

## Computing Educators Oral History Project

# An Interview with *Ellen Spertus*

Conducted Thursday, 23 October 2008

At Mountain View, California USA

Interview conducted by Vicki L. Almstrum

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*Ellen Spertus, an oral history conducted in 2008 by Vicki L. Almstrum, Computing Educators Oral History Project. Online: [ceohp.org](http://ceohp.org).*

Context: The interview was conducted during the morning in a conference room at one of the campuses of Google Research in Mountain View, CA. Toward the end of the interview, the next group that had reserved the conference room arrived and indicated their interest in taking over the room as soon as possible.

- 1 **Vicki Almstrum:** This is an interview with Ellen Spertus from Mills College and Google  
2 conducted by Vicki Almstrum. This interview is being recorded on October 23<sup>rd</sup>, 2008 in  
3 Mountain View, California. It is part of the Computing Educators Oral History Project.  
4 **Did we give and pronounce your name correctly?**  
5  
6 Ellen Spertus: Yes.  
7  
8 **V:** Good. I am so pleased to get together with you here this morning, Ellen, and I'd like to  
9 start in the far distant past. Let's begin by talking about your parents. Can you tell me  
10 a little bit about their education, their work life, and so forth?  
11  
12 E: Sure. My father went to MIT. He graduated in 1956. His major was business with  
13 engineering and he was basically pre-DB ... pre-Daddy's Business. The family business was

14 picture frame manufacturing. The company was Intercraft. It was founded by my grandfather  
15 and his brother after they came over from Russia. They lived the American dream. They  
16 came over, started by working in factories, learning English at night school, and ended up  
17 owning factories and becoming philanthropists. My father became president of the company  
18 and ... I certainly wasn't diminishing his contribution by saying going into the family  
19 business. It grew a lot under him. It became a Fortune 1000 company. The business has been  
20 sold. He was a businessman, but he loved computers and he discovered them after he  
21 graduated from MIT and regretted never being involved with computers when he was there.  
22 Even though he was an executive, he'd bring terminals home and he'd write programs in the  
23 evening. I got started then programming from him. When I was admitted to MIT and decided  
24 to study computer science, he was ... well, he called it one of the happiest days of his life.

25  
26 My mother was a housewife. She got a bachelor's degree from University of Iowa, I think in  
27 geography. When she was graduating in 1957, she became a school teacher in Iowa and she  
28 hated it. She, I don't think, was interested in having a career. She was going to get married  
29 and didn't like teaching, especially somewhere so rural where there weren't any other Jews.  
30 She left there, moved to Chicago, I think did some graduate work and she met my father.  
31 They were married and she never worked outside of the house after that. Well, that's not true.  
32 Much later she did some work in real estate. But while I was growing up she didn't work  
33 outside of the home.

34  
35 **V: And so where was it that you grew up?**

36  
37 E: I grew up in Glencoe, Illinois, which is a north suburb of Chicago. It's an upper middle class  
38 suburb, a nice place to grow up, very good schools.

39  
40 **V: And that's where your father had come from, started his business, or the family**  
41 **business, had started there?**

42  
43 E: Yes, the business was located in Chicago, but my father also grew up on the north shore of  
44 Chicago. My mother grew up in Rock Island, Illinois, which was near Moline and Davenport  
45 on the Illinois-Iowa boundary, and she was happy to get out of there and to live in a more  
46 cultured place and to have married up in terms of wealth and status.

47  
48 **V: OK. Can you tell us a little about the community you grew up in and the schools you**  
49 **went to in pre-college?**

50  
51 E: Sure. As I said, I grew up in Glencoe and that was a prosperous suburb of about ten-thousand  
52 people and maybe half Jewish. My family is Jewish and we grew up in a large house near the  
53 beach, near the train station, my father commuted into the city. I went to public school  
54 through sixth grade. I don't remember this, but my mother said that in sixth grade, I went to  
55 the principal and said that I wasn't learning anything, that I knew all that they were teaching  
56 and that he couldn't disagree with that. But what I remember was that the reason I left the  
57 public school was social. I was very unpopular. I remember as early as kindergarten,  
58 everybody invited to a birthday party except for me and the retarded boy. Starting in seventh  
59 grade, I spent seventh and eighth grade in a private school, North Shore Country Day School

60 in Winnetka, and that was academically better. I could work ahead in math. In seventh grade,  
61 I started taking algebra with the eighth graders, but that was so easy for me that I switched up  
62 to more advanced math in the high school, which also didn't endear me with people. The  
63 eighth grader who was worst to me, named Lorna Mellis, and years later my sister Debbie  
64 married her brother. So she became my sister's sister-in-law. I found out that her brother, my  
65 brother-in-law, had skipped ahead in math and was beaten up for it by the boys. So I guess as  
66 a girl I was better off because there wasn't physical violence. But it's kind of funny that she  
67 disliked me for doing the same thing that her brother did!

68  
69 By eighth grade, I was having some social problems again. In ninth grade I switched back to  
70 public for high school. I went to one of the top public high schools in the country, New Trier  
71 High School in Winnetka. It was an excellent school with a level system, where most classes  
72 were offered the second, third, and fourth level, so fourth level would be honors. So I took ...  
73 all my classes were four-level classes until I got to AP, which was five level. There were  
74 complicated formulas for how an A in one compared to a B in another for computing GPA.  
75 So I was basically with the top students and the teachers were excellent, the material was  
76 challenging. I was active with math club. Back then we usually won the state math meet.  
77 After I went through, Illinois started a special school, I think an overnight magnet school for  
78 the sciences, and that might have been a good place for me, but New Trier was pretty good,  
79 too. I got a good education there and made friends with people through math club and bridge  
80 club and also ... those were boys ... and also through homeroom and some of my other  
81 classes.

82 [8:49]

83 **V: This was sort of the first time you had a real cohort is what it sounds like ... that when**  
84 **you reached that point, there was a better social network that you were able to become**  
85 **part of?**

86  
87 E: Yeah. I think there were about a thousand students in my year. It was a big school, although I  
88 think it felt smaller because I was just with the top students. I was something like 22nd in the  
89 class, so I wasn't the top student, there were ones that got better grades than I did. I mean, I  
90 still got very good grades, but I still had the occasional B.

91  
92 I'm the third child in my family. My big brother, Michael, who is six and a half years older  
93 than me, was a math star and well known locally for that. My big sister, Debbie, was a year  
94 younger than him and wasn't distinguished academically, which was hard for her because she  
95 was known as Mike's sister. But it worked to my advantage because teachers who knew him  
96 expected a lot from me. In one case, I don't know if it was a substitute teacher, regular  
97 teacher, gave me harder math work just knowing my brother. I never encountered the idea  
98 that I shouldn't be good at math because I was a girl, instead I should be good at math  
99 because I'm a Spertus. My family does have a kind of high opinion of itself, high  
100 expectations. My ... as I mentioned about the family patriarchs, back in Russia there were  
101 quotas against Jews to get into college, but my grandfather and his brother got in anyway.  
102 The idea is you're just really good.

103  
104 **V: Interesting. And so those two had emigrated, is that right?**

105

106 E: Yes.

107

108 **V: So they had finished school and were adults when they came to the United States?**

109

110 E: Right, they immigrated, they left the country illegally when they were in their early twenties  
111 to avoid the army ...

112

113 **V: That makes sense.**

114

115 E: ... and joined their parents and their sisters who had already immigrated to the United States.

116

117 **V: OK. So, which courses, while you were in pre-college and high school, were your**  
118 **favorites?**

119

120 E: I liked the math classes. I found geometry hard. I found that some people are good at algebra  
121 but find geometry hard and some people are the other way around. Algebra ... as I told you, I  
122 basically skipped algebra because it was all so easy. We ... my mother hired a tutor to fill me  
123 in on the things in algebra. The geometry was hard, although I wouldn't say I disliked it. We  
124 had some very good English courses. I also enjoy reading good literature and discussing it  
125 and thinking about it. Math courses. Science courses. I didn't like biology but I liked  
126 chemistry and physics and AP physics. I kind of liked French and was good at it. I had  
127 teachers of varying quality. I'd say the only thing I really disliked was PE. I could take some  
128 elective classes; some that I particularly remember having enjoyed were photography and  
129 film making. I did not take any computer classes, I was self-taught on computers. My brother  
130 and father would get me started, but I didn't take any computer classes and I don't think there  
131 was a computer club. I did teach some boys to program, because we'd be in like fifth and  
132 sixth grade. I had them over and taught them how to program.

133

134 **V: So what language was that?**

135

136 E: That would have been BASIC. Yeah, I'm pretty sure it was just BASIC, but from the time  
137 period it could have been Pascal, but I think BASIC. In high school I tutored some children  
138 in math and computers. I remember teaching LOGO to a little boy, he was like six or seven.  
139 He'd say something like "Forward 10" and I'd walk forward or turn right. I think it's a kick  
140 for a kid to have a grown-up or a teenager following his instructions, and of course doing it  
141 on the computer, and teaching BASIC to his older brother, who I think had tried doing a little  
142 on his own. You know how kids, or sometime grown-ups, don't know how to pronounce  
143 things that they read, so he referred to a "stink axe error" for a "syntax error".

144

145 There was one other place I had a cohort: I went to computer camp the summers when I was,  
146 I think, 12 and 13. It was pretty new then, but there were other kids who liked to program. I  
147 was in the top group there, but I certainly had peers.

148 [15:05]

149 **V: Very good. So you've talked about being in a lot of different clubs through the school.**

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151 E: Well, just math club and bridge club.

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**V: OK. And those were a key part of your social network. Were there any other outside activities that you became a part of?**

E: I had some jobs. I worked at the library in junior high school and I babysat in high school. And I did some volunteer work in high school, but I don't think those were big things.

**V: Did you have any teachers who were particularly ... or counselors or other people during your pre-college years ... who were particularly influential in the direction you ended up going?**

E: I don't think so. I think it was pretty clear from an early age that I was going in math and computers. I did go to a math summer program, a well-known one, the one at Ohio State, in number theory, run by Professor Arnold Ross, who I think is no longer with us, I'm not sure. Until then I didn't know if I wanted to be a mathematician or a computer scientist, and after that program I decided I didn't want to be a mathematician, that was too much math for me. It was math all day and all night. And I wasn't quite that into it. But for computers, sure, that would have been fine. But I did get a good background in math and ... rigorous ... know how to do a rigorous proof, knew how to before college.

[16:57]

**V: You've talked a little bit about your siblings. So Michael and Debbie are the two older ones. Do you want to talk about the rest of them? You have some younger ones as well?**

E: One younger sister. Right. My brother Michael took after my father and my sister Debbie took after my mother and was groomed to be a housewife. My little sister, Andrea, who was three years younger than me, wasn't that clear. I think younger children sometimes have a little more freedom and she has been doing web design for a number of years. My big sister is an artist. It's a skill that my parents didn't really appreciate. My younger sister's more in-between, that she has both aesthetics and technical ability. Neither as intensely as the rest of us. Deb may be more balanced intellectually.

**V: So you've talked a lot about the attitude your parents had toward education, that it was sort of a given. So I would be curious to hear just a little more about that and also your feeling about whether you had the same opportunities, the same educational training, had the same aspirations across your array of siblings.**

E: Right. Well, education was greatly valued, strong Jewish value that my parents shared. Certainly they had the highest respect for professors, even though they don't earn a lot of money. That is something that is valued. There was certainly the same educational expectations for me as for my brother. I think there may have been less for my big sister, who was expected not to need a career and wasn't as intellectual. But even she got a master's degree. As I said, my father was delighted when I went to MIT. I think my mother didn't know quite what to make of an engineer daughter and when I came home from MIT freshman year with the freshman picture book that had pictures of all the students and their names, my mom looked through it and said, "Some of these girls are pretty!" So she didn't expect that for women from an engineering school. I think she was more of the "don't show

198 boys that you are too smart or they might not like you” school. But, of course, worrying that  
199 your computer scientist daughter won’t be able to find a husband is about the stupidest worry  
200 you could have with the male-female ratio in that field. I never had problems finding  
201 boyfriends from the math and computer community.

202 [20:37]

203 **V: Interesting. So what I’d like to do now is shift ...**

204

205 E: I have one more story. I grew up with my brother being the intellectual giant of the  
206 household and I was second to him. But I’m the only one of the four to complete a Ph.D. My  
207 brother is ABD [all-but-dissertation] in math. My sisters have master’s degrees, which are  
208 also known as Jewish dropouts. So my brother is very successful, but he also really respects  
209 me for completing the Ph.D.

210

211 **V: Very cool. So it sounds like there may have been friendly competition and definitely**  
212 **some support among you.**

213

214 E: Well, there wasn’t competition. It was just so clear my brother was the stronger one, so it was  
215 ... it’s surprising how it turned out, that I am the one who got further academically.

216

217 **V: The transition I was getting ready to make now is starting to think about your decision**  
218 **to go to MIT and beginning to do your studies. You started a little bit on some of those**  
219 **aspects. So, how did you decide?**

220

221 E: My brother gave me a lot of the culture, of the hacker culture, and would tell me about MIT  
222 hacks, the pranks the students did. I remember he also told me about Seymour Cray and the  
223 things he did, so I’d been exposed to the mystique of MIT and, of course, I knew that’s  
224 where my father went. I visited a number of schools when I was a senior; this would be, let’s  
225 see, I think I had already applied to schools. I applied to Yale, MIT, Stanford, maybe  
226 University of Chicago, which is where my brother went, Berkeley and Illinois were my  
227 safety schools, maybe there was one more. I went and visited schools with my dad. When I  
228 visited Yale I went around and took notes on how many books were in the library and stuff  
229 like that.

230

231 But when I went to MIT it was just clear that’s where I belonged. That people there looked  
232 like my type of people, that was where I would fit in. We sat in on classes. I sat in on one  
233 class by Jerry Sussman, a computer science educator, deservedly well known, his Scheme  
234 course. It was just clear that MIT was the place for me. When we met with the admissions  
235 office, it was just before they were going to send out the early admission notifications and  
236 they made an exception in our case and told me that I’d gotten in and I was delighted. And,  
237 as I said, my father called it one of the happiest days of his life. So I was the first person  
238 admitted to the class of 1990. I cancelled my upcoming visit to Tufts and withdrew all of my  
239 applications, except the one to Stanford. I was wait-listed at Stanford and told them to drop  
240 me from the wait list. But with the MIT early notification, you don’t need to decide until  
241 regular time. But I think I had pretty much decided.

242

243 **V: So you got to pack things up and move from Chicago to Boston. And so tell us about**  
244 **getting started.**

245 [25:09]

246 E: Well, I knew I wanted to major in computer science and started taking computer science my  
247 first semester, the MIT Scheme course. There's some professors who'd advise you not to  
248 take that right away, but I did and I loved it. I did well in it. Something like the majority, I  
249 don't know if it's a majority, but a large percentage of MIT students were valedictorians and,  
250 as I told you, I wasn't. And I've heard ... this is probably apocryphal ... that they surveyed  
251 MIT students and asked if they expected to be in the top half of their class and 98% said they  
252 did. I thought I'd be about average at MIT and instead I was one of the top students.  
253 Freshman year was pass/no-record to help people get used to a more challenging  
254 environment. But I did fine freshman year taking computer science, calculus, and physics and  
255 those other classes. But I really enjoyed the computer science courses, the required EE  
256 courses not so much. Yeah. Just was a computer science major, no switching majors or  
257 doubts about that.

258 [26:50]

259 **V: So you had a pretty straight trajectory knowing that was the direction you were going.**

260

261 E: Right.

262

263 **V: So, you took the Scheme class and continued with computer science classes. Which ones**  
264 **were the ones that resonated best with you during your undergraduate years?**

265

266 E: The Scheme course six-double-oh-one (6001), Structure, and six-double-oh-four (6004),  
267 Interpretation of Computer Programs. Then Steve Ward's architecture class, six-double-oh-  
268 four. I'd been programming computers for a long time by then, including assembly language,  
269 but I didn't know what happened below that. And in six-double-oh-four (6004) we built a  
270 computer, digital electronics – and-gates, or-gates, ALUs [arithmetic logic units] – and I got  
271 to understand all the way down how computers worked and that was very exciting.

272

273 The other class that stood out was Compilers, which I took from Barbara Liskov and John  
274 Gutetack. I did most of my programming in high-level languages, so to learn how got  
275 translated into machine language. So between that and the architecture class I learned how  
276 things worked all the way from C or whatever programming language you used down to the  
277 hardware. So those were the most exciting.

278

279 **V: OK, And you did some research as an undergraduate. You did a thesis ... was**  
280 **compiling data flow programs to the MIT J machine ... and you also had a publication**  
281 **that is well known, a term paper that you expanded to a technical report “Why are**  
282 **there so few women in computer science?” Two interesting contrasts, so we would be**  
283 **interested to hear about the research, the paper on women, and sort of how that fit with**  
284 **your time as an undergraduate.**

285

286 E: OK. Well, I started doing computer science research through the UROP, Undergraduate  
287 Research Opportunities Program. I joined Bill Dally's computer architecture group,  
288 architecture and compilers were interesting to me. When I was in junior high school I tried

289 writing a compiler because I knew assembler language and I knew BASIC. But I didn't get  
290 very far. So joining this computer architecture group was great. The team was building a  
291 massively parallel computer, which had its own processor instruction set. The project Bill  
292 Dally gave me was to write a compiler so programs written in the data-flow model could run  
293 on the J machine, part of his research idea was that he was building a general-purpose  
294 parallel computer that many different parallel paradigms could be implemented on. Even  
295 though I was an undergraduate he met with me regularly.

296  
297 Certainly everyone treated me very well at MIT. I never had someone ... my advisor, Arvin,  
298 never discouraged me from taking challenging classes. In fact, he suggested I try to place out  
299 of a certain class and Bill Dally's expectations were always high for me. So I did that work. I  
300 don't remember now if it was for pay or credit. Thanks to my family I didn't have to worry  
301 about money going through school.

302  
303 We were required to do a bachelor's thesis at MIT. I would have wanted to anyway. I did my  
304 bachelor's thesis on data-flow computing on the J machine and enjoyed that and presented  
305 the work at a second tier conference. But it was still cool to get that publication, I think it was  
306 a short paper at ICPP, International Conference on Parallel Processing ... Parallel  
307 Programming. Then that moves on to graduate school, because I stayed in that group.

308 [31.52]

309 Now, as for the other work, we were required to eight humanities courses in order to graduate  
310 and we all complained about that ... that students at other colleges didn't have to take eight  
311 technical courses to graduate. We said humanities for humanities, arts, social sciences, so  
312 basically you had to take one of these a semester and it didn't really matter very much which  
313 one you took. You know: What does it matter if you took English literature or psychology?  
314 Second semester senior year I took Sherry Turkle's class Women in Computers, because I  
315 did still wonder how come there weren't more women in computer science. I kept hoping as I  
316 went through school that I would meet more women like me, but at computer camp I was the  
317 only girl in the top class and I was the strongest girl in math at my high school. I didn't make  
318 any ... I don't think I made any female friends as an undergraduate at MIT. So I was  
319 interested in this question and I'd started thinking about it a little because when I was a junior  
320 and started doing work at Technology Square, a graduate student I was acquainted with,  
321 Sharon Perl, gave me the MIT "Barriers to Equality" report, which was the first thing that got  
322 me to see that women were treated differently and that their lesser success didn't mean lesser  
323 ability. But I took the course because I had to take another humanities course. And at the  
324 beginning, Sherry Turkle told us we'd have to write a 25-page term paper. I asked, "How are  
325 we going to do that?" I had never written a paper that long. I was very interested in the topic  
326 and I found lots of things to read and I solicited stories on the Systers email list, which I may  
327 have joined in my junior year. I ended up writing 100 pages, which I revised and made into a  
328 MIT AI Lab technical report. That got way more attention than I expected and opened a lot  
329 of opportunities to me.

330 [34:46]

331 **V: Yes, so that's how you came to my attention first. I participated as giving input via**  
332 **Systers to that report.**

333

334 E: Ah! I knew I worked with you after that. I didn't remember you were one of my informants. I  
335 got a lot of useful information and feedback. I remember in a draft that I circulated, or maybe  
336 in some comments, I said ... I suggested that maybe women had it easier in admissions or  
337 that if you had programs that favored women, that that caused people to doubt their  
338 qualifications. And Nancy Leveson said, "No, it is not easier for women to get things.  
339 Women have to work twice as hard to get half the recognition." And Barbara Liskov said,  
340 "Well, it used to be harder for women than men to get into MIT and we still weren't treated  
341 with respect." So I got a lot of useful feedback from senior women who took the time to do  
342 that.

343  
344 So senior year I was also looking at graduate schools. There was no question in my mind that  
345 I'd go on. And I applied to Stanford, Berkeley, CMU, and MIT. I also applied for an NSF  
346 fellowship and I got all of those. I got into all of the schools. It was kind of nice getting into  
347 Stanford for grad school, which I think is supposed to be more competitive, when I didn't get  
348 in as an undergrad. And I got the NSF fellowship and I visited all the schools, in some cases  
349 staying with or talking with women I met through Sisters. I was favorably impressed by  
350 Carnegie Mellon on my visit. The students there seemed to be happy. I was not as impressed  
351 at Berkeley. They had the first year computer science students in this basement with a bunch  
352 of terminals. Perhaps I shouldn't have given that much weight, but that gave me a negative  
353 impression. Stanford was very attractive. I met with Monica Lamb and John Hennessy and, I  
354 think, Anoop Gupta (does that sound right?). I remember getting emotional when I was there,  
355 realizing I might be leaving MIT and what I was used to ... and that was a scary idea. I  
356 decided to stay at MIT where I had a group, a research group, that I was part of and where I  
357 enjoyed what I was working on and where my friends were. At most schools they encouraged  
358 their students to go elsewhere to graduate school, or they even require it, they don't accept  
359 their own students. But MIT isn't like that. Maybe a third of the incoming Ph.D. class was  
360 MIT students. In any case, I stayed at MIT and I continued working with Bill Dally for my  
361 master's thesis, which was also on compiling for the J machine. And I got some publications  
362 at stronger conferences, well, at top-tier conferences, and worked with people ... worked  
363 with a team at Berkeley, at implementing their programming model, threaded abstract  
364 machine on the J machine, and evaluating that.

365  
366 I also ... let's see, I guess it was after completing my master's degree, the semester after that  
367 that I TA'd for the first and only time, because I had the NSF fellowship and then research  
368 assistantships, I wasn't required ... there was no push to teach, but I TA'd the Scheme  
369 course. I really enjoyed that. I was one of the TA's for Lynne Andrea Stein, a young  
370 professor, so the lectures were done by Eric Grimson and Hal Abelson. Lynne did recitations  
371 and as TA I attended those recitations and I ran tutorial sections, one hour sessions for three  
372 students each at the start of the term and by the end it was more like two students each. I  
373 really enjoyed that. It was a lot of work and I dropped one of the classes I was taking, but I  
374 enjoyed that.

375 [40:16]

376 **V: So that was the primary teaching experience you had during your time at MIT, then?**

377  
378 E: It was the primary experience. There wasn't a graduate compilers class and I was still very  
379 interested in compilers, so I arranged for a graduate compiler seminar, which I led, and I

380 worked with professors to come up with the reading list and different graduate students  
381 presented the papers and we discussed them. But the only classroom teaching was six-  
382 double-oh-one (6001).  
383

384 **V: And so it sounds like there was a distinctness between the time you were working on**  
385 **your master's degree and then beginning to work on your Ph.D., but were they**  
386 **somehow related? Was the intention to go directly from master's into Ph.D. from the**  
387 **beginning?**  
388

389 E: Yes, at first I thought I'd keep working with Bill Dally on the J machine, which is now in the  
390 Computer History Museum. But I still had coursework that I was doing and I spent ... I went  
391 for the summer to work at Microsoft. I had been an intern there several times as an  
392 undergraduate. But part of my reason for going out there was personal reasons, relationship  
393 with someone who was working, former MIT student who was working at Microsoft and I  
394 decided that I wanted to continue to pursue that relationship and stay out in Seattle. I spoke  
395 with my advisor, Bill Weihl, who advised me to at least come back to MIT to finish my  
396 coursework before going in absentia. Surprisingly, I followed that sensible advice. I came  
397 back for a semester and finished my coursework. Then the plan was to do my thesis at  
398 Microsoft Research, and Bill reluctantly agreed to that. He didn't think that was the best idea,  
399 but he went along with it. Part of my justification was that nobody was doing compilers at  
400 MIT and I would be in a compiler research group at Microsoft.  
401

402 So I had a thesis topic involving register allocation and instruction scheduling. After a little  
403 over a year, I discovered that someone else had already done what I was doing, one of Mary  
404 Lou Soffa's students, who ... I have since met Mary Lou several times. That was devastating  
405 to me, that I'd have to start over with a new thesis topic. So MIT professors were very  
406 supportive. I remember talking with Jerry Sussman, who was trying to advise me on ways I  
407 could change the direction of the work I'd already done, maybe to operations research, to get  
408 a thesis out of it. I wanted to stay out in Seattle, but Bill didn't think that the failure ... I  
409 indicated that you really need to work with people who know the area better, and he would  
410 have been happy to advise me at MIT, but he didn't want to advise me in absentia.  
411

412 I didn't really want to work on compilers any more at that point, partly because of that bad  
413 experience, partly because I was growing fascinated with the Internet, which was rising; this  
414 was about 1995. I don't remember the exact sequence of how things happened, but Lynne  
415 Stein, whom I TA'd for and who also had helped me make my report on women into an AI  
416 Lab technical report (you need faculty approvers) ... she agreed to be my advisor and I  
417 became a visiting scholar at University of Washington, working with Oren Etzioni. I don't  
418 remember if he was an official or unofficial committee member. But I spent two years there,  
419 doing my thesis in absentia, which was on Internet information retrieval. That's where I met  
420 Keith Golden, who is my husband now. Of course, at the time having to start over with a new  
421 thesis topic seemed like the worst thing in the world. But I switched into an area I liked  
422 better; I met the love of my life – we've been married for more than 10 years now. So I came  
423 on the job market at the right time to get my dream job at Mills. So I try to be more  
424 philosophical about things that don't go as I expect, although it's always harder to at the time  
425 than in hindsight when you know that there was a good outcome.

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**V: What a path! Very interesting.**

E: Well, I think most people's paths are twisty. Mine had just been straight for so long, through MIT bachelor's, master's.

[47:05]

**V: So, it sounds like you had a wonderful support structure among the faculty that you encountered. Are there any particularly significant relationships, any particularly significant events during your entire time of working on your degrees that you'd like to share?**

E: Well, the people I've mentioned ... Arvind, my undergraduate academic advisor, who was always encouraging and helpful to me. I remember he came to my undergraduate thesis presentation. That data-flow was his model, but still, there's no reason he had to. It's nice of a professor to take an interest in an undergraduate's work.

And Bill Dally, of course, hiring me as an undergraduate then a graduate student, bringing me into his research group and spending his time and resources on me.

Lynne Stein, who helped me out and was a very good advisor and was so modest that she didn't even like to put her name on her students' papers, even though that's standard practice. She certainly contributed ideas.

Bill Weihl, my graduate advisor, gave me good advice. He's at Google now. Bill Dally's at Stanford. Lynne, who spent time with her family, who had three children, which you just don't do before tenure, and to teaching very seriously, didn't get tenure and left MIT and is now very happy at Olin (a new, innovative institution).

I saw a lot of professors, junior faculty at MIT, be very stressed out trying to get tenure and Lynne was never that way and when she didn't get tenure she didn't view it as the end of the world. Her idea with accepting the position at MIT was that that would be an interesting job and she would do what she thought was valuable and she'd get tenure or not, but she wouldn't regret anything. I certainly admire that attitude, but there were other faculty, junior faculty, who would be miserable and get divorced and then still maybe they didn't get tenure. Seeing what people went through at MIT and who did and didn't get tenure. Another wonderful person who didn't get tenure, Tom Knight, who was on my thesis committee ... wonderful teacher... brilliant ... generous with his time ... not so good at reading documents when he was supposed to and getting them back ... but he didn't get tenure.

I was invited to give some talks because of my paper about women and computing. One was at Smith College, Joe O'Rourke invited me there. It was my first time seeing a liberal arts college. That the classes were small; that the students interacted with the faculty; I saw them chatting with Joe. It was a women's college and it was somewhere where teaching was really valued. And people also did research. And that got me thinking that maybe a liberal arts college would be a better place to be a faculty member.

472 Should I talk about my job search?

473

474 **V: Yes, I think that's a perfect transition.**

475

476 E: OK. I decided I wanted to be a professor ... or work at a research lab. At this time, when I  
477 started my job search, Keith and I were close to being engaged and got engaged in December  
478 of that year, so it was a two-body job search. I applied to a lot of places because of that and  
479 also because I didn't know what type of job I wanted, whether to be at a research university,  
480 a liberal arts college, or research lab. Of course, if I could do things differently, I would have  
481 included Internet start up, especially because my thesis was on Internet information retrieval.  
482 But I didn't. I applied to over a hundred places. This was '97, so computer science  
483 departments were growing and professors were leaving for start-ups. Nowadays you'd be  
484 have trouble finding that many positions to apply for. Keith applied to fewer places. He was  
485 interested in research labs, but there were AT&T Labs, Bell Labs, NASA, other labs or start-  
486 ups in the Bay Area. Actually, no, he applied to research universities, too. We both got  
487 interviews at University of Waterloo, Waterloo University in Canada. We may have both  
488 gotten invited to interview at University of Chicago. I got invited to interview at a lot of  
489 places, and one of my top places was Mills College because it was a liberal arts college, it  
490 was a women's school. I wouldn't have to worry about discrimination or that if I had a child,  
491 that I couldn't get tenure. The location, the Bay Area, there's a lot of computer science jobs.  
492 And I did get an offer from Mills (I wrote a lot of this up in a web page about doing a  
493 massive two-body job search). I got an offer from Mills. My biggest problem with them was  
494 convincing them that I was really serious. They thought that someone with a strong research  
495 track record from MIT wouldn't want to be at a liberal arts college, that I was just using it as  
496 a back-up position. So I really went out of my way to convince them that I was serious. So  
497 when I got that offer, Keith hadn't yet started his Bay Area interviews. I think I got a two-  
498 week deadline, which I extended to a third week, and when Keith got a written offer from  
499 Intertrust and an oral offer from NASA, which was one of his top choices, I accepted the  
500 Mills offer. And Keith got and accepted an offer from NASA Ames at Moffet Field in  
501 Mountain View. So we couldn't have been happier about how our job search ended up. He  
502 graduated first and moved to San Francisco and started working and I then moved to San  
503 Francisco, started at Mills in January of '98.

504 [55:36]

505 **V: And so you've talked a lot about the reasons you wanted to go to Mills. What was your**  
506 **course load like as you started and were you able to continue with your research once**  
507 **you had arrived?**

508

509 E: Those are good questions. The Mills teaching load was 2/3 and I didn't really think about  
510 what that would be like. My first semester I taught two courses: operating systems, and  
511 digital logic and machine organization. That semester was the hardest semester of my life,  
512 including being an undergraduate at MIT. Teaching was harder than I expected. MIT decided  
513 to stop using the lab kits that I had used in the computer architecture class. I got them to  
514 donate 20 of them to Mills, so I used those in my digital logic class. But both classes I was  
515 making up as I went along. I was also planning Keith's and my wedding, which would be in  
516 June. That was a large wedding. I think we had about a hundred seventy-five people ... but  
517 that was absolutely nothing compared to teaching. Planning ten weddings wouldn't have

518 been as much as one class. That was challenging, but I knew I had a three-year contract, a  
519 tenure-track position. How I did that semester wouldn't ... I wasn't in danger of losing my  
520 job.

521  
522 I got some good advice from Judy Goldsmith: "Your first year your job is just to survive. If  
523 the students learn anything that's great. That's a bonus." The students were glad to see me.  
524 They'd had a bunch of adjuncts. They were glad to have a tenure track teacher, even if they  
525 wouldn't be the ones to benefit. I didn't do that good a job teaching at first. I hadn't taught  
526 classes, but my colleagues were encouraging. My second semester I co-taught with my  
527 colleague, Steve Givant. He didn't get any teaching credit for that. He did that just to help me  
528 become a better teacher. My colleagues were committed to helping me and wanted me to  
529 succeed. And tried not to give me too many different classes so I could develop my classes.

530  
531 I looked all over for where I could get course releases from. And I got a course release for  
532 participating in a multicultural education seminar at Mills. My first summer I applied for an  
533 NSF CAREER grant, which I got. that let me reduce my course load to 2/2, which was  
534 manageable, especially after I was teaching classes repeatedly. It was hard to do research,  
535 though. My first publications were ones based on my thesis. The Mills program ... we had  
536 undergraduates and we had a unique set of graduate programs aimed at people with  
537 bachelor's degrees in fields other than computer science. One program was a master of arts in  
538 interdisciplinary computer science. So someone would come in with, say, a degree in  
539 psychology and they'd take computer science classes and do an interdisciplinary thesis and  
540 get a master's degree. We also had a re-entry program, where people would also take  
541 computer science courses, but then apply to go to Ph.D. programs in computer science.  
542 Sheila Humphries and I wrote a paper about re-entry programs. She was heavily involved  
543 with the now defunct re-entry program at UC Berkeley that Barbara Simons and Paula  
544 Hawthorne, I think, started. Our program was started by Lenore Blum, who is now at  
545 Carnegie Mellon. So the students didn't have a background in computer science.

546  
547 With the undergraduates I was never able to successfully get them to contributing to  
548 research. The one time I tried training a group of them with funding from CRA-W. By the  
549 time I trained them, they were all too busy with their other courses. The graduate students ...  
550 they really chose their thesis topics, which was fine, and did their own work, so I was  
551 basically on my own. I decided to ... my original CAREER proposal was to continue work  
552 based on my Ph.D. But I ended up not that motivated to do that and instead helped design  
553 and implemented the new software for Systers. I did that with the Institute for Women and  
554 Technology, now the Anita Borg Institute, with Robin Jeffries and others. So I felt I was  
555 doing smaller science at this point. That's what I worked on in my pre-tenure years at Mills.

556  
557 I was very happy to be at Mills. At the research universities I interviewed at I'd hear things  
558 like "Don't spend any more time on teaching than you have to until after you get tenure."  
559 And I didn't think I'd be happy at somewhere like that because I'd be seeing the students  
560 every day, or several times a week, and I wouldn't be happy if I wasn't doing a good job.  
561 Plus the junior faculty worked so hard. I thought I might want to have children. I asked one  
562 college president, "Can a woman have children and still get tenure?" He said, "I don't see

563 why not, it's just three months out of six years." Our joke is that if Keith had asked, he would  
564 have said, "It's just 15 minutes out of six years."

565

566 I was very happy to be somewhere that had the emphasis on teaching, that good teaching was  
567 absolutely essential, and I was given help to be a good teacher. That my work on women in  
568 computer science was viewed positively, not something to make me suspect. I liked the small  
569 classes so I got to know the students. I'd have them in multiple classes, so I could sometimes  
570 see the student develop over a period of years.

571

572 When I was going to accept the Mills position, some MIT professors didn't understand that.  
573 When I'd first told Bill Dally I was thinking of applying to a liberal arts college, his reply  
574 was, "Oh, Ellen, I'm sure you could get a job at a research university." But that wasn't the  
575 point, of course. I tried to explain to him and his oldest daughter went to a liberal arts  
576 college. I like to think that eventually Bill got my point; I think he did. It was a really nice  
577 environment, that my job was to help women develop as computer scientists. I had a lot of  
578 freedom to develop the classes as I saw fit.

579 [64:50]

580 **V: Can you talk about a typical teaching day for you?**

581

582 E: Well our class periods were 75 minutes and we teach on Tuesdays and Thursdays. I never  
583 taught before 10:50 am. One of the things that Keith and I liked about our lives was we  
584 didn't need alarm clocks to wake up. We got to work late enough that we could wake  
585 naturally.

586

587 My teaching style was very interactive. At Mills my classes were all under 20 students. Many  
588 were under 10. I think I learned the teaching style from Lynne when I was her TA. She  
589 wouldn't just lecture to the students, she'd also make up handouts that had problems for them  
590 to work on. I would do that. I used PowerPoint slides and I'd give students handouts with the  
591 slides printed on them, which they appreciated. And I'd print onto transparencies so I could  
592 draw on them. Also at first we didn't have data projection. But I would present material,  
593 maybe work an example, then maybe have an example for us to work together or for students  
594 to work on themselves or with people next to them. The students were always free to  
595 interrupt and ask questions. I use a lot of humor in my talk, funny analogies or nerdy jokes.

596

597 I had some policies to encourage participation. Sometimes I'd go around the room and call  
598 on people in turn. But I also told students at the beginning of the semester that they could say  
599 "pass" if they were having a rough day. I'd pass and leave them alone. But to try to get them  
600 to participate. I also had a prize bag. So when I'd get free things at conferences, I'd put them  
601 in this bag. And if a student answered ... gave a really good answer to a question, or if they  
602 asked a really good question, I'd let them draw something from the prize bag. The students  
603 liked that. That was fun.

604

605 I'd say one of the major characteristics of my teaching is great enthusiasm. Something ... I  
606 also learned from my students was to always give them the big picture, not just have a bunch  
607 of details where they didn't know how that fit in. In the computer architecture class ... at the  
608 beginning I'd tell them that they'd learn, all the way down, how computers work, that there's

609 ... that almost everybody uses computers, some people program them, but very few people  
610 know how they work all the way down to the transistor level, and that my students would be  
611 part of that select bunch. They would build a computer and know all the way down how it  
612 worked. If they went back in time a hundred years they'd be able to build the first modern  
613 computers with what they knew. These students didn't have high self-confidence. I think a  
614 lot of them probably didn't believe me that they would understand this. But by the end of the  
615 semester they did. This class we used Hennessy and Patterson's *Computer Organization and*  
616 *Design* and also these MIT lab kits. I created a semester-long lab, which started with their  
617 designing and building adders and ended by their building a computer where they burned the  
618 program onto a PROM [programmable read only memory] and plug the PROM into the  
619 computer and it would run a stored program. They'd debug it using a logic probe and looking  
620 at lights and understand it just as I said, all the way down. In earlier labs, before we got to the  
621 stored program, we programmed it with switches and pulses. I found the course very exciting  
622 and communicated that enthusiasm to students. At the end of the semester, when each student  
623 got her lab project working, I'd take a picture of her with it and I'd give the students the  
624 pictures. It was something we were all excited about.

625  
626 In other classes, in compilers, I talk about how compiler writers are unsung heroes. That the  
627 students did a little assembly language in their computer architecture course and they see  
628 how hard it is and people wouldn't be able to build really big programs without compiler  
629 writers. And also without them we would be programming in assembly language like  
630 animals. I didn't mind if I appeared corny or nerdy. In course evaluations, I'd always score  
631 high for instructor's enthusiasm, also instructor's knowledge of the material, generating  
632 student interest; wouldn't always be so high in organization, although I got much better at  
633 that when I repeated material.

634 [71:04]

635 **V: So you touched a little bit on what I suspect is your teaching philosophy. But can you**  
636 **sum up your teaching philosophy in a few sentences?**

637  
638 E: Well, my teaching philosophy ... I consider motivation key. That I want the students to think  
639 that what they're doing is exciting, that they are learning something wonderful or that they  
640 can change the world with. That everything I teach, all the material I include, I should be able  
641 to justify how it's contributing to that goal that they are excited about. I'm not going to teach  
642 something just because there is a chapter of it in a book. But in computer architecture does it  
643 contribute to their goal of understanding computers all the way down. That's the first part of  
644 the course. Later on I talk about improving computer performance. But I'm also saying,  
645 "Now we're going to look at pipelining and the purpose of pipelining because once people  
646 have a computer they want it do go faster. And this contributes to that goal. And all the  
647 people who jumped into the time machine after the first part to go invent the first computers,  
648 you can go back and build faster ones once you learn this material.

649  
650 Sorry, not a few sentences. So motivation is part of it. Another is learning-by-doing. So in the  
651 75-minute class sessions, you have students being active by answering questions, asking  
652 questions, working problems. Then when you send them home, carefully choosing  
653 assignments so they're not busy work, but so they are really learning how to apply the  
654 concepts.

655  
656 Also with our interdisciplinary computer science program, we get students who feel like they  
657 are remedial in computer science because their undergraduate degree is in something else.  
658 They are a little apologetic. I tell them not to be, that computer scientists are a dime a dozen.  
659 But someone who has their background in another field ... so someone who was a teacher, or  
660 a nurse before, or a political scientist ... that if you take that knowledge and add the  
661 computer science that they've been learning at Mills, you get a unique combination. With  
662 their thesis they can do something that someone who is just trained as a political scientist  
663 couldn't do, something that someone who is just trained as computer scientist couldn't do,  
664 and me with my MIT Ph.D., I couldn't do it. But because of their unique skills they can do  
665 something that nobody else in the world can. And so communicating that to the students.  
666

667 **V: Very good. Is there a particular story that you would like to tell about any of your**  
668 **courses or students?**

669  
670 E: I can't think of any. I am proud of many of them, first-generation college students who get  
671 high paying, satisfying jobs. Or someone who was discouraged from taking science classes in  
672 college because she was a woman, discovering that she's really good at it, going on to a  
673 successful career, getting a Ph.D. It's all great.  
674

675 I should also say that I had male students, that the graduate programs were co-ed.  
676

677 **V: I didn't know that. OK.**

678  
679 E: Right, so that's federal law, although Mills did that even before it was federal law. Yeah,  
680 there some wonderful male students, so I had co-ed classrooms. And, of course, I'd make  
681 sure that no student dominated the conversation.  
682

683 **V: So, your career, we talked a bit about pre-tenure. You've passed the magic three-year**  
684 **mark. So maybe we could talk a little bit about the transition to tenure and also a little**  
685 **bit about what you are doing now with Google as part of your career path.**

686  
687 E: OK. I started mid-year, so I wrote into my contract that I had the choice whether to go up  
688 after my 5th year or my 6th year, after 5 1/2 years or 6 1/2 years. I chose to go up earlier, and  
689 I got tenure and promoted to associate professor. Then it was time where I could take a  
690 sabbatical and I spent 2004 at Google. I mentioned my thesis was on Internet information  
691 retrieval and some of what I did is the same as what Google was doing, specifically looking  
692 at the link structure and using that to recommend pages. I had been acquainted with the  
693 Google founders when I was a grad student. We'd present at the same conferences and we  
694 cited each other's papers, so I watched Google with interest. Plus I knew it was a wonderful  
695 place to work. Peter Norvig, who I was acquainted with, and who was head of search at  
696 Google then and is now director of research, was willing to be my host and I spent 2004  
697 working at Google. Most professors who spend a sabbatical leave at Google don't go back to  
698 teaching, they stay at Google. But as much as I enjoyed that, I also really enjoyed teaching.  
699

700 So I returned to Mills after that but I was able to arrange to work at Google one day a week  
701 and during summers. It sounded to people like I had an extra hard work life, working full  
702 time at Mills, plus this job at Google. I was 40% at Google. I was really double-dipping  
703 because professors are supposed to spend one day a week during the summer doing research.  
704 I was doing what I was supposed to do at Mills anyway, but I was also not just getting paid  
705 by Google, but getting Google resources. I could do my research on Google's machines and  
706 infrastructure and also my evaluation with millions of clicks that Google gets, if I wanted to  
707 test something. We published ... I guess it it was just a poster, a short paper poster at KDD,  
708 Knowledge Discovery and Data mining, based on some work I did at Google. So that was  
709 really the best of both worlds, being able to teach, doing research, having tenure, and being  
710 able to work in industry at the best company.

711

712 **V: So you're currently in the midst of a period where you are not teaching and you're**  
713 **working at Google, correct?**

714

715 E: Right. What happened was that I became department head at Mills, that's a two-year term.  
716 The first three semesters were fine, but the fourth semester the administration decided to  
717 close our graduate program. We had low enrollments. The computer science enrollment was  
718 down then and the program was always pretty small. I knew there was the risk of its being  
719 closed. I'd been trying everything I could think of for years to increase the enrollment with  
720 very little help from other people. I was bearing the total weight. But I wasn't prepared for  
721 the administration announcing that they were closing the program, particularly because that's  
722 the faculty's right, only the faculty can. So the administration said, "The program is being  
723 closed" and we said, "You can't do that." They didn't listen to us, so we went to a faculty  
724 executive committee, which is our representatives from the faculty, and had meetings with  
725 them. They wrote a memo telling the administration, "You can't do that. The faculty needs to  
726 vote on this." The administration said, "OK, we're not closing the program, but we're not  
727 letting you admit any students." So we went through the executive committee again, saying  
728 that, "No, this is tantamount to closing the program. You can't do that." And finally the  
729 administration said, "OK, we'll let you admit students." Then I hear from a student, whom  
730 we recommended for admission, that she hasn't been admitted. So we go to the President and  
731 she said, "Well, if the Provost said that students would be admitted, then they have to do  
732 that," although the President thought it would be fine to suspend admission.

733

734 We got those students in, but going through all this was so stressful on me, I was ... this  
735 affected my physical and mental health. I had to go on anti-anxiety medicine for the first time  
736 in my life. I was stuttering and decided I should take a leave from Mills, that I had this other  
737 wonderful place I could work. Mills wasn't a healthy place for me and maybe after the leave  
738 there would be a change in administration or enrollments would go back up.

739

740 Unfortunately, the next year ... well, I went on leave at Google, so became a full-time  
741 employee (unfortunately too late to get stock options worth anything). But at this point, Keith  
742 had joined Google. NASA, too, had gone downhill and he joined Google. So I began  
743 working as a research scientist full-time at Google. It was nice to be able to commute with  
744 my husband. Unfortunately, things did not get better at Mills. The next year they decided to  
745 cut, pull the funding from the students who were halfway through the program which was

746 against prior tradition at Mills. I decided to take a second year of leave. Now I am in October  
747 of my second academic year, planning has started for next year, and my department head  
748 wants to know if I'll be back because it is not a good environment for computer science. I  
749 really miss teaching and, even though Google is such a wonderful workplace and I have been  
750 given a lot of freedom, I really think I'd like to go back to being a professor. But I don't  
751 know if I should go back to Mills or find another position. I've applied for a few other  
752 faculty positions and am really thinking about would I be willing to give up tenure at Mills  
753 without getting tenure somewhere else. And would I be willing to leave the Bay Area where  
754 Keith and I lived for eleven years, have a beautiful house and have built up our life. So I  
755 expect to have some tough decisions in the next year.

756 [83:22]

757 **V: Good luck as you face all of that.**

758  
759 E: Thank you. I'll try to ... maybe it'll be like with my thesis, where it will all turn out better  
760 because of something going differently from how I planned. But it is always harder when you  
761 are in the midst of it. But I had thought that once you get tenure you live happily ever after.  
762 Or that if something is your dream job, it stays your dream job. But it changed. When I got  
763 there, it was during the boom. We had more students and more support from the  
764 administration. Now we don't have the students and we lost the support, although there is a  
765 new Provost who seems wonderful. But it may be too late for me. I'm not sure.

766  
767 **V: I'm going to move us ahead. Our window of opportunity is closing a little bit. So what**  
768 **I'd like to find out about is your outside interests. If you have any strong outside**  
769 **interests that would help us understand you better.**

770  
771 E: There is certainly my interest in women in computing. I've continued to write about that and  
772 participate on panels and being involved at a life level with education of girls, such as  
773 leading electronics workshops at the annual Expanding Your Horizons Conference at Mills.  
774 And I supervised three master's theses on computer science education.

775  
776 I wouldn't say I have that many outside interests. I am a doting aunt. I have nine nieces and  
777 nephews, whom I adore, though none of them live nearby. So I've been doing volunteer work  
778 with children.

779  
780 My husband and I leave quiet lives. On the weekend we take it easy, take advantage of being  
781 in San Francisco and go on walks, go out for brunch. I read. All of us are following the  
782 election going on now, about the presidential election and there are some important ballot  
783 initiatives in California.

784  
785 I have been involved with non-profits. I have been on the board of two and I am planning to  
786 join a third. I was on the board of Computer Professionals for Social Responsibility and the  
787 advocacy group Stop Prisoner Rape. I was also their webmaster, got their material on-line.  
788 We were a co-plaintiff on ACLU versus Reno, the Internet censorship case. We were part of  
789 the argument that there is material that is indecent but has educational value and should be  
790 able to be on-line. The ACLU won that case. And I've continued to have an interest in  
791 prisoners, how they are treated. I think in general I have an interest in the underdog, whether

792 it's women in computer science or whether it's low-income children or prisoners. I've been  
793 involved in the group Prison Legal News for a long time and may be joining their board once  
794 they get proper liability insurance, and help them get on-line, too.

795  
796 I'd say that I am someone who cares a lot about fairness. That's why it was so upsetting to  
797 me how things went at Mills, that if the faculty had voted to close the program, that would  
798 have been bad. But for the administration to close it in violation of the handbook, that's very  
799 different to me.

800  
801 **V: Very unfair.**

802  
803 E: And fairness matters a lot to me.

804  
805 **V: If you could give advice to a young person just starting out, what would it be?**

806  
807 E: I'd say decide what is important to you in a career. So I decided to go to Mills even though  
808 there were some MIT faculty who thought I was wasting my opportunities, that I could have  
809 gone to a research university. But their ideal of a career wasn't the same as mine. So I gave a  
810 lot of thought of what I want in a job to be me happy, and I wanted a job that would reward  
811 me for doing the things that I thought were important, such as doing a good job teaching or  
812 working to increase women in computer science. And at a workplace that wouldn't penalize  
813 me for things such as having a child, which I didn't do.

814  
815 **V: All right. So we're down to the end of it. Is there any story that you'd like to share that**  
816 **you haven't gotten to share, that we can close with here?**

817  
818 E: No, I think the last thing I said plus ... about what happened with my thesis and it's turning  
819 out for the best are my stories. And then of course there's the story about my current career  
820 choices, but I don't know the end to that yet.

821  
822 **V: OK. Well, I thank you so much. I know that we could continue for a while and I hope**  
823 **that we'll have the chance again in the future.**

824  
825 E: Thank you, Vicki.

826  
827 **V: Thank you, Ellen.**

828 [89:24]