well, anyway, I mean, that didn't last. Because he started to medical school, but actually, flunked out. Well, and that sounds pretty terrible, but actually, he was working and trying to work his way through. He didn't have any money. So it was a combination of him not having enough time to study and stuff. So by this time, you know, the rumbling of World War II was coming on. So he went into the Navy. And he was in the Navy before Pearl Harbor, actually. And so then, when I went to college-- well, when I was in high school, I was the Editor of our little newspaper that we ran in the paper. So I thought, oh, well, I'll be a journalism major. So I went to college and...

Hendrie: Yeah, let's back up. Had any of your siblings before you gone to college?

Bartik: Oh, yeah, everybody.

Hendrie: Oh, your parents...

Bartik: Now, that's very interesting...

Hendrie: ...were determined to send everybody to college...

Bartik: Oh, yeah. And it's interesting that my mother was more determined than anyone, because she knew how much she wanted to go to high school and get an education. And, of course, my father had gone to college, and even my grandmother. Well, they went to normal schools to teach school back at

that time. And in fact, my father was teaching school when he was 17 years old. Because my grandmother sent him to school when he was four.

Hendrie: Oh, my goodness.

Bartik: So he went to high school. And then, when he went to normal school, well, at that time, you could teach school just by going to normal school, like a year or something. So he had students when he was in-- taught school older than he was.

Hendrie: Oh, my goodness. Wow.

Bartik: So anyway, well, my oldest brother got married young. And my two sisters were school teachers, older sisters. And then, my brother, Raymond, well, he went to college, and I did. But by the time he went to college, it was, you know, time for World War II. And he was taking civilian pilot's training, getting ready. Because ahead of time, we really knew we were going to be in war. So they had a civilian pilot's training, and he took the lessons. And then, he went to college, mainly, as an adjunct to those, you know, navigation problems and things like that. They taught courses at the teacher's college in conjunction with the civilian flight school.

Hendrie: All right. Good.

Bartik: Yeah, and my brother, Raymond, was the real entrepreneur of our family. I mean, he was always able to make money and stuff. And he went to Minnesota with my brother-in-law. And they leased land and rented headers and stuff, and they headed bluegrass. And so he worked all that summer, and he ended up with \$2,000, which in 1945 was a lot of money.

Hendrie: That's right.

Bartik: So he bought a little Ford Coupe, with a rumble seat, you know?

Hendrie: Yes, oh, yes.

Bartik: And we used to go over those hills...

Hendrie: Very classic.

Bartik: Well, all my girlfriends, when they saw it were pretty...

Hendrie: They were pretty interested in him.

Bartik: Pretty interested in him. But anyway, he met the woman he married. And once he met her, he wasn't interested in anybody else.

Hendrie: Yeah, all right. So when you went to college, you thought you might do journalism or something like that?

Bartik: Yeah.

Hendrie: And where did you go to college?

Bartik: Northwest Missouri State Teachers College.

Hendrie: Now, how far away was that from where you were?

Bartik: Well, it's about 30 miles.

Hendrie: Okay. But you had <inaudible>...

Bartik: Well, okay. Now, all right.

Hendrie: All right.

Bartik: Where did we get the money? Because we didn't have any money. Aunt Gretchen Jennings was a school teacher. And she didn't get married, so she offered any of her nieces or nephews \$25 a month to go to college for two years. Because at that time, you could teach school after the...

Hendrie: After you had two years of college.

Bartik: After two years of college. So she loaned me \$25 a month. Now, at that time, the tuition was \$18.75 for a quarter. And a room with kitchen privileges was \$2 a week. And the books, we didn't have to buy the books. We could check out the books, and as long as we didn't destroy them, we could check them back in. So the books were given, and we did not have to buy books.

Hendrie: Oh, my goodness.

Bartik: And, of course, the library, we never had to buy any books on the outside, either. So I went, and I worked in the dime store and stuff like that. So between \$25 a month that's what I...

Hendrie: That's what you went to college on.

Bartik: Yeah, and...

Hendrie: And it was enough to do it.

Bartik: And for two years, when I graduated, because the third year, my father sent me, and the fourth year, I had earned enough in the summer to pay my tuition. So when I got out of college, I had college loans of \$400. I paid them off the first summer I was in Philadelphia.

Hendrie: Oh, my goodness. All right. Good.

Bartik: Yeah.

Hendrie: So did you major...

Bartik: Oh, okay.

Hendrie: Yeah, so what were you studying in college?

Bartik: Yeah, so I started out...

Hendrie: Tell me about your academic career.

Bartik: Okay. I started out journalism. And so they had a school newspaper called The Northwest Missourian. And my advisor was a woman named Maddie Dykes, and she also ran the newspaper, sponsored the newspaper. Well, she didn't do anything but criticize every story I wrote. And I despised her. So I absolutely thought, God, I can't-- well, furthermore, they didn't have a journalism school. So I would've had to go to the University of Missouri afterward. And I didn't have any money to go there, anyway. So I despised her, and so I decided-- the only reason I hadn't taken math was I didn't know what I could do with it, except teach school. And I didn't want to teach school. So I switched over to math. And so that's how that happened.

Hendrie: Okay. Because you just had such a terrible teacher <inaudible>.

Bartik: Well, I mean, somebody may have liked her. But...

Hendrie: You didn't.

Bartik: Well, I had another interesting situation. Because my brother, Bob, was a brown noser, particularly, with older people. Older women loved him. So even when I went to high school, I mean, Ms. Madeira was a maiden lady, and she thought he was absolutely wonderful. And when I went to college, those English maiden ladies thought he was wonderful. Even my Calculus teacher, you know...

Hendrie: Yeah, okay.

Bartik: All of them. I was always compared to Bob. Well, Bob was a brown noser. And the question is nobody in the family ever determined whether or not he did it deliberately or whether he really liked these old people.

Hendrie: Okay. But the effect was the same.

Bartik: The effects were the same. So I didn't show up very well in comparison. And to add to this...

Hendrie: Did you always say what you really thought, even then?

Bartik: I suppose so.

Hendrie: Okay. All right. Go on.

Bartik: Anyway, it was, kind of, interesting. I loved college. I mean, I went when I was 16, and the first time I'd ever been away from home, and I absolutely loved it. And I took a course in biology. So the very first quarter I was in school, I got a pink slip in biology and I got an honor in PhysEd. Now, they didn't have grades at that time. They just had, basically, pass or...

Hendrie: Pass or fail?

Bartik: Honor or fail, et cetera. So everybody teased me about being brawny, but not brainy. Well, what happened was-- why did this happen? Because I was Salutatorian at my high school graduation. I mean, I was considered a very bright kid. In fact, Stanberry said, after I-- there was an article in the paper about I was an ENIAC programmer. The school said I made the highest marks in math that had ever been made in the school. So anyway, to get a pink slip, I mean, what was that...

Hendrie: Well, you were used to that.

Bartik: My God, I couldn't believe such a thing could happen to me. Well, what happened was my biology teacher, I'm sure he must've read Count Korzybski's Science and Sanity. It's a book on semantics. Because Count Korzybski said that people went crazy using the Aristotelian logic because there were variations of things. And he gave such an example as if you tried to define what a horse was

while you were looking at a Shetland pony, you would give a description. And you'd see another horse, and your description wouldn't fit. So he was convinced that, you know, people had to be very careful about how they defined things. So I'm sure this teacher must've read that because he wouldn't allow a dictionary definition of these words. He would not allow the definition in the book. And he wouldn't allow one from context. And every day, he gave us this vocabulary test in Biology.

Hendrie: Oh, my goodness.

Bartik: And I flunked them. Because I could not figure out what he wanted. I mean, if you would put the one from the dictionary, I mean, wrong. And from the book, wrong. So the class was in turmoil. I mean, people arguing with him. But anyway, so this was one of those examples where my mother showed hwhat kind of a person she is. Because I wrote and told them I'm really very sorry, but that I'm sure that I would pass the course. And she just wrote back and said, "Yeah, I'm sure you will, too." I mean, you know, they didn't scold me or anything for it.

Hendrie: Really?

Bartik: No.

Hendrie: Okay.

Bartik: No, she didn't. So anyway, apparently, I finally determined how to do it. Because I began to pass the test, and I did pass the course. I didn't make an honor in it. But anyway, I passed it. And the other thing, I mean, this man was one of my favorite teachers, by the way. It seems hard to believe.

Hendrie: All right. Yes.

Bartik: Well, he, also, taught us about sex. And you know a freshman in college being taught about sex. So he said that he put a box outside his office. And we could put any question in there that we wanted to and he would answer it. So I mean, some of the questions were pretty bizarre. But the one that I remember the most is that somebody asked, "How about, before you get married, shouldn't you have sex with the person you're going to marry to see if you're compatible?" So he said, "Well, sex is like music. You have to practice to get good at it." And he said, "One test wouldn't tell you anything." But we were all, our mouths were hanging open.

Hendrie: Oh, my goodness. Oh, yes.

Bartik: How do you like that? Like playing music. So yeah, anyway, he was one of my favorite. And then, I had another favorite teacher named Blanche Dow. I don't know. I suppose most schools have them. They called them Humanities there. And for the first two years, you had to take these Humanities courses. Well, they were World Culture courses is what they really were, art and music and things of that kind. And so she taught those courses. And she'd been, you know, all over Europe and around, and she

spoke French. And I thought she was wonderful. So she was really my role model to some extent, other than my Aunt Gretchen. Aunt Gretchen was my role model, also. Because I never intended to get married, until I was 40, like Aunt Gretchen. And I wasn't going to have any children, because I sure didn't want to marry any of those farmers.

Hendrie: Those farm boys.

Bartik: Those farm boys, and have kids hanging on my skirts.

Hendrie: Okay. Now, just a little bit about Aunt Gretchen. Why was she one of your other role models?

Bartik: Well, she used to come home in the summer. And it was one of the highlights of the year was when Aunt Gretchen came home. Because she wore makeup, and she wore Hammacher suits. And she used to talk to us, and she used to correct our English. And I said, and anything else she felt like correcting. But anyway, we were crazy about Aunt Gretchen.

Hendrie: Where did she live?

Bartik: Well, originally, she taught outside St. Louis, but then, she taught in Cleveland. And how she had enough money to give us that money is beyond me.

Hendrie: Oh, wow. Yeah.

Bartik: Because the school teachers didn't make that much money. But eventually, what Aunt Gretchen did was she married an old bachelor. He was an industrial arts teacher, when she was 40. Well, they were crazy about each other. Well, anyway, they went to California, and he opened an automobile agency. So he sold Mercury's. And I remember one year, they went to Detroit and picked up two brand new cars. And they wouldn't have to pay freight, because they were going to drive them back to California. So they came to Missouri and would take us out in these brand new cars. Well, I mean, we were poor. I'd never been in a brand new car before.

Hendrie: Oh, that was very exciting.

Bartik: But oh, my goodness. And it was interesting, because he didn't have any brothers or sisters. So he took us as his nieces and nephews, the same as Aunt Gretchen. So, you know, they were really glamorous people to me. And then, after, what happened was during the war time, my Aunt Gretchen worked in the Defense plant, if you can believe it, as a riveter. And then, he did. And then, after the war, he built houses, so he became quite wealthy. Because houses were-- I mean, everybody needed houses after the war.

Hendrie: Yeah, needed houses when they came back after the war. And she was a riveter.

Bartik: Yeah, I can't imagine Aunt Gretchen as a riveter. Well, anyway, he told this story. That when he met her they went to a country fair, and she told him that she could milk a cow. And he said, "Show me." So she milked a cow at the fair to show him that she could milk.

Hendrie: Oh, wow.

Bartik: I think that is funny.

Hendrie: All right. That's good. Well, let's get back to your story. So you graduated. Did you major in mathematics?

Bartik: I majored in math. Well, of course, the first year, I was a freshman, December 7, was Pearl Harbor.

Hendrie: Okay. While you were a freshman. Okay.

Bartik: While I was a freshman. So I mean, I was playing bridge one Sunday afternoon, and somebody ran in and said that Japan was bombing Pearl Harbor. So we all went in to listen to the radio about it. And I mean, that spring was really something. Because it cleaned out the boys right away, I mean, and even the younger teachers. So it was really a pretty sad campus the next spring. And then, the next year, there weren't very many men. And then, the next year, they got a Navy program. And it was an Officer's training, but I don't know. I think they were V2 and V12. One was for sailors who had been at sea. And the other one was for new recruits. Well, you can imagine that the sailors that had been at sea how exciting that was for Missouri for most people that had never even seen the ocean. So anyway, I had most of my math courses with the sailors. And, I mean, I was the only math major, you know, in my class.

Hendrie: Really?

Bartik: Yeah. There was a young man that came, I think he was a year behind me, from Peru, to the school. And he took Calculus and Astronomy and things like that with me. But I took Analytic Geometry, Trigonometry and Physics and stuff like that with the sailors. And I was the only woman, of course, and the only civilian. Well, all of them knew me, of course.

Hendrie: Yes, of course.

Bartik: But I didn't know them.

Hendrie: You just threw it out.

Bartik: So anyway, I mean, when I was in Physics and the Lab course, I mean, I had umpteen sailors wanting to be my lab partner. So yeah, I was very popular.

Hendrie: That's wonderful. When did you start thinking about what you were going to do when you graduated from college?

Bartik: Well, the year before my senior year, I worked in a Defense plant in Kansas City for Pratt and Whitney. I did silver plating on a little gear that fits behind the propeller. And so I had figured it out myself that I only needed one more semester. Because we went on the semester system when the sailors came. Went from the quarter system to the semester system. So I figured I only needed one semester to graduate. But when I went back, the Dean told me I couldn't graduate because I was taking too many courses. And he said, "Furthermore, the math courses you need aren't even being given." So I was really horrified. So I ran up to my sponsor, my advisors, and I was crying. And actually, this teacher, Horsfal, was sitting in his office with him and my advisor. And so he said, my advisor, his name was Dr. Hake. He said, "I happen to be head of the math department. And we can hardly say that we provide math graduates if we don't even give them the courses that they need to graduate." So he said, "Since you're the only one that needs them, we'll just arrange them for your convenience." And so he did.

Hendrie: So he did.

Bartik: Well, he used two old teachers. I mean, one of them was old enough, had taught my father. And the other one was past retirement age. But anyway, so I took modern Geometry and Theory of Numbers with those two. So anyway, I graduated. And I was finished with my coursework in January 1945. So I had said to my Calculus teacher, "I don't want to teach school, but I can't think of anything else to do." And she said, "Oh, there are lots of things you can do." So she began to bring me recruitment letters. So she brought me one from IBM for System Service girls. And she brought me one from Aberdeen <inaudible> for computers. And so she said, "Go to the University of Pennsylvania. They have a differential analyzer." She had come from the Dayton, Ohio Air Force base. And they had a differential analyzer. So she said, "There are only three in the world. And there's one at the boy's school at the University of Pennsylvania." And well, she was wrong. There were two more. But she said there was only three, one at the Air Force base, one at Penn, and one at MIT, where Vannevar Bush has invented it. But, actually, Aberdeen had one and Dr. Douglas Hartree had built one out of Meccano parts, which they actually used during World War II to do calculations. So anyway, she said, "Go there." So anyway, I applied. And I didn't hear from them. So I was at home, and my father would come in every day telling me about another school that needed a math teacher. Because they were hurting for math teachers, because most of the math majors were men, and most of them were in the military. So they were really hurting for them. So people were always telling him, and he was always finding out about them. And he'd come home and say, "Oh, you can have this math job here, there, over there." And I'd say, "No. I'm waiting." And my sister tried to get me to go into business with her to open a dry cleaning establishment in Stanbury. But I wasn't interested in business. So it didn't come and it didn't come. Finally, when it came-- now, I had gotten out in January, so this was March. So you can imagine how much pressure I was on to get a job. But anyway, it came, and it was a telegram. And they just sent it to my sister. Well, and it's pretty casual there. They knew my sister, you know, was my sister. So they gave the telegram to her. And it said that I was hired and to come as soon as possible.

Hendrie: My goodness. Just like that?

Bartik: Yeah, I was on the Wabash out of Stanberry the next night.

Hendrie: So you finally got this telegram after sending in your application.

Bartik: Yeah.

Hendrie: Telling them what your background-- do you remember what you put in your application that convinced them to just send you a telegram and hire you without even going there to interview?

Bartik: No, I think it was the fact that they were looking for women math majors. And they were recruiting all around the country because there-- and they were even taking people that just had some math, because there were five of us that came about the same time, there were four that came about a month before I did, and two were from Kansas, one was from Ohio, and one was from Wisconsin. Now they did not have their degrees in math. So I think it was just the fact that I had a degree in math. Period.

Hendrie: Okay, yeah. Which was unusual at that time.

Bartik: Well, and they were recruiting, and they had a hard time finding them. And so why, I mean, the government, well I don't know why it took so long, but you know, government process probably.

Hendrie: Yes. Okay. So you got the telegram?

Bartik: So I got to Philadelphia. Well of course I'd never-- well I'd lived in Kansas City the year before but, I mean, I'd never been in a place like that, and I didn't even know when I came there, the first station I came to, which is North Philadelphia, I didn't know that the biggest station was 30th Street. So <laughs> I just got off and got in a taxi and went to the Y, you know, the Y to stay, because it was hard to find a place to stay. So then I got a cab and went out to the site, which was out at the Moore School. And they were so surprised to see me so fast. <laughter>

Hendrie: They said "Come right away," and you took them literally.

Bartik: Yeah. So I-- they said "Well we needed you to have a physical." So they sent me over to this doctor, and so it was on like a Friday afternoon. So all of a sudden he jumped up and said "I don't have time to finish this, I'll see you Monday." So I said "Okay." So he called me at the Y on Sunday, and said if I would come out to his house that he would finish the physical. Well <laughs> I was naïve, but I wasn't that naïve. <laughter> So I said "No thank you," I would see you on Monday. Well, anyway when I told them at the office what an old lecher they had as a doctor, they never used him again.

Hendrie: Oh, okay.

Bartik: But isn't it amazing?

Hendrie: That's amazing.

Bartik: I mean you just arrive in town, and somebody's already <laughs> trying to do...

Hendrie: Yes. That's pretty amazing, yes.

Bartik: Yeah, it's amazing how quickly people perceive that you're naïve, and assume you're really naïve.

Hendrie: Yeah. And try to take advantage of your naivety.

Bartik: Yeah. Well anyway, so there was no place to live. So my sister's husband was in the Navy and she was at Newport News, and because he was in port, and he, you know, had shipped out. So she came by Philadelphia and stayed and said "I'm not leaving until we find you some place to live."

Hendrie: Oh, well that was nice, yeah.

Bartik: Well <laughs> hardly. So we followed the ads, and I mean we would see these places and these row houses, I mean, Philadelphia's a city of homes, but it's mainly row houses. So we thought they were slums.

Hendrie: <laughs> Okay.

Bartik: And so my sister said "Oh, come home. Don't stay here, this is just a city of slums." So finally I went to the University of Pennsylvania Housing and they got a room for me at a place on Spruce Street that had students from the Curtis Institute of Music. I don't know if you've ever heard of it.

Hendrie: Oh yes, of course I know.

Bartik: It's the finest, probably the finest music school in the country.

Hendrie: Yes.

Bartik: And technology students. So then my sister took off and went back to Missouri, and that's how it began. But I was, I mean, I never had such a wonderful time in my life, because these students, these

music students, were the finest musicians in the country, and they were interested in me because I wasn't a musician surprisingly enough. Because they could talk to me 'cause they knew I wasn't going to gossip about them. <laughter> Well it's true, I mean, they could say anything they liked then. And so because mainly they were around musicians. So they used to take me to the Academy of Music because their teachers usually had boxes, and they would give tickets to their students, and these students would take me with them.

Hendrie: Oh, that's wonderful.

Bartik: Yeah. And then the other four girls that had come the same time I did more or less, we were all interested in seeing Philadelphia, so we worked six days a week, but we had Sunday off. So we used to run around Philadelphia on the Sunday, you know, seeing Philadelphia.

Hendrie: Yes, and so you got know yeah, your co-workers, yeah.

Bartik: Oh yeah, I had a grand time with them.

Hendrie: That's great. So now what did they do when you arrived? What was the first thing they had you do or did with you?

Bartik: Well the first thing they had me do was to sit down and they began to show me how to do a trajectory, and they also had a little training course, you would go like for a couple of hours, Adele Goldstine taught it.

Hendrie: Who did?

Bartik: Adele Goldstine.

Hendrie: Okay.

Bartik: And they would teach you computing techniques for doing these trajectories, like inverse interpolation and things like that. And she would, you know, tell you a little bit about the equations and things like that. So then-- but then other than that, and then that was only for about two weeks. And then you just sat down and did a trajectory. So by hand with- I used a Monroe calculator, and so that's what I did.

Hendrie: Oh, all right.

Bartik: And then I'd only been there for a couple of months, but anyway I looked around and I saw my goodness, these people had been there for several years. And I saw that I was low man on the totem pole.

Hendrie: <laughs> You were just the new recruit.

Bartik: <laughs> Yeah.

Hendrie: Raw fodder.

Bartik: Well my advisor had told me not to come to Philadelphia because he said "You'll just be one of many." And you know, like a nobody. He said "If you teach school you'll be a respected member of the community," and all that kind of stuff. So, I mean, I wasn't interested, but when I got there and I was sitting there I was thinking "Doctor Hake got it right," you know, because I was just sitting there calculating these trajectories.

Hendrie: And lots of other people doing the same thing.

Bartik: Oh yeah, they had about 80 people at that same place, and everybody...

Hendrie: Okay, were sitting there calculating trajectory.

Bartik: Yeah. Well to do-- these trajectories were to go into firing tables for guns, and each firing table had about a thousand trajectories, thousand to 1200. And it took about 40 hours, 30 to 40 hours to do one by hand.

Hendrie: Oh wow, yeah.

Bartik: So they had a lot of them to do. Now the differential analyzer also did the trajectories, and it took the differential analyzer about 20 minutes to do one, and it took, for each new gun it took about two days, two to three days to set up the differential analyzer to do it.

Hendrie: For a particular gun.

Bartik: Yeah.

Hendrie: But then it could turn them out relatively fast.

Bartik: Yeah. But the thing was that the trajectories done by the differential analyzer were not as accurate as they were done by hand. So what they would do would be to intersperse the hand calculated ones with the differential analyzer and it would smooth, you know, smooth the results.

Hendrie: Oh my goodness, okay.

Bartik: So that they did not do by hand, you know, all 1200 of those trajectories, they did some of them interspersed with the one from the differential analyzer. So in any case, I mean, I was looking around and thinking...

Hendrie: You've just been added to this giant pool...

Bartik: <laughs> That's right.

Hendrie: Of people working on these trajectories.

Bartik: That's right, yeah.

Hendrie: You and the people that arrived the same week.

Bartik: Right.

Hendrie: The girls that arrived the same week, yeah. And you're saying "Oh, do I really want to do this for the rest of my life?"

Bartik: So then this announcement came around, I'd only been there about two months, I guess. Yeah, it was June when the announcement came around, so I had arrived, I believe it was March 30th, so I had been there April, May. So this announcement came around that they were looking for operators of new a machine they were building called the ENIAC. So of course I had no idea what it was, but I knew it wasn't doing hand calculations. <laughs>

Hendrie: You knew what it wasn't.

Bartik: Yeah. <laughs> So I figured that if I could start on the ground floor with other people, then I'd have a chance to get ahead. So I applied, and they were- I believe there were 13 of us that applied, and they claimed they wanted five women, or five...

Hendrie: There were five places to fill.

Bartik: Yeah, five places, because there were a couple of men that did apply. And I didn't know this, but they'd already picked four, so they really were only looking for one.

Hendrie: Oh no.

Bartik: Yeah. So anyway, I was not picked. I was the second alternate. So I thought "Well, that's that." And then on a Friday afternoon Lieutenant Tornheim my manager called me in and said "Could I be ready to go to Aberdeen on Monday," that I had been picked as one of the ENIAC operators. So I said "You bet." Well, <laughs> what happened, well, we were going to Aberdeen because...

Hendrie: I know, the ENIAC was not in Aberdeen yet.

Bartik: No.

Hendrie: It hadn't been moved, right?

Bartik: No. But the ENIAC used a card reader for input, a cardpunch for output, and a tabulator as a printer. And then we had a sorter and a keypunch and a verifier and things like that. So they wanted to send us to Aberdeen to learn keypunch equipment so we could wire up the boards for the different problems on this punch card equipment. So Aberdeen was about 32,000 acres of swamp, and the town itself was a little wide place in the road, and there were 20,000 soldiers there at that time, and it was pretty much a hellhole. So the one that was picked had a very nice apartment in west Philadelphia, and housing, you know, was very bad, and when you went to Aberdeen the single people basically lived in barracks, so she didn't want to give up her apartment, nice apartment, to go to Aberdeen, so she turned them down. And <laughs> the first alternate was actually from Missouri from Park College, and people, during the war people didn't take vacations. So you know, once in a while they got a vacation. Well it turned out she was on vacation, so they called her up and told her she'd have to cut short her vacation to go to Aberdeen. Well she decided she didn't want to do that, so she turned them down. So luck beats brains. <laughs>

Hendrie: <laughs> Yes.

Bartik: So that's how I got to be an ENIAC programmer.

Hendrie: And you were told on Friday "Can you be there by," and you said "Yes."

Bartik: I said yes, you'd better believe it. Well, it was very surprising, because none of the other women had ever seen me before, because I hadn't been there very long, and Kay worked on the differential analyzer, Kay McNulty was one of them. And Betty Snyder worked on another floor, as did Marilyn [Wescoff] and Ruth [Lichterman]. So they'd never even seen me.

Hendrie: Okay. They'd worked in teams though, doing the trajectory calculations, but in a different area.

Bartik: Yeah. So they were standing on the platform of the B&O Railroad, you know, wondering who this person was that was coming. And so when they met me, they were absolutely wonderful. I mean, none of them had ever seen somebody from the farm, and I had never been anywhere or done anything. So they were just wonderful.

Hendrie: That's great.

Bartik: Yeah.

Hendrie: Very good. So they really welcomed you.

Bartik: Oh yeah. Well Betty and I became best friends, and of course Kay Mauchly, became McNulty Mauchly Antonelli, she and I were friends for 61 years. And she just died a year ago April. I mean, they were wonderful, we were crazy about each other. Well first of all there were two Jews, one Catholic, one Quaker, and I was a member of the Church of Christ, and <laughs> so none of us had ever been around people of other religions like that. So we spent a lot of time talking about religion as well as about the ENIAC. And of course they took me to Baltimore so I could eat lobster, and Ruth took me to New York, and Marilyn took me to Washington, because I hadn't seen these places. So I really had a wonderful time with them.

Hendrie: So how long did you stay in Aberdeen doing this training?

Bartik: Well we stayed in Aberdeen from June 'til-- we came back at the end of July. And this is the interesting thing, Herman Goldstine supposedly was in charge of everything, we didn't even have a place to sit. We didn't have a place to sit.

Hendrie: When you came back you mean?

Bartik: When we came back. And we had nobody to teach us anything. They just gave us these block diagrams of the ENIAC and told us to study them, learn how it works. Well we couldn't see the ENIAC because it was a secret clearance, and our clearance, I mean, all of us had a clearance of some kind, but it wasn't secret, wasn't that high.

Hendrie: You didn't need to have secret clearance to do trajectories.

Bartik: No. Well I'd worked at a defense plant too, and then they had...

Hendrie: So you had a clearance from that.

Bartik: Yeah. Well they had, you know, security, but it was much lower. So they said we couldn't see the ENIAC until our security clearance came through. So Betty and I, Betty Snyder Holberton, we just picked a classroom, because it was August and the school wasn't in session, so the classroom was empty. So we just sat there with this block diagram, and we didn't even know how to read it. I mean, we just...

Hendrie: Yeah, you didn't know what it meant.

Bartik: <laughs> So we're sitting there looking at this thing, and they were putting a third floor on the Moore School at that time, so the jack hammers were going and the dust was flying, and it was hot. I mean...

Hendrie: No air conditioning.

Bartik: Oh no. I mean, modern Penn it's not. I mean it's old. <laughs> But anyway. So we're sitting there trying to figure this out, and this man came in the room, and he walked all around the room looking at the ceiling. And then he came over and he said "Hi, my name is John Mauchly." He said "I was just checking to see if the ceiling's falling in." <laughs>

Hendrie: Oh my goodness, okay.

Bartik: So we almost fall off our chairs.

Hendrie: Beause you knew who he was, yes.

Bartik: Oh my goodness we'd never even met him, neither one of us. And we said "Boy are we glad to see you." You know "Tell us how this blasted accumulator works." Well anyway, he was a marvelous teacher, absolutely a wonderful teacher. And so he was explaining it to us, and so he said "Well, my office is next door. So anytime I'm in my office, you can come in and ask me questions." So we began to, and in the afternoon he'd be in his office, so we would go in, and save up our questions, and then we'd go in and ask some questions. So that's how we learned about the ENIAC.

Hendrie: Oh my goodness, right from John Mauchly, that's pretty good.

Bartik: Yeah.

Hendrie: Well you get clear answers, don't you, especially if he's a good teacher, he can explain things.

Bartik: Yeah, well John, he's a great teacher in the sense that he always pushes you, you know?

Hendrie: Yes.

Bartik: To do more then, you know, if you ask him a question, you know, he'll give you an answer that takes you beyond where you are.

Hendrie: Yeah, not just the literal, straight, simple answer.

Bartik: Yeah, right.

Hendrie: He'll then really explain more about it, so you understand it even better.

Bartik: Yeah.

Hendrie: Okay.

Bartik: So then in September when the boys were coming back for classes, they gave us an office. And so the ENIAC women then got together for the first time, and we would, you know, we were sitting there trying to figure out how to program the ENIAC. Though actually, you know, I don't think they ever really thought that we would be programmers. I think the original view of it was that anybody that had a problem to put on the ENIAC, that they would program it themselves, and then just give it to us and we would plug up the machine and run it.

Hendrie: Oh, you'd do the wiring.

Bartik: Yeah.

Hendrie: You'd put in all the plugs, set all the switches and everything.

Bartik: Yeah, right. I don't think they ever expected-- but the thing that happened was of course that it was so complex from the very beginning that, you know, our role switched so that we really were programmers.

Hendrie: Yeah. It was easier for you to understand the math, or the equations that somebody wanted to have solved, and the math problem, and then translate it then for what was essentially a mathematician to learn how to tell you how all the settings, of what should be connected to what.

Bartik: Right. Because I mean the ENIAC was a parallel machine, and plus, I mean, it had multiple memory buses, and instead of having a memory bus, you know, like modern machines would have, or instead of having a program counter, I mean, it had program trays which you plugged in and out of to

stimulate the next operation. And then of course you had whatever the operation you were doing, instead of doing in software, you had to set the switches and round offs and all that kind of stuff.

Hendrie: Right.

Bartik: Anyway, I remember we were sitting there trying to figure out how the ENIAC could do a trajectory, because we realized that the real test for the ENIAC's acceptance would be the fact that it could calculate a trajectory. So we began to figure out how to do it, and so we were saying "My goodness, there's not enough equipment to do a trajectory." And finally I remember one day Kay said "Oh, I know, I know, I know. We can use a master programmer to repeat code," and we did. We began to think about, you know, how we could have subroutines, and nested subroutines, and all that stuff. And that was so exciting to realize how we could do that. And I find this interesting because [J. Presper] Pres Eckert said in a speech, well he gave the firsts with the ENIAC speech, and he gave the firsts-- the things that were first on the ENIAC. And so that's one of the things that he says was the subroutines, and nesting subroutines, that if they had not had subroutines and nested subroutines, and I understand that the Aiken Mark I did not have them, that it would have required a million vacuum tubes instead of 18,000 to build a machine that big.

Hendrie: Yes, that could do that problem, yeah.

Bartik: Yeah. Well that's, I mean, Mauchly thought of the ENIAC as, he had used desk calculators to do calculation for years, and he thought of the ENIAC as a series of desk calculators that were under master control. So, I mean, that was the way he thought of it. And he did not think of it just as a trajectory solver, he thought of it as a general purpose computer, and he used to always try to get us to think, you know, of other problems rather than just the trajectory, he would always want us to invert a matrix <laughs> or something like that.

Hendrie: Yes, okay.

Bartik: But anyway, our job was to get the trajectory done.

Hendrie: So all of you were sort of working on the same thing?

Bartik: Yes, all of us working. But the one thing that we did do that was very smart, and this is the thing that got us respect from the engineers. We had Ruth and Marilyn, now Marilyn was supposed to be one of the human computers that didn't ever-- never made a mistake. So anyway, she had also worked with John Mauchly before, she went over and worked with the Aberdeen. So anyway, Ruth and Marilyn were friends, and had worked in the same group, so they were assigned a job of doing a trajectory exactly the same way the ENIAC did it add time, add time. And it was that trajectory that when we got on the machine that allowed us to de-bug it down to the vacuum tube. And we could do it in a very few minutes.

Hendrie: So they had on paper the steps that the machine...

Bartik: Yeah, it took forever to do.

Hendrie: That you would go through if you did it exactly the way the ENIAC...

Bartik: And it would show what was in...

Hendrie: What was in all the accumulators.

Bartik: That's right. That's right.

Hendrie: Ah, okay.

Bartik: So...

Hendrie: Yeah, so you just go run the same problem with the same inputs, and you see where it doesn't agree.

Bartik: Well, and if we'd made an error, we could hone into it by powers of two, because we could set break points, you know, half the way and see if an error was in the beginning, or at the end. And then we have that and see, you know.

Hendrie: Yeah, binary search.

Bartik: Right. We'd go in. So we could find an error in a very few minutes. And the engineers were very impressed with that because the engineers had little test programs for their unit, like the-- Bob Shaw had one for the function table, and Kite Sharpless had one for the, I believe it was a multiplier, and Chuan Chu had one for the divider, square rooter, and stuff like that.

Hendrie: Yes, okay.

Bartik: But they didn't have anything for the whole machine. So this trajectory though tested the whole machine.

Hendrie: Very good.

Bartik: Yeah. Well anyway, the next thing that happened, from the timeline I've got, Stan Frankel and Nick Metropolis came to put the Los Alamos problem on the ENIAC. Now Johnny von Neumann...

Hendrie: Yeah, I read that that was the first big problem that actually was ever run on it, was not 100 or 200 or 1000 trajectories, but was this problem.

Bartik: No, no. It was their problem. Now what happened was that Johnny von Neumann was a consultant with Aberdeen and he was also a consultant with Los Alamos. So he convinced Penn and Aberdeen that they should run this Los Alamos problem as a test to see if the ENIAC really worked. So these two, Nick Metropolis and Stan Frankel, ran the punch card installation at Los Alamos. So they came, I think they came in the summer while we were in Aberdeen, because we didn't see them then. And then they went back to Los Alamos because there was a Trinity Test, you know the atom bomb test at Alamogordo.

Hendrie: Yep.

Bartik: So anyway, they came in October, and when they came they'd already programmed their problem, but...

Hendrie: They didn't need you.

Bartik: Well they did to run it and to set it up and stuff, but in...

Hendrie: But they had learned enough about the ENIAC to program it.

Bartik: Yes. Well they came, they took out the block diagrams too, and...

Hendrie: And figured it out.

Bartik: And they had come and talked to Pres, John and the engineers, they had, you know. So anyway they came. And so the day that-- first time we saw the ENIAC was the day that we put the Los Alamos problem on the machine.

Hendrie: Oh wow, all right.

Bartik: 'Cause we'd never met the engineers.

Hendrie: You weren't allowed in there.

Bartik: No. So anyway, we went down and we were assigned a unit, like one of us would be assigned accumulator 1, accumulator 2, etcetera, around. And then Goldstine stood out with a plan, and he would

say "Accumulator 1 set it to receive from alpha," you know "Memory bus alpha." And "Program pulse input would be A1," let's say.

Hendrie: Okay, yeah.

Bartik: So you would do it. <laughs> And then he'd tell...

Hendrie: The next one, yeah.

Bartik: The next one. So anyway, that's how we put that problem on. So then during this time Fran and Kay were really assigned to help them run their program and stuff, which they did, and Marilyn and Ruth were still doing this trajectory, and then Betty and I were assigned to do the trajectory, you know, for the acceptance test. So that's how we worked in these teams. I don't think I mentioned, but when we came back to Philadelphia, a sixth programmer was added, and that was Fran Bilas, and she had been-- worked on the differential analyzer also. So they had added a sixth programmer.

Hendrie: Okay.

Bartik: So anyway, that's...

Hendrie: Well did it help to have worked on the differential analyzer? At least, I read an article by Arthur Burks that, you know, sort of showed that there were a lot of similarities in the sense of the layout of multiple units that were connected up, the way the differential analyzer was connected up and sort of did a problem in parallel. Did it help? The people who had worked on that, did they find it easier to figure this out?

Bartik: I don't think so.

Hendrie: Not really?

Bartik: No.

Hendrie: Okay.

Bartik: Not at all.

Hendrie: Not at all. All right, good.

Bartik: I mean, the ENIAC was so different, not at all.

Hendrie: Yeah, it was just completely different. Okay.

Bartik: I mean, the thing about it was all of us knew the trajectory problem, which was a big help.

Hendrie: Right, you all understood that.

Bartik: So that we knew-- so that what we really had to learn was the ENIAC, we didn't have to learn the trajectory problem.

Hendrie: Yeah, okay, you didn't have to learn the math.

Bartik: No.

Hendrie: You just had to learn how to convert the math to set up the machine.

Bartik: Yeah. So all of us helped Nick and Stan some. I think the way that they worked with their problem was that Nick would take one shift and they ran two shifts, and Stan would take the other. And Kay would work with one and Fran would work with the other.

Hendrie: Okay.

Bartik: But then we helped them also every one in a while. And then they were really quite ingratiating. And it was interesting because Stan's wife was with him, and of course by this time the atom bomb had been dropped, and everybody was very much interested, you know, in the atom bomb. So we were asking her about all this stuff, and from what she said the people at Los Alamos were as horrified as everybody else in the world with the number of people that got killed at Hiroshima and Nagasaki. That they were...

Hendrie: They didn't realize what...

Bartik: Well they, I mean, it's a little different when you think about something, and then when it really happens.

Hendrie: Exactly.

Bartik: The horror of the reality. Anyway.

Hendrie: All right. Well so you worked on the acceptance test problem, and some of the others worked on this first big problem from Los Alamos. So what happens next?

Bartik: Well in-- they were going to have a public announcement of the ENIAC. Well they had one on February the 1st for the press, but the press was not allowed to write about it until they had the announcement to the scientific community and the university community and the government on the 15th. Well as I understand it, now the ENIAC women had nothing to do with the 1st, but I understand from people that were there that it was very unimpressive. So Goldstine invited Betty and me out to his, and his wife, I mean Adele was there, to his apartment. And he asked us if the ENIAC-- if the trajectory was ready to go, and if they could use it as a demonstration for the announcement on the 15th. Well Betty and I were pretty sure it was perfect. <laughter> So we said "You bet." So he said "Okay, you can do it." So we went back and began working like mad to put it on and to, you know, get it up and running. So we worked and everything was going fine until the night-- well actually, everybody was really frightened because they realized, and that was one of the problems with the 1st, they realized how foolish they would look to announce this machine that had been brought to do trajectories and it couldn't even do one. You know, that would have been pretty horrible.

Hendrie: Right.

Bartik: So I think that's way the one on the 1st, because they just had sines and cosines and a few things like that.

Hendrie: Yeah.

Bartik: So anyway Dean Pender of the Moore School came down, Betty and I were working away. And so he asked us how things were going. I mean, Dean Pender never talked to us at all, so we knew how important this was. So he said, he asked us how we're going, we said "Fine," so he said "Hop to it." So he left us a fifth of liquor. <laughs>

Hendrie: Oh my goodness.

Bartik: Well, he kind of liked to drink his lunch.

Hendrie: <laughs>

Bartik: But Betty and I didn't drink fortunately. <laughs> I mean, maybe we'd have a Tom Collins once in a while, but we didn't really drink. Of course we never drank it. <laughs> So anyway the night before the demonstration, the night of the 14th, Valentine's Day, it worked, everything was fine, except it didn't stop when it hit the ground, it dug a hole.

Hendrie: <laughs>

Bartik: Kept on going. So, geez, we were worried and worried what to do about it. So Betty, the last train to Narberth was like 12:30 or something.

Hendrie: That's where she lived, yeah.

Bartik: Yeah. So we had to leave, so we left and we just thought "Well that's what we'll have to do, we'll just have to run it." So anyway I always say Betty had her nighttime logic working. She was an amazing person. Frequently when we would have a problem, she would come in the next day and say "You know, I was thinking this morning this." And I thought "What on earth is she doing? Is she going home and working all night?" Because she came up with the solution to a problem so many times the next day. Well it turned out she didn't work all night, but her brain did, that what she did was before she went to bed she would, you know, she'd be thinking about the problem, you know, and apparently her brain worked through the night. And <laughs> the next morning she would come up with the answer. Well anyway, her nighttime, I called it her nighttime logic, and I've always said Betty could do more logic in her sleep than most people could when they're awake. So the next morning she came in and she knew which switch on the master programmer was set wrong, and she flipped it, and we were in business.

Hendrie: Oh my goodness.

Bartik: And it stopped when it hit the ground.

Hendrie: Oh wow.

Bartik: So in any case-- now the ENIAC has 20 accumulators, and the top of them is a 10 by 10 matrix that stores a ten decimal digit number, and on the side it has two for the sign. So the vacuum tubes that do the calculations, they had the tips of those vacuum tubes peeking through little holes they'd drilled in the chassis, in the front of the chassis. So when the ENIAC ran, you could see the numbers build up and see the signs change, and all this kind of stuff while it was running.

Hendrie: Well we're going to have to-- I'm sorry, but got to call time.

Hendrie: All right, we're back on, and I think we stopped when you were telling a story about running a demonstration, about the panel with the holes and the two tips going through.

Bartik: Oh, yeah. Well, the accumulator had this 10 by 10 matrix with the vacuum tubes that do the calculations with the tips of them peeking through holes drilled in the chassis in front of it, and these you could see but when the photographers took the pictures they didn't show up very well. So Pres and John went out and they got tubes, light tubes that screwed in the front of the chassis, in front of the tip of the vacuum tubes. It looked like half a ping-pong ball and they printed the number on them, so now when it ran, you know, it really produced quite a show because these things really showed up. So when they ran the trajectory for the demonstration, the trajectory that they ran took 30 seconds for the shell to trace it, but the ENIAC did the calculations in 20 seconds, so it actually ran faster. Then, of course, the people that were sitting there could see the numbers build up as the shell reached the altitude and then came down and hit the ground. So that was pretty impressive. And then what we did was we printed it out and then we went out to the tabulator and printed them up and handed them out as souvenirs for people.

Hendrie: Oh, my goodness.

Bartik: Yeah, we ran it several times, you know, to show people, you know, exactly what was going on. So, I mean, they were absolutely ecstatic.

Hendrie: Yeah, that demonstration, really, that would be wonderful. I wonder whether we'll ever get one of those souvenir printouts. Wouldn't that be wonderful?

Bartik: You know, that's really-- yeah, I should be ashamed of myself because I never kept stuff like that.

Hendrie: Of course, why would you? I mean, you know, you're at youngster at this time. You aren't thinking about that, what this is all going to mean some 50 years or 70 years later.

Bartik: Well, we knew it was an important thing, that's for sure. But I've never been a person that collects things very much. Well, the thing that happened, though--

Hendrie: Yeah, so what happened, okay?

Bartik: Well, they went out to dinner with all the people, but guess what, <inaudible> Betty and I weren't invited so we were sort of horrified. We knew how important it was and we felt that we had done so much but we didn't -- and of course in history afterward nobody ever mentions us. And of course Goldstine in his book lied.

Hendrie: Really?

Bartik: Oh, he's a liar; he said that he and Adele programmed the trajectory for the demonstration, and he actually says he not only did that but he forged entries into the logbook. He claimed in his book that he wrote in the logbook after it was ready to go, you know, okay or some such, oh, okay. He wasn't even there.

Hendrie: Oh.

Bartik: Well, he lied, I mean, he never even mentioned in his book *The ENIAC women*, all he ever mentioned was our names and who we married, and he called me Elizabeth. Well, my name was never Elizabeth.

Hendrie: Nobody ever called you Elizabeth.

Bartik: Well, I grew up in the Middle West where we used the double-names, Mary Lee, Betty Jean, Sue Ann and stuff like that. But the way he told about us, he claimed that he and Adele programmed it; can you believe that? That was a boldface lie. And to forge the log book and to think that he is considered a historian? I mean, he told lots of other lies which I will tell if you give me a chance.

Hendrie: Okay. All right. <laughter>

Bartik: When we come to the things that he lied about.

Hendrie: Okay, good. All right, so what happens next? Okay, now...

Bartik: Well, after this demonstration, of course, well, I did with Adele the Taub problem, and then Douglas Hartree came, and Kay and Douglas worked on a problem for him. And then they put the Los Alamos problem back on again and that ran, and other people came from Los Alamos to work on it. But then, by the time of the end of that summer of 1946, actually, the Taub problem, and I think that was the last program that run before they moved to Aberdeen, they were going to move the machine to Aberdeen. And I was getting married so I wasn't going to Aberdeen.

Hendrie: Oh, yeah, so tell me now, so when did you meet--

Bartik: Well, he was an engineer at the Moore School.

Hendrie: Okay, so you met an engineer then.

Bartik: Yeah, and so, well Marlen, she'd married a dentist, and she left the group and they were moving to Aberdeen, Fran and Ruth and Kay and Betty all went to Aberdeen with it. But, anyway, I was getting married so I wasn't going. Well, Dick Clippinger was at the Wind Tunnel in Aberdeen and he had problems he wanted to put on the ENIAC but they were too big to run on the ENIAC. Now, I don't know how he heard of it, but anyway, he heard that you could use the ENIAC in a different way than it was and Pres and John have it in the patent that you can now. Once the trajectory wasn't done anymore, we didn't need those function tables because those function tables stored the drag on the shell, so once we weren't going to trajectory we didn't need the functions tables. Now these function tables could store, each one could store 102 twelve decimal digit numbers. So, anyway, he got the idea from somewhere that you could use the function tables to store programs. So at this time people were talking about instruction sets, you know, for computers and a lot of people--

Hendrie: A lot of people were planning to build follow-on new machines.

Bartik: Right. And a lot of people were talking about instruction sets and stuff. And, of course, the EDVAC instruction sets of the stored program computers, anyway, Clippinger had thought of a 3-address instruction. But, anyway, he talked to von Neumann, and von Neumann said no, to use a 1-address

instruction, so anyway, Clippinger couldn't get a programmer to work on his stuff because the ballistics research lab were busy with their own stuff, so I was a loose programmer so--

Hendrie: And you knew the machine.

Bartik: Yeah, so he wanted me to teach him how to program the ENIAC so before I began to-- I stayed on with Aberdeen and I used to go down and teach him how to program the ENIAC and then I would come back and work on how to make it using stored programming. So, anyway, what he decided to do was to write a contract with the Moore School with me to head it up and to hire four programmers that I would train that could do his problems. So that's what he did. So then the first three problems were to be implementing this stored program. And when we went to Princeton, we would go to Princeton to consult with Johnny von Neumann, now what we were consulting with was on the instruction set, and the instruction set was okay except the problem was we didn't have enough facilities to do them all, so what we would do is we would go up and tell him that we were having trouble with this one, and we would talk about how to simplify it and things like that. Well, it was interesting because when Dick and I, and he had two mathematicians who were going to be defining problems to be solved on the ENIAC, they used to go with us and their names were Galbraith and Giese, John Giese, and they would go with us, but they were primarily going just to learn how to, you know, to use the ENIAC. So when we went up there, Adele Goldstine joined the group, and I asked Dick Clippinger many years later if he had hired her and he said no, I didn't, so who did she work for, so he said he didn't know but he had assumed that it was Los Alamos or Princeton. So, anyway, we would sit with Adele and we would program and then we would meet with von Neumann maybe half an hour a day and discuss what was going on. So we would stay up there for two or three days. And then eventually--

Hendrie: Then they'd come back to Philadelphia, well that's an easy call.

Bartik: That was called the 60 order code, and then after that, what we did was the group that I set up in Philadelphia then began to program his problems using the 60 order code.

Hendrie: And the 60 order code was implemented using these function tables.

Bartik: Right. And then you never had to set up the machine again, all you had to do was set the switches and the function tables so the horrendous problem of programming the ENIAC was gone. So the ENIAC was really the first stored program computer, actually.

Hendrie: Yeah, yeah, after you figured out how to use it that way, then it did that.

Bartik: Yeah, well, that's another thing. Goldstine says in his book that von Neumann and Adele programmed it. Isn't that interesting?

Hendrie: Isn't that interesting.

Bartik: That they were the ones that did the 60 order code. I mean, he knew better because he went with us when we went into see von Neumann. He knew exactly.

Hendrie: Wow. And he moved up to Princeton to work on the IAS machine, right?

Bartik: Yeah.

Hendrie: He didn't stay at Moore School, right?

Bartik: Yeah, well, when I was doing the Taub problem he was already up there, and he used to come down and have dinner with us and he used to tell me that the computer business was no longer with Eckert and Mauchly, that it was the Institute for Advanced Study, that the stuff was there. Well, heck, von Neumann got all this stuff from Pres and John from the EDVAC because he did not invent the stored program computer. And in fact, this business with the EDVAC, I mean to say that everybody knew they had I/O's and different things to do, the thing he did was to write it down. And the thing that I just found recently which I find very interesting, because Goldstine in all those years has said that he was responsible for publishing the EDVAC report.

Hendrie: Oh, that preliminary report.

Bartik: Yeah.

Hendrie: That von Neumann wrote.

Hendrie: Yeah. He would say well, probably if von Neumann knew it was going to be published, he would have given credit to somebody; he didn't give credit to anybody. I just read an affidavit that was in one of the technology magazines that von Neumann signed that said that Goldstine asked him to write the report for publications. It was when they got permission from Aberdeen and Penn. He knew from the very beginning it was going to be published, so the fact that he didn't attribute -- I mean it shows to me that he was planning to steal it to start with, I mean that is piracy. And I don't know why Goldstine never knew that because back in 1984, he was still arguing in the MIT oral history that it was his responsibility and that von Neumann was so gracious that even if somebody were in the room when he was writing he would give them credit. I mean that's baloney and...

Hendrie: <laughs> Okay.

Bartik: I mean it's outrageous that computer history takes that man seriously; he's a liar.

Hendrie: Okay. I think some people, you know, they make up things to make themselves--

Bartik: Yes, but this is history.

Hendrie: I know.

Bartik: Well, and what gets me by the way, and this is the one that I am really incensed about, when Goldstine wrote his book, Princeton Press, they had readers and normally they don't tell the author who the readers are so John Mauchly they sent him a copy, and he made the changes and sent it back, and they called him up and told him that they had to tell Goldstine who the reader was because the changes were so extensive, so they told Goldstine and he made none of them, and they printed it. So it's not just Goldstine, Princeton Press. And the things that he talked about were computer things and not about the ENIAC women, I mean, he of course wouldn't have made any of those changes. He said to me, John Mauchly said this to me once, he said, well, about 95 percent of what Goldstine said in his chapters that he reviewed were accurate, but he said but that the other five percent made all the difference.

Hendrie: Wow, that's not right.

Bartik: No, and of course, von Neumann called, instead of electrical circuits he called them neurons and apparently so it would get by the censors because if it's a classified project then Pres and John couldn't publish, and when Goldstine got this EDVAC report he told Reed Warren, who was now the head of the project, because they kicked Brainerd out, he told Reed Warren that it was just for internal use to train the engineers. So you have a lot of, well, I don't know, I mean, I should think he would be prosecuted for doing stuff like that.

Hendrie: A lot of people playing a lot of games sounds like to me.

Bartik: Not games. That is intellectual dishonesty, and for a man as brilliant as von Neumann, come on, he's not some little kid.

Hendrie: Right, so why would he do that?

Bartik: Because he wanted credit for EDVAC. I think he realized, in my mind, I think he realized that the stored program concept and electronic computers would be far more important in the world than his math, is what I think, and I think he wanted to be at the forefront because John claimed that he used to, when von Neumann would speak, he would sit in the front row and von Neumann wouldn't even recognize him, he never even acknowledged him.

Hendrie: Really? Wow.

Bartik: And when they went to apply for the patent for the EDVAC, Goldstine and von Neumann had already applied. I mean, this is outrageous. But the computer history can't seem to bring these guys to justice. I'm still angry today, and of course Arthur Burks is another one. Arthur Burks, he and his wife have done everything they can to belittle John Mauchly and to raise [John] Atanasoff up to the extent of

saying that the idea of the ENIAC came from Atanasoff, I mean it's the most absurd thing I've ever heard of. And when I had, with their books, when I reviewed them on Amazon.com, he claimed that so many things that are wrong. He claimed that he never met with John Mauchly and told him that if he would put his name and Shaw's and Sharpless on the patent, that basically John's understanding was that he would testify for Sperry Rand against Honeywell on the ENIAC patent but otherwise he wouldn't. But, anyway, and Kay sent an affidavit on what John told her from the meeting, and Burks claimed it never happened, on Amazon.com.

Hendrie: Wow.

Bartik: Claimed it never happened. But as far as I'm concerned, I think that he told John that his reputation would suffer if he didn't do that. Well, the irony of it is that before they applied for the ENIAC patent, they asked all the engineers if they had anything to patent, and they all said no, that it was the system that was the thing, the whole system, because a lot of the things they used, they tried to use as many devices that had been in use for a long time, they didn't try to do something new.

Hendrie: Right. They wanted to build a reliable machine so they wanted to use all reliable circuits and reliable techniques that had been proven before by other people; they weren't trying to invent something.

Bartik: Yes. And then Kay Mauchly had written that all of the stuff that John had done throughout his life had led up to the invention of the ENIAC and Burks in the appendix of their book does nothing but make fun of Kay and discounts everything that she says. And in his book he said, well of course Pres didn't say anything; but that isn't true. Pres came over every day and worked with her. That article that she wrote was the combination of the two of them, although it had her name on it. And he, in his book, also says that von Neumann should have given Pres credit but he didn't mention that he should give John credit. Well, I think the problem is that John's role in the design of these things was a similar one to von Neumann's, which is basically the software side of it, and I think that in order to, if you give John credit then you have to take credit away from von Neumann. So basically they just assumed and give no credit at all to John. Because Eckert in his eulogy to John, said he is the most brilliant man he ever met. Now, he certainly worked with von Neumann, I mean nobody doubts that von Neumann was brilliant; everybody admits that; the question is was he ethical? And the answer is "No."

Hendrie: Alright. Well, we should probably get—can we get back to the story for a little bit?

Bartik: Okay, what do you want to know?

Hendrie: Okay, well, we were, you were training other people to do Dick Clippinger's problem, this is after you worked on a problem, what was it, the tax or the--

Bartik: Taub.

Hendrie: Taub. What was that?

Bartik: From Princeton.

Hendrie: What was the Taub problem?

Bartik: I don't know the problem, really. I have a citation for it, for having done it, but I've forgotten what it was called. But then after a year of working for the Moore School and doing Clippinger's problem, then I wanted to leave and I wanted to go and work on, you know, the newer computers, so I wanted to work with Pres and John. So I left and I went to work for Pres and John, which was called the Electronic Control Company. And when I went there I was a programmer and they only had two programmers, Betty Snyder-Holberton and me, when they started their company, they had three people that sponsored them. One was Prudential Life Insurance; and one was A.C. Nielsen, and the other one was the Census Bureau.

Hendrie: Yeah, because they didn't have any money so they needed somebody to sponsor them.

Bartik: Well, they had \$25,000, I think, or something like that.

Hendrie: Yeah, some relatively small amount, yes.

Bartik: So it's interesting that [Edmund] Berkeley, Berkeley was the guy from The Prudential, and the reason Berkeley wanted a computer was that he was convinced that The Prudential clauses for their insurance refuted each other, he was sure that they weren't consistent, so he wanted it for logical reasons; he wanted to check out these clauses. And A.C. Nielson, of course, wanted to keep track of who was watching what to reduce their data and then John had been-- John and Pres had already talked to the Census Bureau before they ever left Penn, when they were thinking about the EDVAC, they had already talked about handling the Census Bureau's work. So, anyway, when I went there, Betty was doing-- well, both of us did for awhile.

Hendrie: Now, Betty was there first?

Bartik: Yeah, oh, yeah, she was there-- because she worked for them for nothing for awhile.

Hendrie: Really?

Bartik: Yeah, well, a number of the engineers worked for them for nothing until they got some money from the Census Bureau.

Hendrie: These are engineers that had been at Penn working on--

Bartik: Well, Bob Shaw and Betty and Frasier Welch, I think, of course, he was independently wealthy, but, you know, people were inspired by Pres and John.

Hendrie: Yes, they were remarkably capable people.

Bartik: So, anyway, she, we were doing sort/merge problems, trying to do them for the Census Bureau and then when they decided to build the BINAC, then I moved over to the trajectory for the Snark Missile. The BINAC was designed supposedly to control the Snark Missile. That's why it was twin computers that checked each other, each pulse time so--

Hendrie: It would be reliable.

Bartik: Well, yeah, when you're controlling a missile you sort of don't want it to make a mistake.

Hendrie: This was the contract from the Navy? Yeah, it must have been.

Bartik: No, from Northrop Aircraft.

Hendrie: Oh, from Northrop, okay, it was not a government contract.

Bartik: So, anyway, that's what I was working on, and then after we had been there for awhile, Pres came to John and said that he wanted two programmers. Well, by this time, a year had passed, and Arthur Gehring, who was one of the men I had hired for my project at the Moore School, had come to work for it, for Eckert-Mauchly. Pres said he wanted two programmers because he had no engineers available to do this so he wanted two programmers to design a backup machine for the UNIVAC. He was afraid the mercury delay line memory wouldn't work so he wanted to design a backup machine using cathode ray tube storage. So he didn't want-- it was a secret project because he didn't want anybody to know that he was worried. So, anyway, John asked us to work on it. I was scared of Pres because I was afraid of him, I had never really been around him, and I said to him if he ever yells at me I'm out of here, so John said, "Oh, I don't think he's going to yell at you", and he never did. And he also is a wonderful teacher. He's different than John. Their personalities are so different because John, he is one of the most responsive people that I think I've ever met. If you go up to him and you'd be singing a song, he'd sing with you. I mean, if you go up to him and quote some poetry, he'd quote some more, and he's terrible punster, I mean, John. Well, Pres, I never talked about anything personal with him. I mean, Pres decided to talk to you; you didn't decide to talk to Pres.

Hendrie: I see.

Bartik: So, anyway, we said, well, you know, we don't know anything about this, and he said, "I'll teach you." So he wanted us to do the logical design and he wanted it micro coded. Well, I think this was the first micro coding machine and he told us about Boolean algebra and all this stuff.

Hendrie: Really? Okay.

Bartik: Yeah, so he would come in twice a day and we weren't allowed to talk to anybody about it except each other and him. So that's what we did, and after we had done this for awhile, he came in one day and he said, you know, I'm really worried about how long it'll take to debug the UNIVAC when it's built, so he said that he wanted us to check the logic, he wanted to make sure there were no mistakes in the logic of the UNIVAC, so he asked us to check the logic of the UNIVAC, so--

Hendrie: So you're gonna do a logic review on the UNIVAC?

Bartik: That's right.

Hendrie: Well, okay, he has taught you logic, now you know logic, so now he can ask you do this.

Bartik: That's right. So, well, Bernie [Bernard] Gordon, you know, gave a speech at the History Museum, and Bernie Gordon was one of the engineers so...

Hendrie: I didn't know Bernie Gordon worked on that.

Bartik: Oh, yeah.

Hendrie: Okay, yeah.

Bartik: He was a young man. I don't know why they say in his Wikipedia that he wasn't married; he was married when I met him. Anyway, Bernie Gordon, when Pres said to them you can't make any changes to the logic of the UNIVAC without clearing it with us, well, he was horrified. I don't know whether-- I mean, you know, engineers always think they were better than programmers, and then, of course, men always think they're better than women.

Hendrie: Right.

Bartik: So I don't know which he was most horrified by, that I was a woman or that we were programmers, but anyway, I have always said that if you want to ingratiate yourself with somebody, do something for them that they have to do and they don't want to do. So they found out that when they made changes to the logic we were going to trace it all around the machine and make sure all the other changes were made so, voila, all of a sudden we were doing something they hated to do, so they loved us. In fact, Bernie said to me, "You must have a beautiful marriage", he said. "You're so logical and you're married to an engineer, and", he said, "my wife is so illogical". And I said, "Well, you know, Bernie, most decisions that are made in marriage are emotional, not rational, anyway." And I said, "I have as much trouble as anybody else". I mean, engineers like to believe that all their decisions are rational, not emotional, because they'll cover it up, but they're just as emotional as anybody else.

Hendrie: Yes, exactly, they just have to train themselves to be logical so they don't make emotional decisions on engineering, they just make logical ones on the engineering.

Bartik: Well, we found no major logical errors by the way and Bob Shaw had drawn those block diagrams in about six weeks. So, it's amazing, and Bob Shaw was an albino and he had to hold the paper, he had five or six inches from his face, and he had used great big three by four sheets of paper to draw them on. Well, I've called him a Renaissance man because he could do logical design; he could write; he could talk; he could do electrical design; he was very ingratiating, charming, I mean, he was really a wonderful person. So then time passed and one day Pres said well, I'm really concerned because UNIVAC doesn't have any check circuits other than the odd-even check on the memory.

Hendrie: Excuse me. Can we pause?

Bartik: So anyway, oh, one day, Pres came in, and he said he was really concerned that the UNIVAC didn't have any check circuits in it. Other than the odd/even check on the memory and on transfers. So I'm sure you all know what an odd/even check is. And that is that if the bits add up in a character, if the bits add up even, then, you put a check bit in so that it's odd. Because if any time that it runs across an even character, then it signals an error. So anyway, we began-- he said, you know, that if it's not checked in any other way that we'll duplicate the circuit. So we immediately began to tell the engineers they had to duplicate circuits. Well, they went into orbit, because they don't want to add equipment, I mean. So they said we were ruining their design and we didn't know what we were doing and all this kind of stuff. So they were really in rebellion. So Jim Weiner, who was the Chief Engineer, couldn't really control them. So we had a meeting with Pres, and the meeting took about ten minutes. Pres said, "Here's the rule." He said, "When you have a police department, you don't have every policeman checking every other policeman. You just have one policeman checking another police. You make sure that every police officer has one other checking them. And the assumption is that you don't have two corrupt policemen, simultaneous." He says, "Same thing as here. That you must have every circuit looked at by, at least, one other circuit. And if it isn't looked at by somebody else, you duplicate." And that was the end of the meeting. And they just left. I mean, that was the end of the argument. So we put the check circuits in the UNIVAC.

Hendrie: Okay. Good. Very interesting.

Bartik: So then, my husband had taken a job in Washington, DC. So I was going to move to Washington. So...

Hendrie: And he had been working at the Moore School all this time?

Bartik: Yeah.

Hendrie: Okay.

Bartik: No, he didn't. He worked for a consulting outfit that did-- his field was electrical noise. I mean, one of the jobs he did was to shield the centrifuge where they swung animals and astronauts around at Johnson Naval Air Station. To simulate gravity so you could measure, you know, what the effects of G's or gravity would have on people. So he had the job of shielding that centrifuge. Because they put these sensors on the human body, and the signals from the body or electrical signals are so small. That if you have any noise in the system, you know, it distorts what's going on.

Hendrie: Okay. All right.

Bartik: So anyway, he took a job in Alexandria, Virginia. So I went to Washington with him. Well, I fiddled around for a little, and then, Pres wanted me to-- after we were finished with the check circuits, he wanted us to go back and finish the design of the backup for the UNIVAC.

Hendrie: The backup for the UNIVAC?

Bartik: Well, that's the one I was telling you we were working on originally.

Hendrie: Oh, originally, yes. Yes. Okay.

Bartik: Yeah, so the design wasn't finished, and he wanted it finished. So I agreed. I traveled. I came up during the week and worked in Philadelphia until Art and I finished it. Then, I took a job with RemRand [Remington Rand], in Washington. And they had programmers...

Hendrie: Okay. Remington Rand bought...

Bartik: Bought Eckert-Mauchly.

Hendrie: ...Eckert and Mauchly's company by now.

Bartik: Yeah. Well, Straus was in for a while from American Totalisator. But then, he was killed in an airplane crash, so they pulled out. So then, they sold out to RemRand.

Hendrie: Because they just didn't have the finances to continue.

Bartik: Yeah. So isn't it interesting when they originally had gone to borrow money, banks couldn't see how they could ever use a computer?

Hendrie: Yes. Pretty interesting, isn't it?

Bartik: Yeah, it's interesting what bankers know or don't know. So anyway, when I went there, the first thing they wanted me to do was to train the Census Bureau UNIVAC programmers. Because they were going to get a UNIVAC, you know. So that was the first job. And then, they wanted me to go around with salesmen and tell about the UNIVAC. So that's what I did. That was my first experience. One of the programmers for the Census Bureau was deaf, and I had never worked with anybody that was deaf. And they said, "Oh, she is so skilled at reading lips that you don't have to worry about her." Oh, well, that isn't true. Because, you know, when you talk, you turn your head, you lower your head, you turn your back. I mean, so that you do have to know how to work with a deaf person. I mean, just if you go over and are looking at the paper and start talking, it doesn't work. You have to pull up their head and talk to them, you know?

Hendrie: Yes. Yes.

Bartik: So anyway, I did that. But these salesmen, then, would have me run around and tell about the UNIVAC. And then, they would go in and sell them typewriters and comptometers and stuff. So they had no sales plans for the UNIVAC. They had no commission schedule. And those salesmen didn't know a thing about the UNIVAC. So they just used me to get their foot in the door to sell something else. It was horrible.

Hendrie: Oh, my goodness. Yeah, they just say, "Hey, we have somebody that really knows about these new computers. We're going to come tell you about it."

Bartik: Right. Yeah, you get the foot in the door...

Hendrie: They just get you to come in to...

Bartik: ...and yeah.

Hendrie: ...get educated.

Bartik: It was terrible. So then, finally, Aviation Supply Office had one of their Cardex systems to handle inventory. So they were about to kick it out. So they had me see how the UNIVAC could do this system. Well, it was perfect for it. You know, I mean, that's exactly what the UNIVAC was designed to do. So, you know, inventory control and process, shipping and reordering when your supplies get low and all this stuff, billing. I mean, it was wonderful. I was so excited because I finally had a job to do. So, anyway, they probably were very worried that I wasn't a salesman and didn't know how to...

Hendrie: Make the customer happy.

Bartik: Yeah, so they had Paul Chinitz from Philadelphia to come down to tell these guys how the inventory control problems worked, which they worked with it every day. I mean, it was idiotic. But anyway, the guy on the Cardex system, a new Cardex system they were thinking of, spent most of the

day. And late in the afternoon, they had the guy from Philadelphia tell them about inventory problems. And then, they finally had me on to tell them how the UNIVAC could do it. Well, they went wild. They were so excited. It was amazing. When an objection come up, one would object. I mean, they were answering their own objections.

Hendrie: Yeah, they were arguing with each other.

Bartik: Yeah. It was absolutely fascinating. And RemRand had had their VP of Sales from New York to come down to be <inaudible>. I guess, to see that...

Hendrie: Yeah, well, this was an important customer.

Bartik: Well, it was fantastic. So they would not let me go to the banquet with them, because they said they'd tell some off colored jokes and I'd be embarrassed. So I had dinner with one of the Commander's wife. Because, you know, the people that ran it were Commanders and Lieutenant Commanders.

Hendrie: Yes.

Bartik: So they couldn't wait to get out of the dinner with them to come down and talk to me. I mean, it was really amazing.

Hendrie: Well, that's great.

Bartik: And guess what?

Hendrie: What?

Bartik: They never let me give another presentation.

Hendrie: I would've thought they would've had you give them all.

Bartik: Wouldn't you?

Hendrie: Wouldn't you?

Bartik: You would think that, but no. And they had me go out with Bledsoe, who was Assistant Manager. And he sold pulpits before he worked for them, so he didn't know much about the UNIVAC. So he would almost tell lies and stuff like that. And then, I would be there to answer technical questions afterward, because he couldn't answer any questions. That's all I did.

Hendrie: You didn't enjoy this very much?

Bartik: It was a job from hell. It was the most horrible job I ever had in my life. I hated it. So anyway, my husband finally took a job with RemRand back in Philadelphia. Well, at that time, they didn't allow husbands and wives to work at the same site. So Bob Shaw's security clearance had been questioned, so he had to work offsite. Well, John's was, too, and he couldn't work at the company.

Hendrie: Really?

Bartik: Yeah, have you heard those stories?

Hendrie: No.

Bartik: Well, guess what? I have John's FBI Report. When the Freedom of Information Act came out, Kay and I wrote-- Kay could access it, and she let me make a copy of it. Well, he belonged to Consumers Union, and that was considered a communist oriented magazine. And they said he belonged to some Philadelphia Engineering's Club, which he said he never joined. But according to the FBI Report, it said Carl Chambers from the Moore School said he did. Well, John said he may have signed up for some literature one time at something. But he never joined it. And then, he hired such security risks as Bob Shaw. Well, Bob Shaw was an albino and, obviously, couldn't drive a car. But back in 1948, cars were not as prevalent as they are today. So Bob bought a car so people could drive him where he wanted to go, because he was very social. He liked to go places and do things. Well, he had plenty of people that were willing to drive him to these places. So one weekend, one of his drivers wanted to borrow his car. He wanted to go to Washington, DC to visit a friend. So he did. He went to Washington, and his car was parked on the street. And he went upstairs to the apartment to visit his friend. Well, there was a parade in Washington that day that was considered communist oriented. And the police went along and tagged the cars, you know, took down the license plates of the cars that were on the street. And, of course, Bob was the owner of the car. Well, he wasn't even there. And the guy that was there wasn't even on the street. But anyway, I mean, that's the kind of stuff that you'd have during the McCarthy Era. It was terrible. And, of course, one of the things the report says that he spent a lot of time with the ENIAC women. Well, that's right. He did. I mean, what was wrong with that?

Hendrie: Yes, exactly.

Bartik: And the President of Ursinus College, when he was there, didn't like his lectures. Well, John graduated, got his PhD during the Depression. And when he went to Ursinus as, you know, head of the Physics Department, they didn't even have anybody that needed to take Physics. They had three students who were premed and that's all. So when John went, he wanted to attract students. So he began to give lectures that would be interesting to students. And one of the lectures he gave was he put a board, and he put roller skates on the bottom of it. And he came into the room, and he put this board up on a lab table, and he got up there and demonstrated Newton's Laws of Motion on these roller skates.

Hendrie: Well, that's brilliant. Yeah, all right.

Bartik: Yeah, well, I mean, this was before skateboards, remember?

Hendrie: Yes, exactly.

Bartik: So that was one of them. And then, one lecture he used to give at Christmas time was on how to tell what's in a Christmas present without opening it, using laws of physics. So the kids always had a party the night before their last day there, so they were always pretty wasted. But they had to attend class the next day. So the professors used to dismiss them and let them go listen to John's lecture. In fact, they would go themselves. And it got so big, they had to have it in an auditorium.

Hendrie: Oh, my goodness.

Bartik: I mean, he would punch the package with...

Hendrie: Yeah, he'd use all sorts of <inaudible>.

Bartik: Yeah, and one of them would hold a balloon in it, so when he'd punch it, you know, he'd-- and then, he would suspend it in water and weight it and, of course, measure it and do all kinds of stuff like that.

Hendrie: So he was quite a ham, a performer?

Bartik: Oh, yeah.

Hendrie: Wow. Okay.

Bartik: Well, he needed students.

Hendrie: I had a chemistry professor at college that was the same way. All sorts of people would come to the lecture, because he just was such a showman. But he was teaching chemistry, too. But it's the same idea. Yeah, appeal to the kids so they like the subject.

Bartik: So let's see. What else was in there? That's mainly it. But they repeat this business about Consumer's Union and this Engineering Club over and over again in it.

Hendrie: Wow. Okay.

Bartik: It's amazing. So I mean it's hard to believe, today, that people believed that stuff in the McCarthy Era.

Hendrie: Yeah, it really is. And you're right.

Bartik: Well, people got so they were afraid to talk about things on the telephone and stuff is how bad it was.

Hendrie: Yeah, it really was.

Bartik: So anyway, after I left RemRand, I stayed home for 16 years and had children, had three children. And then, when I went back in the business, it was interesting. It was the minicomputer was just coming in. So I never worried about mainframes again. I worried about minicomputers and communications.

Hendrie: Okay. Now, you lived in the Philadelphia area?

Bartik: Well, yeah.

Hendrie: Okay. Yeah, so you had a home and you had raised your children <inaudible>...

Bartik: Well, no. The kids, when I-- I was divorced. I went back to work. I went back and got my Master's Degree at Penn. And I decided that if I didn't get a divorce, I was going to just teach school, so I'd be home in the summer with the kids. But if got a divorce, and I was planning I probably would get a divorce. I had to go back in the computer business to earn enough money. So I did file for a divorce. And my kids, my son was 14 and my oldest daughter, I think, was 9 and Mary was 8 or 7. So my kids were small. And my ex-husband, actually, moved to California, and he really wasn't a factor in our lives after that. And so the question is what could I do? Well, I was really interested. I didn't know what I should do. So I went to Sperry Rand, and my buddy, Arthur Cehring that I had worked with before. But at that time, actually, my husband was still there. So they didn't quite know what to do. So anyway, they really didn't want to hire somebody with-- he didn't stay there but a very short time afterward. So the people that I had worked with at Eckert-Mauchly had formed Auerbach Corporation. And one of them was Isaac Auerbach, not Al, but Isaac.

Hendrie: Okay.

Bartik: And one was Paul Windsor, who had worked there. Well, the other one had not worked there, Arnold Shafritz. But anyway, so I went there. Well, my goodness, they greeted me with open arms and said I could work with consultants and could work with some programmer. But publishing really wanted me, they said. So, gee, I went down, and I took an editing test. And then, I saw the reports they wrote, and they were very technical. And I thought, gee, that's the greatest way in the world for me to get back into the business is to do technical reports. You know, to read them and to edit them. So that's what I did was to work for Auerbach Corporation publishers and developed a service on minicomputers.

Hendrie: Okay. Very good. Those Auerbach reports, everybody read them.

Bartik: Well, yeah. In fact, one time, I went into a hotel in Chicago to an ACM meeting. And here came old Grace Hopper. If you know Grace Hopper. So she stomped up to me, and she didn't say hello, how are you or anything. And she said, "What are you going to do about microprocessors?" Because many computers were starting to be implemented, you know, using microprocessors.

Hendrie: Oh, my goodness.

Bartik: So anyway, I did that. And then, I began working for many computer companies. I worked for Interdata. And I was Market Manager of their megamini. And then, I worked for Systems Engineering Labs in Florida. I was Product Support Manager. And then, I worked for Honeywell, as a Manager of Minicomputer Competitive Analysis. And then, I worked for Data Decisions, developed a communications project and then, edited it.

Hendrie: Okay. Now, did you move around for these? Did you go <inaudible>...

Bartik: Oh, yeah, I did. Yeah, well, because I thought I would be Vice President of one of these companies. It was interesting. When I was in Honeywell, in Minneapolis...

Hendrie: Okay. You were in Honeywell, in Minneapolis.

Bartik: Yeah, one of the men who was in communications and was a-- these corporation leaders, like the President of the United States, have kitchen cabinets. That people down in the corporation that'd tell them what's going on. So one of the guys that was on the Spangle's, who was head of Honeywell, he said to me, "You'll never be an officer of one of these companies." He said, "You're too aggressive, and you're too open." He said, "The next generation of women will make it up the corporate ladder." He said, "They'll go to business school, and they'll have more finesse than you have." Well, the main thing I found that they learn in business school is never bring bad news to the CEO. Because I got punished. That's why I left these companies, I got punished for telling the truth.

Hendrie: Yeah, they don't want to hear it. And rather than doing something about it, they shoot the messenger.

Bartik: That's right. They certainly do.

Hendrie: Wow. Okay.

Bartik: Yes, indeed.

Hendrie: All right. Well, that's certainly very difficult. About how long did you spend with these various companies?

Bartik: Well, I stayed eight years with Auerbach, Isaac Auerbach, because I learned a lot there. The reason I actually left there was that one of the editors had suggested that instead of hiring people, they use freelance people. And he didn't have to pay benefits for them. And that was the beginning of this benefit stuff. So they made him vice president of the company. Well, Isaac was big on rewarding stuff like that. So anyway, it wasn't fun to edit these, because you had nobody, and you had these freelancers. And they didn't know the products. I mean, they would just quote manuals. I mean, it was terrible. So I spent so much time trying to fix up these reports and this kind of stuff. So that I decided I didn't need it anymore. So I decided I'd just go out-- and, plus, the other thing was I mistakenly thought my children were old enough so that I could move with them and it wouldn't bother them. But that isn't true. My oldest daughter tells me that's the worst thing I ever did to her was to move her.

Hendrie: Was to move her when she was <inaudible>...

Bartik: Well, I moved the year before she was a senior in high school. And then, the other one was in, what, ninth grade. So it turned out I was wrong. To this day, my daughter hates to move.

Hendrie: Really?

Bartik: Oh, yeah. She said that was really terrible.

Hendrie: Well, yeah, she tends not to move.

Bartik: She what?

Hendrie: She would tend not to move, then.

Bartik: Yeah, she doesn't want to move, at all. So I was there, and I really moved, you know, I felt they were old enough. And then, as I said, it wasn't any fun working there anymore. Then, at Interdata, me and the marketing manager got kicked out, basically. Because I was marketing manager of something called the megamini. And they had a 16-bit mini computer. And it was the one that the president of the company had founded the company based on. But the thing that happened was a company in Japan had a microprocessor to emulate their mini. And offered to sell it to them, but they didn't feel that they needed it. So they didn't buy it. So they were still using discrete elements and everybody else was going to microprocessors. So they couldn't afford-- I mean, they sold a lot of their minis, but they didn't make any money on them, because they had to cut the price. So most of the money they made was from the megamini. So the marketing manager decided that what we should do is to cut out the 16-bit one. And put our research and development in the megamini and where we made money. And the only person that went along with him was me. So we had the meeting with, you know, everybody and the president of the company went ape. He was livid. He wanted us to bring back the 16-bit mini. Well, you couldn't bring it back unless you got a microprocessor to implement it. So anyway, he, basically, fired the manager. And I, say, in the Peter Principal that I got the sidewise, the *Lateral Arabesque*. So they didn't fire me, but they moved me over to report to somebody that I considered beneath me, so to speak. So I left.

Hendrie: Now, the megamini was a 32-bit machine?

Bartik: Yeah.

Hendrie: Wow. All right.

Bartik: So then, Bill Sweet, who was the manager, went to National Semiconductor. Now, they were considering coming out with a microprocessor that emulated the PDP-11. So they asked me to come to be product manager of it. Well, I mean, I was crazy about Digital Equipment, and I was crazy about the PDP-11. And I didn't feel very comfortable doing that, because I really thought that DEC deserved, you know, whatever they had with the PDP-11. So I didn't go. So I went to Florida for Systems Engineering Labs. Now, they were the only other competitor for a 32-bit mini. And I was Product Support Manager. Well, there I got in the same problem of telling the truth. While we were there, I had a grand time for a while with the job. But anyway, eventually, the marketing department kept saying that they didn't have any products to sell, any new products to sell. And development kept saying, "If you'd sell what we have," well, they didn't have anything but an old machine to develop products. I mean, and it wasn't anything that the users wanted, because mainly, their customers did link trainers for pilots. They sold...

Hendrie: Yeah, they sold a lot of pit control aircrafts <inaudible>.

Bartik: Yeah. So anyway, finally, they had an offsite meeting and where we were supposed to discuss these things with the vp's and the president and the product line managers. And me, I was the only woman there. So anyway, the meeting started. So this head of development kept talking about COBOL compilers and database management systems. So then, we had a coffee break. So my boss, who was the marketing manager, said, "I haven't heard from you." And I said, "Well, this is idiotic. I don't have anything to say to such idiotic ideas." And so he said, "Listen. You're the only woman here, and I brought you here. And I expect you to talk." So I thought, well, I'll just let it all hang out. So I came back and I sat down. So I said, "Well, first of all"-- now, I'd come with our main competitor you understand.

Hendrie: Right.

Bartik: So I knew what was going on. So anyway, I said that Interdata, when I was there, had the Bureau of Standards redo their math routines. And they doubled the throughput of their software. And I said, "Our math routines don't even give the right answers." Which is true. And I said, "And we're not interested in COBOL compilers. We're in a FORTRAN environment completely. And that Interdata was coming out with a FORTRAN IV compiler, and it was optimizing. And that it was going to run like greased lightning, and they were going to eat our lunch." And I said, "And none of them care about COBOL compilers or database management." Well, the development guy was whispering in the president's ear and nobody said a word. Not a soul supported me. But guess what?

Hendrie: Yeah?

Bartik: Almost immediately, the vp of development was ousted and so was all his crew. But guess what? Nobody wanted to even talk to me. I mean, one of the product line managers said I didn't have the right to say such things. And one said, "Well, you were certainly right, but I certainly wouldn't say it at the meeting like that." So now, this is what they did. They put new skins on the old computers and announced new systems. They did.

Hendrie: Really?

Bartik: Yeah. And they told me to-- well, that vp of the company. Let's see, what was he vp of? Sales, I guess, it was. He came up behind me. I was copying something at the copier. And he said, "You'll have all new product bulletins for the new machines." And I said, "What new machines?" He said, "You heard me." Well, I thought, what can I do? I mean, these are the same machines. So I sent the product line product bulletins to each of the product line managers and told them to fix it up for publication. Guess what? Not a one of them handed me back a product bulletin. Well, they hadn't changed. So why would they hand it back?

Hendrie: Yes.

Bartik: So that's how come I left there.

Hendrie: Yes. You said, "I don't need to be in a place like this." Yeah, well, you know, they proceeded to not do very well, either.

Bartik: Oh, yeah, they sold-- well, Sam Bosch, my manager, this is what he told me. I saw him in Arizona later. And he said that the president never forgave me, because what he heard was that he had wasted his money. He paid \$500,000 to get that VP of development out of his old job contract. He bought it out. And that he had wasted \$500,000 to get him. So he wasn't grateful.

Hendrie: He wasn't very happy.

Bartik: No, he wasn't happy.

Hendrie: Yeah, because, basically, you pointed out that he made a big mistake.

Bartik: Well, that's what he heard.

Hendrie: Well, yes. It was true.

Bartik: Well, anyway, so then, the same sort of thing...

Bartik: So then I went from there, they were setting up a competitive analysis group at Honeywell. So I left Systems to go to Honeywell, and as Manager of Minicomputer Competitive Analysis. Now there's another situation I'm...

Hendrie: Now what year, say roughly what year are we at so I can sort of roughly...

Bartik: 1978.

Hendrie: Okay.

Bartik: Yeah, 'cause I was there from 1978 to 1980.

Hendrie: Okay.

Bartik: So anyway, the main thing they said that-- Spangle, the president, had set up this group so they could tell him how the Honeywell products competed in the marketplace. So they had a manager of competitive analysis for large systems and medium systems, and minicomputers, etcetera, communications. So they decided that the first responsibility we had was to brief the president on how competitive their minicomputers were. That was for me anyway. And that we were going to have a half hour presentation for him, and that's what we should prepare for. So time passed, time passed, and it got smaller and smaller until finally we were going to have five minutes. So we had the meeting and he was surrounded by these, I don't know, management types, and he wanted to ask us questions, they went "Oh, we don't have time for that, we have to take you some place else." So I never saw such a frustrated man in my life. And they hustled him out of there.

I mean, they didn't want him to know the truth because their 66 was not <laughs> I mean, it wasn't competitive at all. So anyway what happened was that the 66 was made in Phoenix, Arizona, and they wanted to come out with the new system. Well at that time the computers were four and five times faster than they were before, and the Honeywell and the ones that are built by GE were not very powerful, but they had gotten into multiprocessing, so they were one of the first companies that did multiprocessing. So that's how they made up for the fact that their systems weren't very powerful. So anyway the users who had kept telling they wanted a more powerful system, so they wanted to come out with this system where it was only 20% faster, it wasn't even worth coming out with a marketing campaign or anything. So anyway, they ousted Spangle, and the head of sales for the United States came in as president. Well he hated that group at headquarters because, I don't know, it was a matrix management system, I don't know if you know what it is, but I mean, it's got to be the worst management system in the world. There was a person you know, at headquarters advising the president, comparable to one in the field. So the rule at least at Honeywell was that they couldn't do anything out in the field that cost more than a million dollars unless they cleared it with headquarters. So a lot of their projects they managed to pare them down. <laughs>

Hendrie: <laughs> Make a numerical rule and you will have unintended consequences.

Bartik: So anyway, the guy that came in hated that group at headquarters, so he immediately disbanded it. I mean, I was supposed to work for somebody in the field. So anyway, I left and went to Data Decisions, back in the publishing business.

Hendrie: Now where is Data Decisions located now?

Bartik: It was here in Cherry Hill.

Hendrie: Okay. So you had a short stint in Minneapolis, enough to have a winter or two.

Bartik: Two winters. God the first winter, oh my god, I couldn't believe it. I mean the snow, it snowed so much that they-- the snow was so high you couldn't see around corners, they had to come and haul the snow away at corners, it was unbelievable.

Hendrie: Anyway, so you get back here?

Bartik: So anyway, I came back here to develop a communications product. The woman who started it was Liz McKeown and she got Bill Ziff from Ziff Publishing to back her in doing a technical publication that would compete with Auerbach and Data Pro. And she developed it so that supposedly they were going to cover everything in one product, but it didn't work that way. So anyway, I was hired to work with Fannie Reagan who I'd worked with Auerbach, and to develop this communications product. So I came back and we had a lot of fun development, you know? 'Cause minicomputers, you know, were the first that really used local area networks.

Hendrie: Right, exactly.

Bartik: And then the army developed AUTODIN [Automatic Digital Network], and then there was ARPANET and then Xerox had the Ethernet, and the Wang had the WANGnet. So anyway, I had a grand time writing reports about all these things, and we were there about, I mean, we were quite successful. But anyway Bill Ziff and Liz had a falling out over something, probably because of schedules, you know, missing schedules. But anyway she developed a PC product for PCs, and that's the one that went on and became a blockbuster success. PC Magazine's still around.

Hendrie: Absolutely.

Bartik: So anyway Liz was ousted and he had some people come down, and one of the biggest regrets that I have in my career is that when I was at Data Decisions and Computer World was such a popular newspaper, and they didn't have anything comparable for communications, there was only the Communications Magazine, so I thought that Ziff Davis should start publishing a Communications World that would be quick and dirty like Communications World, but the VP that I brought it up said that "Oh, they'd really like to buy run down products and then build them up," they didn't like to start new products,

and all that kind of stuff. Well anyway they basically turned it down. Now whether it ever went up to Bill Ziff, I don't know.

Hendrie: Yeah, whether he ever heard.

Bartik: But anyway, it was rumored that Bill Ziff had Hodgkin's Disease, and everybody was worried about it, what was going to happen to the company. Because Liz was gone, and the man that he'd put down there obviously didn't know what he was doing. So anyway, Bill Ziff came down and he was so gracious and charming, and told us how much he was-- crazy he was about us, and what great plans he had for us. And two weeks later on November the 13th 1986, we came into work and they said "As of 9 o'clock this morning you're out of business." He'd sold him out to McGraw-Hill. So <laughs> that was it, finis.

Hendrie: Oh my goodness.

Bartik: Yeah.

Hendrie: Wow.

Bartik: And his sons, his sons weren't interested in publishing, they were in finance. Quite a number of years later sold what was left of that PC and then the magazines, they kept that stuff. They sold it for almost a billion dollars. Imagine just what started there in Cherry Hill.

Hendrie: Oh my goodness.

Bartik: Yeah, they did.

Hendrie: Wow. Alright.

Bartik: Amazing.

Hendrie: Yeah, well so he-- that was clearly a good idea.

Bartik: So anyway, that was it.

Hendrie: Yeah, alright.

Bartik: So then after years, I mean, nobody paid any attention to the ENIAC women until 1986. Kathryn Kleiman who was graduating from Harvard with a degree in social science, and she had chosen as her

senior paper the women in the computer business. So she had heard of the ENIAC women. So she came down, and that's the first time we ever met her, was then. So in any case ten years later when they had, in 1996, she had called up Steve Brown from Penn, who was running the thing, what he was doing the ENIAC women, and he said "Nothing. I don't know anything about any ENIAC women." Well it's sort of interesting because we worked for Aberdeen, we didn't work for Penn, so he did not have our employment records, you know. Because we worked for Aberdeen. We were located at Penn.

Hendrie: Yeah, but you were working for them.

Bartik: Yeah. And so then Tom Petzinger who wrote the Up Front Column in the Wall Street Journal on Fridays, heard about us. So he called up Steve Brown, but he got the secretary. So the secretary said "You sound like a woman that keeps calling me," she said "Would you like her telephone number?" So she gave him Kathryn Kleiman's telephone number, and they got together. And so he began-- he interviewed, he spent a day with each one of us. So then he came to the 50th anniversary. Well Kay sat with the bigwigs because of John, and who did Betty sat with? Something. But anyway the rest of us didn't do anything. I mean, just like an attendee. So he couldn't decide what to do with the story. He fiddled around with it, he was thinking about writing a book and all kinds of stuff. Well finally in November 1996 he wrote two columns in the Wall Street Journal, in the Up Front column. One on succeeding Fridays about us. And then everybody was interested in us, that's when the interest began of people about the ENIAC women.

Hendrie: Alright, so that's what sparked it, was the column.

Bartik: That was what sparked it, yeah.

Hendrie: And the woman at Harvard who was...

Bartik: Yeah. Well now she, yeah, I can't remember his name, the guy that sold Lotus to IBM. Oh, why can't I remember his name?

Hendrie: Oh yeah, what is his name? Yeah, he replaced Mitch Kapor as...

Bartik: Kapor is the one. Kapor is the one that did it, yes.

Hendrie: Oh, okay, Mitch did it. Okay.

Bartik: Mitch Kapor, yes.

Hendrie: Yeah, okay.

Bartik: He gave her \$80,000 for, you know, for the documentary or whatever...

Hendrie: To go work on this, yeah.

Bartik: On the ENIAC Women. So what she did was to hire a professional group, and she acted as the questioner, and they came around and spent a day with each of us filming, and so those are the records that she wants to make a documentary of, is that.

Hendrie: Oh, very good.

Bartik: That's what...

Hendrie: Okay, but she hasn't, yeah, she's still working on it.

Bartik: She's never gotten the money.

Hendrie: Yeah, she needs some more.

Bartik: Well she spent some money on-- Tom Petzinger's wife was also a writer, writing a script for it, you know. I believe she has a script, but I don't-- I've never seen it. And as a matter of fact, I think her agreement with us has run out, I'm not sure. But anyway, she's still trying to...

Hendrie: Still working on it.

Bartik: Yeah.

Hendrie: Okay. I've never met her, but I've certainly heard of her, you know, seen some kind of correspondence from her.

Bartik: Yeah, well she's an internet lawyer. She works... one of her big things is domain names.

Hendrie: Oh, okay, very good. Well that's how she must have met Mitch, because he's very interested in the Frontier Foundation which is, you know, trying to preserve privacy and things like that on the internet. Very good, okay. Now what happened to the different ENIAC women? Now let's see, Kay, when did she-- she married John Mauchly?

Bartik: Yes, now...

Hendrie: Now when did that happen?

Bartik: Well I don't know if you know, but John's wife in 1946, they went down to the seashore one, I guess it was probably Friday night, and got down there about 9 o'clock, and they went out swimming in the nude in the ocean, and she got caught in an undertow and was swept away. And he was running up and down the beach, you know, trying to get help, and her body washed up down the beach the next day.

Hendrie: Oh no.

Bartik: So she died then.

Hendrie: In 1946.

Bartik: I believe it was in August of 1946, I'm not sure, it was almost to September.

Hendrie: I did not know that piece of history.

Bartik: Yeah. And then when did-- I believe he and Kay were married in 1948, like the spring of 1948. I know the first time he did anything socially was for my wedding, because I had asked him to be my-- to give me away. So when I ask him he says "Don't be ridiculous, I'm not going to give you away. You're too valuable to be given away, what's the big idea?" <laughs> So anyway.

Hendrie: <laughs> He was really charming. Yes.

Bartik: But he did give me away.

Hendrie: Okay.

Bartik: And Kay had an engagement party for me, and I think that's the first social function that he ever went to after his wife died.

Hendrie: Oh wow, okay.

Bartik: And then Betty and her family had a reception for me at their house.

Hendrie: Oh wonderful. Oh that is really nice.

Bartik: Yeah. They were really wonderful.

Hendrie: That's great.

Bartik: So then Pres' wife, and I mean, she also died tragically. The two of them had a son named John, and then about a couple of years later they had a son named Chris. And she went into postpartum depression and was in a mental institution thereafter, and she came home one weekend for a visitation and she, actually she took the oldest boy, and she overdosed on drugs, and went to bed. And with him in her arms, and they came and found her dead and with that little boy asleep, it was terrible.

Hendrie: Oh no.

Bartik: Yeah, it was terrible.

Hendrie: And the boy died too?

Bartik: No.

Hendrie: No, he did not die.

Bartik: No, but now he had a tragic life because he went to...

Hendrie: Oh, can you imagine having that in your life?

Bartik: He was brilliant. Huh?

Hendrie: Just having known, having been, to grow up knowing that that happened to you.

Bartik: Well it affected both of them I'm sure, but the one, Chris is the one that I know, and I have a picture of him with me, and Bill Mauchly in this thing. Chris is the one that she'd never recovered from, you know? So he always felt I think, well according to one of his friends, he always felt that his father blamed him for her death.

Hendrie: Yes.

Bartik: But any way, Pres was, she was suicidal, so one time my-- I never saw Pres' office by the way.

Hendrie: Really?

Bartik: No, I never was in it. I didn't even know where it was. Well he came to talk to me, I did-- you know, that's the way he worked, he went from group to group, you know?

Hendrie: Yes.

Bartik: And he chose to talk to you, and you did not choose to talk to him. So one day though Art for some reason went into his office, and he came back and he said "You know, I went into his office, and Pres opened this draw and it was full of drugs and stuff." And he explained, he said that Hester was, you know, would overdose on drugs, so he had no drugs in house. Everything that anybody needed, he had in this desk draw in the office. So you know, he was afraid she'd commit suicide, well she did. I mean, after the first child was born he bought her a gold Cadillac convertible, it was beautiful. Yellow I mean, it was really yellow. And Chris, I mean, now this John was brilliant. Well John went to Vietnam, and was wounded. And he got hooked on drugs, you know, during the recuperation, and for the rest of his life he was off and on hooked on drugs and alcohol.

Hendrie: Oh, what a tragedy.

Bartik: And he only died, oh I don't know, maybe it's three or four years ago now. But Chris is, I mean, he's very bright, but he's not Pres bright. And he lives in Atlanta, Georgia, and he's in the computer business.

Hendrie: Now Eckert did not marry one of the ENIAC women, he married somebody else, yeah?

Bartik: No, no. No, he was already married, Pres, when I met him.

Hendrie: When he arrived at...

Bartik: Yeah.

Hendrie: Okay. So he may have gotten married when he first started the project back in '43.

Bartik: Yeah, she was a draftsman, Hester was a draftsman for them.

Hendrie: Okay.

Bartik: Then Pres' second wife, he was a widower for, oh quite a number of years, and then he was always interested in music, and so he was singing in some choir and he met Judith singing in this choir.

Hendrie: Alright, so that's how they met. Good. Are there any other stories about the...?

Bartik: Well the history of the ENIAC is very interesting. I mean Penn wants to claim it for itself, and Aberdeen doesn't want to claim anything. And I found it interesting when Aberdeen did the 50th Anniversary, they never even mentioned Pres and John. Everything they did, the soldiers' salute and everything, for Goldstine. It was all Goldstine and von Neumann. It was unbelievable. The only thing they had Kay and Judith, his second wife, cut the cake. But that was it. And the only thing they had that amounted to anything was they had the ENIAC Women, a seminar on us. I mean, we sat and discussed what we did, and the one said "After it was Aberdeen" as well as...

Hendrie: Yeah.

Bartik: And the rest of it was trash.

Hendrie: <laughs>

Bartik: They brought Gillian's, Colonel Gillian's family from Europe to come. And the keynote speaker was von Neumann's daughter, she's an economist. I mean it was absolutely the worst thing. And I had never seen Goldstine's book before, they gave us Goldstine's book. And that's when I realized he was...

Hendrie: That's when you started to go, yeah.

Bartik: I mean, I couldn't believe.

Hendrie: Go ballistic.

Bartik: He's such a liar.

Hendrie: Wow.

Bartik: I mean, how on earth could you write a book and tell lies like that.

Hendrie: Yeah.

Bartik: It's really horrible.

Hendrie: I don't know.

Bartik: Well I find Princeton Press, I mean I have no respect for them whatsoever, it's ridiculous.

Hendrie: Alright, I'd like to ask you a few sort of general questions maybe too.

Bartik: Well let me tell you one story, which I think is very funny.

Hendrie: Oh, I'm always open for a story. Okay, good.

Bartik: Well Kay and I of course were the main ones that talked, have been, you know, giving speeches around about our experience. Because Ruth died in 1986, Marilyn as I said, married a dentist and wasn't there, and Betty had a stroke in 1991, and Fran came in late, and she has never really been interested. So Kay and I mainly went around. But it was interesting, the women of Microsoft invited us out for several days.

Hendrie: The women of Microsoft, alright.

Bartik: Yeah. Well Bill wasn't in town, so we didn't get to meet him. But anyway, one of the events that we went to, they had for us, they had their women managers at Microsoft. And we were in a big round table, and there were about a dozen of us, so we didn't know each other, and when we went in there we didn't quite know what to say to each other. So we're sitting there and finally one woman piped up and said "What are you women really doing?" And we said "Well what we're trying to do is to set the record straight, because the wrong people have gotten credit for things." Well you should have heard them. <laughs>

Hendrie: Did that set them off?

Bartik: Oh my goodness, they were telling about the stories of who was getting credit and didn't deserve it and <laughs> who didn't get credit they deserved. The whole luncheon. I mean, it was <laughs>. So it's still going on today.

Hendrie: Yeah, it still goes on. <laughs> Oh that's funny, that's really good. That's great. I guess one thing, you know, if you were to give advice to young people that are just sort of starting out on their career, especially women, what would your advice be for them?

Bartik: Well it's interesting for me to-- the Systems Network, I access a Systems Network and get all the postings so I know what the women are saying today. And the thing that I find so interesting is that the women today are still trying to find an even playing field for their daughters. And I do, and of course I always found it very interesting that Lawrence Summers got fired from Harvard for his remarks about saying that women, their intrinsic ability, and blah-blah-blah, like that. I mean, it's pretty horrible that such attitudes still prevail. But you know, the guy at Honeywell said to me "The next generation of women will make it." But the women today are still worried about it, and they tell the stories of the discrimination against women that's unbelievable in this day and age. So the problems of who is responsible for taking care of the children, and all that kind of stuff, I mean, it's still primarily the woman's responsibility. So it was interesting, there's a group called the Grrl-- they just gave me a-- they were just here last week, I

never heard of them before. But these women believe in open source everything. I mean, in the Linux operating system, and they believe that the internet should really make it a flat world. But the thing that they were saying to me was that the internet is English, and so that one of the things that they're trying to do, they speak English on the internet, is to get people to be able to communicate with all these countries of the world who don't speak English. Now for example one of the girls that was here, one of the women that was here, was Portuguese. Now I believe she was telling me that she's trying to provide this service for Ecuador. But anyway the woman that I talked to that arranged this meeting for them to come down and meet me, her husband, when she got married she made sure that it was going to be an equal situation. She was not going to marry anybody that expected her to take care of the kids and be responsible for them completely and stuff. So she does just the opposite. He's the househusband, and she works in New York during the week and only comes on the weekend. Can you believe this? And her husband is studying to, he doesn't like the computer field, and he's studying to be a 5th grade school teacher. It's interesting, isn't it? <laughs>

Hendrie: Hey, if they can work it out that way, well more power to them. <laughs>

Bartik: Yeah.

Hendrie: Exactly.

Bartik: Well I found it amazing, and they said to me "What do you think of open source?" And I said "What do I know about such things," but I said "Sounds like a good idea, but I really don't know anything about it."

Hendrie: Yeah, okay. You know, you had a long career, what would you say was your proudest moment when you think back?

Bartik: I would say it would have to be the day of the introduction of the ENIAC when the trajectory ran, you know, so brilliantly. I mean, it really fulfilled all expectations. I don't think I've ever quite had as thrilling a moment as watching that trajectory run exactly the way it was supposed to in front of all those people, yeah.

Hendrie: Okay.

Bartik: The best job though, and I've called Eckert-Mauchly the Technical Camelot, I have a copy of what I wrote about that. That was by far, and I think it was everybody else that was there, that it was a magical place. I don't think anybody ever had as much satisfaction as they had working for Eckert-Mauchly.

Hendrie: Do you mean at their company?

Bartik: At their company.

Hendrie: At their company when they first started out.

Bartik: Yeah.

Hendrie: Okay.

Bartik: I mean, Pres, I mean, I loved those men. I didn't just like them, I loved them. I mean I would have done anything for either one of them. They were so open. I mean, they were so-- you could ask them any question in the world, and it's funny but as brilliant as they were, they never made me feel stupid. They never made fun of a question you asked, they answered it. They usually saw it as more complex than I'd even thought of, you know?

Hendrie: Then you thought of it when you were asking, yes. Okay.

Bartik: And so they didn't just answer it, I mean, they gave-- they really covered the subject. And my IQ went up when I worked for Pres, I've always said that because he was so focused that you became very focused, and you were the most important person in the world when you were talking to him. It's true. Because he listened to every word. People don't listen. I mean, when you did something for him and reported to him about it, he'd listen to every word.

Hendrie: Yeah, he was really interested in it.

Bartik: I mean <laughs> so when you're taken that seriously, you know, it's a big high.

Hendrie: Yes, it feels really good.

Bartik: And, I mean, you wanted to do everything for him. I mean, both of them, I felt that way about both of them. And they complimented each other so well, because John said that the thing about Pres was he said when he would give him an idea, Pres would say "Well, we can do it if we're careful." And he said "He never pooh-poohed any of his ideas." He's always considered it. And he says that he believed that Pres was the greatest component engineer, you know, of the country at that time, in terms of components.

Hendrie: Wow okay. In terms of taking ideas and realizing them into something that worked.

Bartik: Yeah. Well the way he used components. Because he told me this was interesting. At the 40th Anniversary I sat with Pres, and at that time a UNIVAC had been bought by the IRS, and they were all making mistakes. And I sat with Pres and I said "Pres, how on earth can the UNIVAC be making mistakes?" And he said "Well I'll tell you how." He said when he stopped being chief engineer, where he used to design so that components never had to work more than 50 to 55% of their capacity, and when

the next chief engineer upped it to 80 to 85%, so when a component doesn't work up to par, that the point is when you have more than one that doesn't work up to par, then you very quickly cause problems.

Hendrie: Yes, exactly.

Bartik: Well he certainly, I mean, there was somebody like that could never have gotten the ENIAC to work, that's for sure.

Hendrie: Wow. Alright. Very good. Let me-- we've got to stop for a second.

Hendrie: Are there any things, you know, that you thinking about what we've been talking about that you think we glossed over and you want to roll back and tell me about?

Bartik: Well, the one thing I want to tell you. Why was I very successful and Betty very successful? And we were very successful in a man's world. Why were we so successful? Well, I think, it's because we were great finishers. Betty was the best finisher I have ever seen in my life. You know how most people like to do the fun part of a job. But then, for all these nasty little details, they don't like to do them. Engineers are the same. Well, Betty and I were great finishers. And when she finished a job, she had thought of everything, absolutely everything, and it was ready to go. That's why Pres and John gave her the console to develop. I mean, she was the final arbiter of the instruction set. And she told this story, which I love to tell about Johnny von Neumann. One time she was at a meeting where Johnny von Neumann was enunciating his perfect instruction set. So he was telling, you know, what it should be. And Betty piped up and said, "You forgot one." So he, sort of, amused and, sort of, tolerantly asked her, "And just what would that be?" And she said, "The stop instruction." And he said, "You're right."

But in fact, Grace Hopper called her the greatest programmer she ever met. Now, when Betty was told, she laughed, because she said, "Well, you know Grace. That if you can do anything better than she can, you have to be the best in the world." And so Grace had said this, because Grace had a compiler that was making errors, and she couldn't find what the error was. So she asked to borrow Betty from the Bureau of Standards, which was where Betty was at that time, if she could borrow her to find this error. And Betty found it in three days. And what had happened was that when you wrote on the mag tape, every time you wrote on it, you had to put the labels on again. Because the tape was about 1200, 1500 feet long. So when you wrote on it, again, even though it was the same amount of data, you might come up with a slightly different place. So you might have garbage in between that and the label or it might be slightly over the label. So that's what Grace had done. She hadn't rewritten the label. Now, she was primarily responsible for the FORTRAN compiler, for the FORTRAN language to standardize it. Because when the committee had left and said that "Here's the standard," well, Betty saw it, and she couldn't even program with it. So she had a manager in Washington who believed in her enough. So she called the committee back and they worked and made it to standard. And she was the one that developed the test routines to test to make sure that it complied with the standard. And she was on the COBOL committee. And, you know, she was always on these things. She was supposedly just the recorder, but she was the one that kept them honest is what people have said to me all the time.

Hendrie: Is that right?

Bartik: Yeah, and I mean, they sent her on trouble shooting all the time. I mean, they sent her to NATO to Italy, and she told about that time she was there to find out what was wrong. And they had the windows open and the cars were in the street honking. And the fumes and stuff were coming up. That certainly wasn't any good for tape drives. So their problem was that their environment wasn't clean. But yeah, so we were finishers. When they gave us a job, they could depend on the fact that we would finish it. We didn't just do the fun part. We did the nitty-gritty things...

Hendrie: Did all of it.

Bartik: Yeah.

Hendrie: Good.

Bartik: So I believe that was, you know, the main reason that we were given jobs.

Hendrie: Okay. That's very good. I'm glad you brought that one up. What would you say were the most important lessons that you learned during your career?

Bartik: Well, I think you should do what you love. I think that because it's not work, really, it's not that much work when you do what you like to do. But when you're doing what you don't like to do, it's really drudgery. So I believe that for temporarily, you can do what you really don't like to do. But I think that as your career that you really should move on if you don't enjoy doing it. Because life's too short not to enjoy what you're doing.

Hendrie: Good.

Bartik: The other one, of course, is luck beats brains. I told you that before.

Hendrie: All right. Well, I want to thank you so much for taking the time to do this oral history interview for the Computer History Museum. Thank you very much.

Bartik: Well, I thank you for asking me.

Hendrie: All right.

Bartik: I'm flattered.

END OF INTERVIEW

