Computing Educators Oral History Project
An Interview with *Eric Roberts*
Conducted Monday, July 6, 2009
In Paris, France
Interview conducted by Barbara Boucher Owens

1   [0:00]
2   **B: This is an interview with Eric Roberts of Stanford University. It is being conducted by**
3   **Barbara Boucher Owens [on July 6th, 2009] in Paris, France, as part of the Computing**
4   **Educators Oral History Project. Did we get your name correctly?**
5
6   E: You did. Thanks.
7
8   **B: We start way back at the very, very beginning. Okay?**
9
10 E: Okay.
11
12 **B: All right. So tell me a little bit about your family.**
13
14 E: Well, I grew up in an academic family. My father was Professor of Political Science. He
15   travelled to a number of places, but he ended up getting his permanent position at the
16   University of Nevada in Reno. And so I grew up in Reno, and later the family moved to
17   Carson City, which is the state capital.
18

19　There are a number of other people in the family that I got to know over time who were
20　either teachers or filmmakers. They were in Hollywood, so that was sort of where I drew my
21　inspiration from. They were all quite intellectually engaged and so reading was a part of the
22　family history. My mother's sister, for example, during the time that I knew her best, read
23　three books a day. And I try to read three books a week and everyone thinks that this is
24　wildly crazy to try to undertake that much. And sometimes … one can do even better.
25
26　We were also very active politically as a family. My grandmother was a Quaker anti-war
27　activist in the period and worked with the American Friends Service Committee doing
28　reconstruction work in Germany after the Second World War.
29
30　**B:** **Is this maternal or … ?**
31
32　E:　My father's mother. She went over in 1947, and the American Friends Service Committee
33　　won the Nobel Peace Prize for that work and so … she was only a small part of it, of course,
34　　but that was the kind of thing that I grew up with. And she was extremely a strong influence
35　　on me, as certainly my father was as well.
36
37　**B:** **Did you have siblings?**
38
39　E:　I have two siblings. My brother is Professor of Medicine at the University of Pittsburgh. My
40　　sister is a lawyer.
41
42　　Just as an aside, my brother and I were offered faculty positions at Stanford in the same
43　　week. It was my second academic position, his first. He's two years younger. But also
44　　because he has more schooling, he was later in entering the academic ranks, just because
45　　graduate school takes so much longer when you do two degrees. So we were both applying to
46　　a number of places. I remember when I got the offer from Stanford, I called my parents and
47　　said, "Well, should I call my brother?" And they said, "Yes." It turned out he had heard three
48　　days earlier and done the same thing. Called our parents and said, "Well, should I call Eric?"
49　　They said, "Well, why don't you wait. He'll certainly call us." In Computer Science terms,
50　　we had a data-flow graph and my parents were waiting for both tokens before it would fire.
51
52　**B:** **So the two of you, the two boys, followed scientific-type paths and your sister different**
53　　**…**
54
55　E:　Certainly, my brother, as a physician, has a scientific bent. But his area is in decision making
56　　and economics. His undergraduate degree is in economics, so he has social science bent like
57　　my father.
58　[04:37]
59　**B:** **Can you tell me a bit about your schooling?**
60
61　E:　I went to public school in Nevada. All three of us did; the same school. And my brother and I
62　　both went to Harvard as undergraduates.
63
64　**B:** **We're going to stay down in that elementary school. Think back on that.**

65
66 E: Think back.
67
68 **B: Think back on that. And think about what characterized the school. What**
69 **characterized the learning environment? Were there teachers who were particularly**
70 **influential? What was it like?**
71
72 E: Well, it was a very small elementary school. This was when I was living in Reno. Reno
73 wasn't very large in the late 1950s. I don't remember my elementary school that well. I think
74 class sizes were around 20. I was accelerated. I skipped the second grade. And I think one of
75 the nice things about a smaller school system is that they take more time to make exceptions,
76 to find ways of (allowing children to take) courses in advance of their grade level. I took my
77 high school algebra course in 7th grade and was (well ahead) in mathematics. I had the
78 opportunity to do it there.
79
80 Probably the most interesting piece of my education before college was that (I had the chance
81 to go to school abroad. My father taught in a number of countries), particularly in later years
82 after I was already in or out of college. His area of interest was comparative public
83 administration and so he would go to other countries, study — either working for USAID or
84 other travel scholar programs — and teach for a time at a local university, but also study and
85 then write papers about the governmental systems. In his doctoral dissertation some years
86 before, for example, he compared the bureaucracy in Sweden with the United States. The
87 most interesting thing was to have the chance to live in Lahore, Pakistan, for two years as a
88 child.
89 [07:22]
90 **B: Could you tell me the name of the town, please?**
91
92 E: Lahore.
93
94 **B: Lahore.**
95
96 E: The second largest city; the capital of the Punjab, very close to the Indian border. This was
97 before the war in 1965, and actually the two countries were at a level of relative calm that has
98 only been re-created sporadically, very rarely since that war. It was possible to drive across
99 the border. There were, of course, border patrols. We were able to visit Delhi and Agra and
100 Kashmir by car. It's very difficult to do that now.
101
102 **B: How old were you?**
103
104 E: 10 to 12, so I remember it quite well. And remember the things that you learn when you're
105 10 to 12, you know. So people will ask me things about the politics or the way people lived,
106 and I don't know the answers to those things except as I've learned them through other
107 readings. But certainly the images of the country and of the town, and of visiting all those
108 places, going up to the Khyber Pass in Afghanistan. I know — particularly given that these
109 places are in the news so much now — to have been in most of them is interesting from a
110 different perspective. But I think, more than that, the opportunity to live outside the United

111 States gives you a very different perspective on the world and how the US fits into it. We
112 went to an American school when we were there, although there were Canadians and British
113 and Pakistani students in the school as well. But we were living in a different country and a
114 country that was undergoing turmoil. And there was some anti-Americanism at the time. And
115 I remember all that. So it was interesting.
116
117 **B: Can you tell me something about what you remember about your math and science**
118 **education in school, was it … ?**
119
120 E: As I said, I took …
121
122 **B: Accelerated.**
123
124 E: Accelerated. I took the math courses as soon as they would let me and always really enjoyed
125 it. I knew I wanted to be a scientist from a very early age. In fact, I wanted to be a professor
126 of science … when other kids wanted to be a fireman, I wanted to be a science professor. I
127 didn't quite know what that was, but living in an academic household I knew what a
128 professor's lifestyle seemed to be and that was very attractive. My father was home a lot, if
129 nothing else, and working at home and reading was so important. I also went to school every
130 summer that I can remember. Partly in demonstration classes for the education school at the
131 University of Nevada, but then there were summer programs for gifted and talented youth, I
132 think they're called these days. And that's what I was immersed all my life, in sort of, in the
133 educational process.
134 [11:00]
135 **B: Can you tell me a little bit more about some of the summer programs?**
136
137 E: There was this marvelous program, and I don't know exactly how it was constructed, but the
138 University of Nevada had someone from the School of Education teaching philosophy. I
139 remember that I read Plato's *Republic* in that class. I couldn't have been … well, since it was
140 before we went to Pakistan, I could be at most in the 5th grade. And I don't remember which
141 summer it was. But there were students in that class of all ages in pre-college time, so it was
142 an odd mixing. But it was fascinating to hear about all these ideas. To read plays. To read
143 classical philosophy. To read science. I don't have a good memory of exactly how this came
144 up, but I remember there was an article in the Reno paper about the class and I was listed as
145 reading Einstein. I don't remember reading Einstein, but knowing that I wanted to be a
146 scientist, it does not surprise me that I was reading something about Einstein.
147
148 So, I took those courses. I took chemistry a year early. I took physics. And in the sort of
149 Sputnik-era attempts, particularly in the 1960's when the Kennedy and then the Johnson
150 administration starting pouring more money into schools across the country, to improve their
151 science education, we had an electronics class — which I think was intended to be vocational
152 — but the physics teacher took on electronics class I and II. And in the second year, there
153 were only three of us in the class, so we had tremendous help from the teacher and it was
154 amazing. I remember learning a great deal about that. I went on … well, we're getting
155 slightly ahead, so let me back up a little bit.
156

157 Getting into computing at a very early age was something that came out of the academic
158 background. In the summer after we came home from Pakistan, so that would be the summer
159 of 1965 or 1964, we came home that year — my father decided that since I was a science
160 type and he knew, at the University of Nevada, people in the Engineering School, that he
161 convinced some people in electrical engineering to take me on as a summer intern. And I was
162 soldering wires on the back pane of an analog computer in 1964. You know, perfect for me. I
163 could then and probably could now make very good solder joints. I had small hands so I can
164 do it very accurately. I had no idea, I think, of the big picture. It was called a computer, so I
165 was working with a computer. But I don't remember really having a sense of how it worked.
166 It wasn't a modern, digital computer. But I loved the electricity in it. I had invented, as an 8
167 or 9 year old, the concept of a relay, an electromagnetic switch. I needed it for something and
168 never had heard of one, but could have been able to do some digital logic at that time if I had
169 just pursued it a little further. And learned years later what it was that I had done was sort of
170 interesting.
171 [15:27]
172 When I started high school, my parents decided, partly for the school systems, to move 30
173 miles south of Reno to Carson City, which is the state capital. They thought the schools were
174 better. I understand retrospectively that the Reno school system just said, "Oh, you should go
175 to the University of Nevada as a 12-year old." And my parents didn't want that. They worked
176 out with the Carson City school system that there would be ways of getting me into the
177 science classes I wanted a little early and giving me some individual attention there. I didn't
178 know about most of these things at the time, but it worked out really well.
179
180 And what my father did, rather than commute to the university in those years was, because he
181 studies public administration, he got a job as the Deputy Budget Director for the State of
182 Nevada. So he could learn how the bureaucracy works, and then write about it and go back to
183 teaching. So he lived in the state capital. And all of the state offices for Nevada at the time, I
184 think, fit into two administrative buildings. So here was the Budget Office on the same floor
185 as the fledgling Data Processing Office. This is in the summer of 1965. So he got to know
186 those people.
187
188 And it's just an amazing story. My father brought home — I remember doing this — an IBM
189 programming aptitude test that they gave in the 1960s and he gave it to all of us. My sister
190 was probably too young to have done it then, but to my brother and to me. And I evidently
191 got the highest score they'd ever seen. And so the director of Data Processing, the state
192 director, took a personal interest in me and had me come down and work on an IBM 1401
193 computer. I worked with a number of earlier data processing machines, I don't think you can
194 call them computers. I have programmed collators, the IBM collators that you did with plug
195 boards and wires. The 1401 had no permanent storage. There was no disk attached to it. I
196 don't even know that there were tape drives. Everything that you did was read in from the
197 card reader, processed in memory, and then printed on the printer or possibly punched. And
198 all the coding was done in assembly language for the machine. And I loved that. I wrote a
199 number of programs. I wrote programs that the state of Nevada used — after school and later
200 summer internships.
201

202 So, here I've become quite proficient in early high school at using computers of that
203 generation. I didn't think of it as science. It wasn't. It was business data processing for the
204 state of Nevada. I did have the opportunity to work with those things and certainly to be in
205 the machine room and see how all these computers worked. And I just loved it.
206
207 And then in the summer of 1968, that would be the summer after my junior year, I went on a
208 National Science Foundation funded summer science training program. So many people in
209 my generation did precisely that. There was a lot of them nationally to try to get people who
210 were interested in science the opportunity to work on a college campus, to take some courses.
211 And I still thought that I wanted to be a chemist. I loved my chemistry teacher in high school.
212 He was so good as a role model.
213 [20:05]
214 **B: Can you describe some of the characteristics that made him a good role model?**
215
216 E: Yeah, I could do that. It's all of a piece, you know, moving back and forth in time. I took a
217 chemistry class. He read stories to the class. He was funny. He was engaging. He cared a lot
218 about his students. Most students, for example, in that day, as seniors took only a half a day.
219 So small a number of students were going on to college and very few out of state. Some
220 would go to the University of Nevada, from that public high school. And most would get jobs
221 in the afternoon and that was the transition to the work world. And there wasn't that much in
222 terms of offerings. The highest mathematics that was offered in that high school was a one-
223 semester trigonometry. There was no calculus. There were no AP classes. Quite a different
224 public school than it would be today.
225
226 But there was the opportunity to learn and the school gave me that. My job in the afternoon
227 was being a lab assistant for the science program. And what John Hunter, my chemistry
228 teacher, allowed me to do was, I taught second period chemistry. I gave every lecture that
229 one year. And it was amazing to have that opportunity. I was younger than a good fraction of
230 the kids who were in that class. But it certainly taught me about teaching. It taught me about
231 lesson planning. It taught me about how other students were thinking. And I had a mentor
232 who was really good at making sure that what I did worked. And I don't think that the
233 students felt in any way cheated by it. I had good friends in that class. People thought I was a
234 little odd but, you know, it wasn't a hostile environment, which I think at some times is for
235 students who see themselves as more academic or more advanced. So that was what
236 happened in high school.
237
238 The summer before I did that teaching was the summer I spent at the program in Chico,
239 Chico State College, in chemical equilibrium and computer science. When I tell people the
240 story about this, it's sort of rehearsed in my head, so it's easy to tell. I chose it because it was
241 chemistry. But the idea that there was a little computer science helped. So of all the summer
242 science training programs that one could apply to, that one stuck out as a good opportunity.
243 And the schedule for that summer was every day we had chemistry lecture from 7:30 to 9:00.
244 People think nowadays, "How could there be something at 7:30am, students are never up!"
245 But in Chico, California, you had to do everything in the morning because after 2:00[pm], it
246 was 110 [degrees Fahrenheit] in the shade and you didn't want to be in a classroom then.
247

248   So 7:30 to 9:00 was chemistry lecture, which I invariably attended. And 9:00[am] to noon
249   was chemistry lab, which by the second week, I stopped attending for reasons that will
250   become clear. Lunch, then 1:00[pm] to 2:00[pm], I think. Just an hour of computer science
251   class, which was a programming class in Fortran on a 1620 — a really modern machine,
252   which I just loved. And then every single day for eight weeks from 2:00 in the afternoon until
253   7:30 the next morning, I lived in the computer room, programming. And the only time I slept
254   was during the chemistry lab. The directors called my parents to say, "Is this normal?" (I
255   didn't know that).

256

257   But I was doing interesting and exciting things. I was so obviously taken with it that about
258   week four the computer science teacher said, "Why don't you go work?" And he assigned to
259   a group of graduate students doing a research project. I had no idea quite what I was … and I
260   helped them code. It was unbelievably exciting, engaging, and so concentrated that I couldn't
261   have done it any other way and learned as much as I did in that time with that obsessive-
262   compulsive streak that I've always had. By the time I was done with that I was just an ace
263   coder in Fortran and assembly language. I coded in assembly language for the 1620.

264

265   The first course I took when I got to Harvard was …
266   [25:52]
267   **B: I want you to step back a bit. So step back and tell me how you chose Harvard. What**
268   **was your decision-making process?**

269

270   E: Process? I applied to a number of schools. I wanted actually to go to Swarthmore. The
271   Quaker connection was important to me. These were the years of the Vietnam War. I was
272   active in the Quaker meeting in Reno and I even … We lived in Carson City but I drove, as
273   soon as I could drive, each Sunday. My grandmother was living in Carson City by that time
274   and was still that role model for me, as someone who put the health of the world above other
275   things that she did.

276

277   My exposure to the larger world, outside of Nevada, I think came as much as anything
278   through the American Friends Service committee, which would run these large high school
279   conferences in California for people from the western states. So I was exposed to a lot of
280   things that were going on. There was a conference that I attended a couple of years. The one
281   that was so memorable was the one that happened right in 1968, one week after Martin
282   Luther King was shot, and being together with other Quaker and non-Quaker high school
283   students from all over.

284

285   I don't believe that we had a single African-American student in our high school. But in Los
286   Angeles there were plenty and those students came. And so I was able to work more with
287   students from many different backgrounds and really get a sense of the world through that.
288   And had done some draft counselling through the [American Friends] Service Committee in
289   Nevada.

290

291   And so I thought that Swarthmore would be the right place. I didn't get in to Swarthmore, but
292   I got in the other places I applied. And the final decision … Retrospectively, I'm happy with
293   that. Thirty-five years later when I was appointed the Lang Visiting Professor for Social

294   Change at Swarthmore for a year, the Provost called me to tell me that I'd gotten that
295   position. I said, "It's sort of fun, I didn't get in to Swarthmore." He was silent for a few
296   seconds. "Swarthmore was the only school I didn't get into." [laughs] We had a good laugh
297   about that. But the final decision was between MIT and Harvard. My father was a Harvard
298   College graduate too, so that may have had something to do with it.

299

300   **B: What about your mother?**

301

302   E: Mother has a Master's degree from the University of North Carolina.

303

304   **B: And her undergraduate?**

305

306   E: Greensboro College. My mother didn't work professionally during the time that she was
307   raising us, as I think most women in that generation didn't do. She was comfortable in an
308   academic household and read a lot, but did not, I think, sadly, pursue that intellectual career.

309

310   She's very proud. My parents just celebrated their 60th wedding anniversary. They're still
311   together, still alive. Failing health, as one would expect at that age. But they are so proud of
312   the three children that they've raised, all of whom have been extremely successful
313   professionally. So I think Mom lived in some sense vicariously through the children in that,
314   certainly followed the pattern that so many of her contemporaries followed.

315   [30:27]

316   **B: So between Harvard … you were trying to tell me the difference … how you chose**
317   **Harvard over MIT.**

318

319   E: I don't think the fact that my father was an alumnus made that much of a difference. What
320   really made the difference was I knew that I had interests that transcended the sciences. And
321   I recommend this to students today, that if they know that they are really interested in science
322   and technology, and that they are not really concerned with how good the Shakespeare
323   course is, you probably can't get a much better scientific, technical education than at MIT in
324   the United States. It's just an amazing place. But that, if they want something that's more
325   balanced, the Harvards and the Stanfords of the world have something really important to
326   offer there.

327

328   And I think that was true for me. I was interested in a number of other things and I enjoyed
329   the fact, for example, that I could take three courses in folklore when I was an undergraduate
330   and just loved them. I've always liked reading, and I've liked literature. I'm married to a
331   poet. When I say I read three books a week, they are not computer science books. They
332   wouldn't even count in my list. These are novels or histories or something of that sort
333   because that's the kind of thing that really keeps me plugged in to the world.

334

335   It's what I think … progress is for, to give people more of a time to be creative in that way.
336   And I like computing because I think it's creative. I think that the skills that I have and that I
337   use are the ones that … they call on the same parts of the brain that other creative people
338   have. I think that when you look at the kind of things that really excite people about any
339   discipline, they have to have that creative strength; Paul Graham's book *Hackers and*

340   *Painters*, it's an important thing. I think that's how I feel too, that my work is as painting is
341   to painters in some way. So, I decided very much …
342
343   Oh, the other thing is that given that I was deciding on colleges in 1969, the politics of a
344   place like Columbia or Harvard would have made those more exciting to me as a many
345   generation left-wing family upbringing. So I wanted to be at a place where students would
346   continue to oppose that war that was going on. One certainly heard more about that at
347   Harvard than one heard about that at MIT. So that probably had its influence. And the
348   Quaker Meeting House is right across the street from Harvard and just down the way. So that
349   was important too.
350   [33:44]
351   **B: Tell me a bit about that undergraduate experience …**
352
353   E: Worked out?
354
355   **B: Yeah.**
356
357   E: Well, it was an interesting time. I came to Harvard intending to major in chemistry and
358   physics. It was a joint major. I didn't. I was terribly behind so many of my fellow students
359   because of the fact that my high school had not had Advanced Placement offerings. I was
360   placed into the advanced beginning calculus, it was Math 11, at Harvard on the strength of
361   my mathematics test scores. But almost everyone in that class had had calculus before and
362   was using it to review … perhaps a spotty high school education. And for me it was all new.
363   And one of my Stanford colleagues — one of my obvious contemporaries, since we were in
364   that same class — and I talked about that class in years later. He loved it; I just … didn't.
365   And he became a mathematician and I became a computer scientist. I loved my chemistry
366   teacher. But in the final analysis I ended up spending — in more or less the same obsessive
367   way I had in that summer program — ALL my time working in computing.
368
369   In my sophomore year, I had a chance to lead some review sections and later to teach a
370   section of the introductory computing course — that's still something our Stanford students
371   do, that those undergraduates do. John Hennessy, President of Stanford University, said once
372   that he doesn't think he would have gone into academia if he had not had the chance to teach
373   as an undergraduate at Villanova. That that just opened his eyes to what the academic
374   mission could be. And of course, since I came from an academic family I had more of a sense
375   of that. But the chance to do again what I'd done in high school teaching a class as an
376   undergraduate made an enormous difference. And that was possible only in computer
377   science.
378
379   I loved the computer science teachers that I knew at Harvard. They were really genuinely
380   interested in taking their passion for the field — not the whole department, but the people
381   that taught the introductory course. One of them was Professor of Biology named William
382   Bossert. He taught the introductory course for years and years and years.
383
384   **B: Bossert?**
385

386 E: Bossert. He's still teaching as far as I know. Saw him just a year or so ago. And he had his
387   community: the students that he taught, the students who taught for him. So many of them
388   have gone on to academic positions because of that example that he provided … in much the
389   same way that Brown students have felt about Andy van Dam over the years.
390
391 **B: Did they have a program in computing?**
392
393 E: No. It was called Applied Mathematics until, I think, 1989; I could be off by one or two years
394   in the history of when Harvard actually named their program. I got three degrees from
395   Harvard — bachelor's degree, Master's degree, and a Ph.D. — all of which are in Applied
396   Mathematics. There is more mathematics than there would have been in a computer science
397   degree of the same time, which I don't regret. But it was, for all intents and purposes, a
398   computer science degree. It was just … it was too new a field to … I remember talking to a
399   Dean at one point when I was a graduate student who still believed that computer science
400   was just a new and presumably flash-in-the-pan fad that would soon pass. And Harvard
401   needed to defend the long-term ideas. And that we should wait until this matures in a
402   generation or two and then maybe we could name it as a field of study. Which eventually, of
403   course, they did.
404
405 **B: So, in your mind, do the degree paths, the Master's and the Ph.D., do they meld into**
406   **one seamless whole?**
407
408 E: Oh yes. I had decided to do computer science — if not in name, in fact — by the end of my
409   sophomore year. And that was the only major I declared.
410
411 **B: I think what I am trying to say — the educational experience. Do you differentiate your**
412   **undergraduate program from …**
413
414 E: Not much, not much.
415
416 **B: … your Master's and how did that**
417
418 E: Well I was at the same institution which of course I …
419
420 **B: But you chose that.**
421
422 E: Right, I chose that. I subsequently counselled students not to do what I in fact did, as many of
423   my faculty members counselled me to go somewhere else and have a different perspective.
424   But I made that choice, not for academic reasons but for personal reasons. I wanted to stay in
425   Cambridge, which I loved. I didn't want to leave friends. I didn't want to leave the woman
426   with whom I had been involved for a number of undergraduate years, although that didn't
427   last until the present time. But you know, people make those decisions. It wasn't a bad
428   decision. It's just that it wasn't necessarily the most mind-expanding decision. And so the
429   fact that things seemed to be a natural progression is probably easier to explain by having the
430   same people, the same institution behind it.
431 [40:18]

432 **B: Can you think of … were there any women involved in the field?**

433

434 E: Not as many. I know Lynn Stein from that time — sort of. At Olin now. She was singular.
435   This was the year I came back to Harvard when I was teaching at Wellesley, so it was some
436   years later. But it was so unusual to have women involved in computer science in those days.
437   There were a couple of doctoral students who were female.

438

439   And what's fascinating is that my life at that time was bifurcated. I had a political and social
440   community that was almost entirely women. The political feminist community centered
441   around Radcliffe and Cambridge. The Redstockings, sort of the second and third wave —
442   depends on how you count it — feminism at that time, was very much centered in
443   Cambridge. And those were my friends. And then there were the people that I studied with
444   and worked with professionally, who were not by and large my friends. I wouldn't see them
445   outside of classes. And one was almost entirely male and one was almost entirely female.

446

447   I have very strong role models of women in my family. My grandmother, my father's
448   mother, for example, was probably the single most important influence — I've said that in
449   other interviews — growing up. I dedicated my first book to her. And what she did in terms
450   of making it clear that I could accomplish things and being very active as a feminist force in
451   her own … in her way meant that I was really, I think, ready to go that way. But in part it
452   was the accident of my living at the Radcliffe quad and finding the first … feeling at home
453   there in a way that I had never felt on the Harvard side of things, partly for issues of class.

454

455   There's this amazing historical fact that I arrived at Harvard before there were co-residential
456   dormitories. Into an institution that was about — again I might be off by some small
457   percentage — I think 55% private school graduates. During the time I was there, their co-
458   residential experiment started. I moved to Radcliffe, right at the beginning of that and stayed
459   there for many, many years because I lived there as a resident tutor when I was a graduate
460   student. And so you opened the floodgates and women who really liked being at Harvard
461   moved there and men who didn't like Harvard, I think, moved to the Radcliffe quad. The
462   Radcliffe quad was over 90% public school graduates within three years. The sorting was not
463   done on anything other than sort of comfort level with the enormous class privilege of
464   Harvard. Radcliffe is not a lower-class institution anywhere in the country except at Harvard.

465

466   And people who are frustrated by the class focus and the left, the people who have gone to
467   public school, the people who felt out of place at Harvard, gravitated toward that island of
468   sort of normalcy in the midst of this wildly skewed social environment that was Harvard.
469   And what happened subsequently, and continued for so many years afterwards, was there
470   was this attempt by Harvard to steamroll Radcliffe and just draw into its orbit everything that
471   had been important historically for women students at that institution. And those of us who
472   decided that we liked the things we had found at Radcliffe fought it. And my allies were that
473   feminist community.
474   [45:19]
475   And, I don't know, that was the people that I interacted with. And so, when I got my Ph.D.
476   and wanted to go find an academic position, I went extremely deliberately to Wellesley.
477   Again, it let me stay in the Boston area where all my friends were, or where that community

478 was. But, it was also the opportunity to create a program at a women's college. I was the first
479 computer scientist they hired. And in the course of the five years I spent there, a major was
480 created. And I believe that you could detect, in just looking at employment statistics for
481 Massachusetts in that sector, that the existence of a program at Wellesley made a difference
482 in the gender make-up of computer science jobs that was measurable. I remember the statistic
483 that was just so astonishing is that in 1983/1984, Mount Holyoke College graduated more
484 women in mathematics than the entire Ivy League, even though it is smaller than every
485 institution in the Ivy League. That's what the women's colleges did. They were able to
486 produce people in fields that the stronger Ivy League and Little Three colleges [Williams,
487 Azmhrst, and Wesleyan] never did. And I wanted to be part of that. And was part of that.
488 And then decided for other reasons to go to the west coast.
489
490 **B: You want to talk a little bit about that transition? Or … before you do that; talk about**
491 **your teaching philosophy. Sounds like it started in high school and it was perpetuated**
492 **…**
493
494 E: I learned it at my father's knee if you will. He's also taught as I have — broadly. He uses
495 many, many different resources in his classes and teaches courses where, in looking at public
496 administration, they read plays. Because he thinks that, in fact, the best place to look at the
497 way people treat each other is not in … of course he assigns analytical texts by people who
498 do public administration or political theory or sociology; those are part of the reading. But to
499 really have a sense of how someone responds to power without — his course on plays reads
500 *Antigone*, either in Sophocles' or Anouilh's version, and Ibsen's *Enemy of the People*, and
501 Bertolt Brecht's *Galileo*, to look at the question of the relative responsibility of the individual
502 and the state — and Antigone is probably just a classic in that. And so I remember in high
503 school reading those books when he would assign them because I'm fascinated by that and
504 he would talk about them at home. And so I think that the notion that a broadly-based
505 education is essential pre-dates even my teaching in high school by a lot. I grew up with that.
506
507 **B: So can you give an example of what a class was like or some of your classes at**
508 **Wellesley?**
509
510 E: Wellesley. Well, Wellesley was complicated in that I ended up leaving because, you know, I
511 couldn't, in some sense, make it work and make it survivable. There was a phenomenal
512 growth of interest and enthusiasm in computer science in the early 1980s, you probably …
513 you know all about that. But I got my position at Wellesley in 1980 and over the next 4
514 years, the doubling rate of students — it was faster than Moore's law, doubles every year —
515 and there were no faculty to hire. It's 1983-1984 that the ACM estimated there was one
516 applicant for every seven faculty positions in the United States in computer science. And so
517 all these schools are trying to handle increasing numbers of majors in an environment where
518 they cannot hire additional faculty, there just are no people to hire. And so they retread
519 mathematicians and physicists and bring them in to teach computing. All of that was the
520 usual approach.
521 [50:38]
522 Wellesley was a little bit more fortunate because we had the attractions of being one of the
523 top colleges in the United States, but also in the Boston area, which a place that people like to

524   live. So we did get applicants in that year and in previous years and were able to build up our
525   program. But the teaching load was still … I wrote a memorandum where I was able, I think,
526   to prove quantitatively that the load on computer science faculty was more than twice our
527   nearest rival and almost four times the average. You know, in the number of students we
528   taught. The student classes were supposed to be capped at Wellesley at 35. I routinely had
529   more than 70. And no graders. But how could you do anything else? Those students wanted
530   to take it. I mean, I could have taught five courses in a quarter instead of three and reduced
531   the number in each class, but it doesn't change the work load in any way. And the demand
532   was there. We couldn't satisfy the demand and couldn't bring in enough people.
533
534   We did bring in Jim Hendler at Maryland, who started his first teaching with us. Evelynn
535   Hammonds, now the Dean of Harvard College, I hired to teach computing at Wellesley. So
536   there were a number of people that we did bring in, but we couldn't, in that, reduce
537   workload, not during that, no question. I went back and taught in my year of junior leave at
538   Harvard. I went from teaching three classes in a semester (I said quarter earlier because that's
539   so ingrained in my Stanford world) that I would teach three courses and then I went and
540   taught one course at Harvard.
541
542   The courses that I taught at Wellesley were entirely female. The course I taught at Harvard
543   had one woman. That's when I got to know Lynn. She was so easy to spot by being all by
544   herself as a woman going into computer science at Harvard, intending to make it her
545   academic career. And so we had … it was very rare. And I wanted to change that. I wanted to
546   change that when I saw that all of my friends — albeit political friends, who were, as I say,
547   almost entirely women — had real trouble finding lucrative jobs in the majors they had
548   chosen because they were passionate about them. And all the men that I knew as colleagues
549   were going off and getting these great jobs in the Route 128 build-up in the 1980s, or late
550   1970s or early 1980s. And so I wanted to see what I could do to make some difference there.
551   And that's why I sought jobs only at women's colleges.
552
553 **B: So after your junior sabbatical at Harvard …**
554
555   E: I didn't go back.
556
557 **B: You didn't go back. And were there other places you were looking other than Stanford?**
558
559   E: Well, I didn't go directly to Stanford.
560
561 **B: Okay, where did you go?**
562
563   E: I went to a research lab for five years.
564
565 **B: Right …**
566
567   E: And … it was the lab that was formed at Digital Equipment Company out of the collapse in
568   1985, 1984-1985, of the computer science lab at Xerox PARC. Xerox PARC, of course, had
569   invented all the technology and refined the technology to some extent. The genesis that's in

570   that milieu of PARC and Stanford Research Institute, now SRI. The computer science
571   department at Stanford. All the ideas for bitmap displays and the mouse and the user
572   interface technology that we consider just standard today grew out of that time and was made
573   real at Xerox PARC. But it wasn't marketed by Xerox. This pair of entrepreneurs named
574   Steve Jobs and Steve Wozniak in their garage came and looked at that and hired a number of
575   people away from Xerox. And the Apple Lisa and Macintosh were that work that had
576   happened.
577   [55:49]
578   I don't know if you know the book by Alexander and Smith called *Fumbling the Future:*
579   *How Xerox Invented, then Ignored the First Personal Computer*. A very interesting historical
580   time and interesting too — I know economists and business leaders who think that Xerox did
581   exactly the right thing. They didn't commercialize that technology successfully. They tried to
582   market the Xerox Star, which was the commercial version of the Alto. And it didn't work;
583   the price point was completely wrong. No one thought that this was going to be on
584   individuals' desks. Rather, this would be a workstation that would be used in a company.
585   And so the whole PC revolution missed. The timing was just wrong for Xerox to
586   commercialize it. But Apple succeeded.
587
588   And so the powers that be at Xerox got very upset that they hadn't been the ones to bring this
589   technology forward. And Bob Taylor, the director of the lab, was fired and enjoined not to
590   talk about his firing. He violated those terms and managed to take almost the entire technical
591   staff with him. And knowing how good this group was, Digital Equipment Company set up a
592   lab in Palo Alto — two actually — hired most of the old team. Taylor directed it and hired a
593   number of people, many of whom were people I had known as an undergraduate at Harvard.
594
595   And there was this wild day that I was visiting the new lab. And in the course of visiting one
596   of my good friends there, I ran into six or seven other people with whom I had a strong
597   connection, most of whom had lived in the same dormitory (the same dormitory that Bill
598   Gates lived in in those days). It was old home week! And the possibility of doing good,
599   collaborative research again got me so excited that I abandoned teaching — which looked as
600   if … 24/7 was not enough time to make that work. And I didn't see how to expand beyond
601   the 24/7 I seemed to be working. And so I thought maybe working a mere 80-90 hours a
602   week I could do things that would matter and it would be fun. So I applied for and got a
603   position at that lab. Only to discover that I missed teaching too much. And then five years
604   later took the position at Stanford.
605
606 **B: Well, clearly you applied for that position because you and your brother were both**
607 **applying to Stanford at the same time.**
608
609 E: Yep, yep.
610
611 **B: And that was the only teaching position that you applied for?**
612
613 E: No, actually that year I applied to Mills College as well and I got both positions. And … it
614   was touch and go. Now, Lauren and I were together by then and had been for a number of
615   years. She would be a good person to talk to about my agonizing over that decision. I usually

616 tell people that had the year after … my first year at Stanford was the year that the Board of
617 Trustees at Mills College decided that they would make the school co-ed. And the students at
618 Mills successfully organized against that decision. Had that been a year earlier, I probably
619 would have gone to Mills because I would have been so impressed by the dedication of the
620 students.
621 [59:54]
622 But I felt that I had more of an opportunity to make a difference at Stanford, that the things
623 that I would do in terms of education would be seen by more people. I really liked the idea of
624 having very, very bright students. It's not that the students at Wellesley and elsewhere were
625 not bright, but they weren't focused on technology in the same way. That became very clear
626 at Wellesley. And I tried to do things to change that orientation, to develop the kind of
627 passion (if you're being generous, obsession if you've decided that you don't like it — but
628 two different sides of the same coin). That there weren't people who spent their lives doing
629 this work when I taught at Wellesley, and that I didn't think there'd be at Mills. As there had
630 been at Harvard and as I knew there would be at Stanford.
631
632 **B: I want to step back just a bit because I want you to inform me and the listeners about**
633 **the research path that you took both as Master's level, Ph.D. level, that has to have**
634 **carried that passion. Or did it carry the passion?**
635
636 E: Probably not.
637
638 **B: Probably true. Because you talk about your passion for life came from the women.**
639
640 E: My passion for teaching is different from my passion for research. I don't believe that … I
641 mean, I've never believed that the best researchers in any sense make the best teachers. They
642 may, but I don't think that they're correlated. One of the myths that I think the research
643 universities promulgate is that the great thing about being at a Stanford or a Harvard is that
644 you get to work with people who are at the tops of their field. It tends not to be true. A few
645 people do, but only the ones who have self-selected and so are sort of brought into those
646 research groups. More now at Stanford than was true in that day, I think that that myth is
647 becoming less of a myth and more real than it was because of continual reform. But that what
648 has always been true in computer science at most institutions is that some people have been
649 brought in whose passion is in teaching. Because of … a variety of, sort of, demographic
650 factors. We have … I mean, for the last 20 years, more student units are taught in computer
651 science at Stanford than in any other department. And if you ask my colleagues that across
652 the university faculty, no more than 5% could tell you that. It's one of the secrets.
653
654 **B: Describe the term "student unit".**
655
656 E: It may not be universally applied, but if you take each registration and the number of units /
657 hours / credit hours that are assigned in that course and you add them all up, we're probably
658 50% more than our next closest rival, which is electrical engineering. Stanford is, of course,
659 an engineering … is more of an engineering school. I don't believe that this is true at
660 Harvard; I don't know the numbers. And because we have an enormous graduate student
661 load, particularly in the Master's program, people taking courses. We have one of the largest

662 majors, undergraduate majors. Those give us, in some sense, the same load that other large
663 departments would have.
664
665 But what we have that no one else has is that everybody takes the Intro course. And maybe a
666 lot of other people take courses for quite some time. Our service load is huge. When I was in
667 the Dean's office at Stanford, I looked at these numbers. And if you look at what every
668 engineering department teaches in terms of what fraction of their units … again, you have to
669 scale it somehow because at Stanford, a course is not a course. There are some courses that,
670 you know, are one unit big and they meet for one hour a week. And you can't give that the
671 same weight as one that subsumes its students. So when you scale it by the number of credit
672 hours, that … in our department, we teach less than 20% of our units to our own students.
673 Four out of five or more go to students in other disciplines who are taking this course. So, we
674 brought in lecturers, teaching faculty to — and using undergraduate teaching assistants — to
675 meet that demand. Our faculty still teach more student units per faculty member than the
676 average in the School of Engineering, even though we have this huge para-professional
677 teaching faculty along the side. It's not that they're not doing their job, which occasionally
678 we hear ("Because look, you've got these lecturers!"). Yes! But our faculty are working
679 harder doing their job by any number you can count. So, that all comes from the enormous
680 demand from outside the program.
681 [66:06]
682 **B: I guess the question I have as you look at that is: At Stanford, is there a separate**
683 **teaching track?**
684
685 E: Yes.
686
687 **B: Tenure track teaching …**
688
689 E: No, it's not a tenure track.
690
691 **B: It's not a tenure track.**
692
693 E: It's a permanent track, but it doesn't formally have tenure.
694
695 **B: Do you have labels? At the professorial levels are the same.**
696
697 E: Yes, absolutely. I'm a Full Professor (Teaching). And I don't in some sense have tenure. I've
698 had an endowed chair. I've been president of the faculty senate. I don't ever get re-appointed.
699 I have a continuing appointment. But they could eliminate the program and they would not
700 feel obligated, necessarily, to find me a job teaching in some other department. I've never
701 thought that this mattered one whit [laughs]. I don't believe it does.
702
703 And we have … we've hired a second person in that professorial track and made an offer that
704 may still get taken up for a third. It's … and all over the university there are people in that
705 line. And they're the most successful teachers, in general. And they're long-term contracts. I
706 mean, I expect to retire there. I guess I can't imagine the programmatic need would ever go
707 away. And as I say, it's not as if one is continually re-appointed. In fact, my appointment

708   after the first re-appointment decision when I was re-appointed as a full professor. Yepp.
709   Nobody has paid any attention to me in terms of re-appointment. I get good salary increases
710   because they think I'm doing a good job, but it's not … there is no sense in which a position
711   is any less secure than someone who formally has tenure. At Berkeley …

712

713 **B: The first part of the question … Yes, tell me about Berkeley.**

714

715 E: At Berkeley, the lecturers have tenure. They are hired under …

716

717 **B: That's part of the State.**

718

719 E: Yes, that's part of the State system. They have the same security of employment the faculty
720   do. I think it's called something different, but it's effectively a tenure decision. And
721   sometimes it makes it harder for us to recruit since our terminology is different. And yes,
722   there is that possibility that the university could decide the programmatic need had gone
723   away. But I don't believe it's ever happened so, you know, I've always believed the best
724   defense against being laid off is being indispensable [laughs]. It seems to work.

725

726 **B: You are concerned about computer education and concern about women in computing**
727   **has permeated …**

728

729 E: My work over the years.

730

731 **B: Your work.**

732

733 E: And because, since I got to Stanford, what I've done as my work is computer science
734   education, I didn't really pursue … I mean, when I worked at the research lab, I continued
735   my work in multi-processor systems. That's what I did my doctoral dissertation on. I like it,
736   but I haven't done much with that since I came to Stanford, maybe nothing. So I have a
737   reasonable track record of papers in that area, particularly in terms of its length. I wrote
738   papers in the very early days of multi-processor design that were in the classic books about
739   multi-processors that created the field. They were printed there. But … so I had a real
740   contribution in that research area.
741   [70:01]
        But it wasn't where my passion was. My passion was for teaching computing and in
742
743   particular teaching programming. And getting people to understand the amazing excitement
744   that attends to the ability to be able to solve problems by computer. You talk to other people
745   and this is commonplace, that everyone was captivated by the power that programming gave.
746   And I believe it. I mean, I still believe it. I still spend … probably too much of my time
747   coding. But I don't know that I could do anything else. It is just the most fun thing to do.

748

749   You know, I was telling one of my colleagues that when I write my Christmas letter for this
750   year it will almost certainly not include the thing that I found most exciting, which was
751   working out how to do something in a class that I had convinced myself for two years was
752   impossible to do technically. And then one morning, in the shower, you know, this epiphany
753   happened: "AH! I could do it that way!" And you run and you make it work and somehow,

754   you know, that just keeps you going for months. I was very happy with that. But no one else
755   really outside the field — or really outside the people who are teaching that material —
756   would know how important it was to be able to restore the ability to teach in a way that we
757   had been able to do when were teaching in C into our new courses was just amazingly
758   important. I think I've argued in the past that the ability to build iterators in that way saves a
759   lecture day. So in a quarter system that's probably 2% to 4% of the course, somewhere in
760   that range. That's a huge savings.

761

762 **B: Is your teaching primarily in the beginning classes? What courses do you teach?**

763

764 E: I teach a wide variety of courses. I do teach the beginning classes. And the textbooks that we
765   use at Stanford and are used many other places are textbooks I've written. And I've
766   reconstructed that course over and over again. It doesn't tend to stay put very long. You have
767   to track languages that become the most important languages to teach because those are the
768   only languages that you can find the right technical support for … the best compilers. You
769   need to teach on something that people can buy the software for. You can't necessarily outfit
770   labs that will work with a thousand students a year, that's just too expensive for one course.
771   So you need the things that people can just go out and download free compilers for. So that's
772   got to be the stuff that is in the most common programming languages. And over time we've
773   had to retool that course and rewrite the textbook. And I've done that a number of times. So
774   that's my primary work in the computer science department.

775

776   I think I teach almost every year the course in computers, ethics, and public policy — which,
777   of course, all computer science departments have something like that to meet the requirement
778   on social and professional issues because the curriculum guidelines or accreditation requires
779   it. So in computing, those are the courses I've taught more or less every year.

780

781   But I've also taught … I believe it's now in 12 programs and departments at Stanford. And in
782   terms of my courses are at least cross-listed in … psychology was one of the ones I picked up
783   this quarter. And linguistics and philosophy and English are all included in that list of courses
784   where I've taught with colleagues in those departments to teach a combined class that looks
785   at issues from our different perspectives. And I'm certain that that's a record for the school,
786   for the university historically. I love doing that. I won't be doing it this coming year, but for
787   the last three years I've been on the faculty in the program in the introduction to the
788   humanities at Stanford because I want to model, as a real person, a technical person, an
789   engineer, a computer scientist who thinks it's really important for students to learn how to
790   read. And I don't mean how to read on the Kindle or read technical papers (those are
791   important too), but to read the literature of humanity because it will — not because I think
792   that that will make them better humans, I know that's true too — because it will make them
793   better scientists, it will make them better engineers. I don't think that without an
794   understanding of humans, you do a good job with that. And I, like my father, believe that you
795   get the best insights into that, not from … there's no way you can get from reading a manual
796   — a computer manual — much sense of how people think about things or how people learn
797   about them. And even the work that's done in human factors and psychology and the design
798   division of mechanical engineering don't really speak to the way people think about things in

799   the way that reading the best literature would allow you to understand. I think you can get an
800   enormous amount out of that.
801   [76:36]
802   As an example: When I taught the course in introduction into the humanities, which is a
803   jointly taught program at Stanford. All those courses are taught by a team of faculty. And the
804   rule is that none of the faculty members can come from the same department. The idea is that
805   it is not an introduction to a particular discipline, but rather multiple disciplines that look at
806   classic literature. You choose a set of texts that go along with your course, that has historical
807   sweep, that has some diversity of authorship so it's not all some white male canon from
808   classical times. You want modern pieces, you want pieces that are written by women and
809   minorities. The course that I taught, with — mostly with a professor in the German
810   department, but also with a professor in the English department one year — is a course called
811   Technological Visions of Utopia, in which the question … the overarching question that we
812   are asking is, "How do people perceive in literature writ large the changes in our lives that
813   technology promises or delivers?" And so in the early years of Utopian writing, Plato and
814   More, who are sort of the classical Utopists, don't really talk about science and technology at
815   all. And then you recognize it's easier to find in Plato than it is in More. But by the time you
816   get to Bacon and his *New Atlantis*, technology and science are going to liberate humanity.
817
818   But you get into the 20th Century and writers start thinking about technology as being much
819   more dark. For instance, among the readings that we've taken during those — it's changed a
820   fair amount over the years that we've done this — *Metropolis* and *R.U.R.* [*Rossum's*
821   *Universal Robots*] as a sort of base. *The Time Machine*, the late 19th Century, it isn't 20th, but
822   the same idea of the possibility that technology might even bifurcate the species. The mid-
823   century dystopias of *Brave New World* and *1984*, both of which have technology, or at least
824   biology in science, being critical components of their social control that each society puts in
825   place. Modern cyberpunk fiction, when you read *Neuromancer*, for example, this is a dark
826   world. It happens to have a particular fascination for a lot of people that are technology-
827   focused, but no one could really like that world.
828   [80:11]
829   So what is technology holding out for us? The single reading that I think my students have
830   found most compelling is the 1909 short story by E. M. Forester called *The Machine Stops*. It
831   is absolutely wonderful. It is more prophetic. You know, last year was its centennial. And so
832   when we are reading it we could point that out a hundred years before the present day this
833   very accomplished English writer, who would provide the Merchant / Ivory film series with
834   most of their stories, had a prophetic vision of a world in which we live in a room in which
835   we communicate on screens and all our lives are mediated through the machine. It is
836   probably far more accurate than anything else written before 1975. It is just amazing how
837   closely he managed to nail it.
838
839 **B: I'm going to stop that part of the conversation, just to ask that …**
840
841 E: But those are the courses that I teach.
842
843 **B: … to merge this. To merge this with your passion for programming and the importance
844   that you think an education in programming and a love for programming is within a**

845   **computer science context. Do you teach any programming in those classes that are**
846   **cross-disciplinary and, if so, how does it fit? And perhaps what languages do you use?**
847

848   E: Well, that's an interesting question. One year we did sort of teach a little tiny bit of
849   programming in that course. It's not … I mean, it's a humanities course. It's an introduction.
850   That's what it says. So I felt it would be inappropriate, unless you could teach it as a
851   humanities discipline. But there was one year that our reading list included Neal
852   Stephenson's *Diamond Age*. Neal Stephenson is a modern, very creative cyberpunk author.
853   We've tended to use his more famous *Snowcrash* novel in most years. The trade-off is that
854   *Snowcrash* is certainly more popular with students, and we can say a lot about it. There's no
855   shortage of interesting points to make in terms of the course history. *Diamond Age* is less fun
856   for most readers, but certainly closer to the theme of the course. There's a lot more to say,
857   and it has a female protagonist. *Snowcrash* arguably has too, but the person whose name is
858   Protagonist, and therefore you couldn't possibly miss who he is supposed to be, Hero
859   Protagonist is the name of the hero. And protagonist of the story is male. So particularly if
860   we are trying to encourage more women to think about this field, *Diamond Age* is a little
861   better. But that story, the second half of it, is in the land of Turing. And knowing about
862   Turing machines helps you understand the novel. So I talked in that year about Turing
863   machines and had people program some. That's programming — it really is — but it was in
864   the service of learning to read that particular novel. And it was a way that I could bring my
865   expertise to bear.
866

867   **B:** **What percentage of your teaching is in the humanities courses then?**
868

869   E: I teach about one course a year in that area out of four.
870

871   **B:** **Can you talk a bit about … what's a typical day for you?**
872

873   E: I've always been an early riser, so I get up at whenever the sun does or sometimes earlier.
874   And I walk in to work. I do a lot of thinking while I walk in to work. One of the things I've
875   talked to students about a lot is that, because they never think about things when they're
876   walking, because the cell phone comes out instantly. I have asked, "When do you, for
877   instance, if you're giving a talk, when would you write that talk? If you're writing a paper,
878   does it only get written when you're focused on writing the paper?" Where's the background
879   that, for me, is essential? All these ideas come out in the downtime when I'm able to focus on
880   something while I'm walking or in the shower or all those things when I'm disconnected
881   from the web, and not texting everybody every second. You know, that time doesn't exist for
882   most students today, so I don't know what replaces it. The evidence that we see from
883   sociology is that nothing replaces it and therefore they can't do certain things as effectively.
884   But that time is important and I want to include it in my day.
885   [86:05]
886   I live a block and a half from the campus boundary, but Stanford being 11 square miles, the
887   trip to my office takes half an hour, all of it on campus essentially. And so I get a lot of
888   thinking done every day. And the same thing on the way back. I then write on … I guess I
889   spend, I don't know … I would say that I spend three to four hours preparing each hour of
890   lecture, maybe more, maybe a little more. And almost all of that has to do with writing the

891   examples and the slides. It's programming of a sort, you know, that I have to build
892   convincing … this is for the computer science courses.
893

894   I believe that the courses that I teach outside the field, even though I have to read whole
895   novels and read them every year — I actually believe that's important, I don't want to lecture
896   on some thing that I've only read two year ago, so I will and usually find new things in them.
897   Writing paper assignments in some of the courses, actually grading those papers, which
898   Stanford faculty rarely do. You know, "That's the TA's job," but I've done it in many
899   courses routinely. Those courses — the courses that are non-programming courses — take, I
900   think, on average one-fifth the amount of time as a programming course does to put together.
901   I put a lot of time into them, but nowhere near what I put into the programming courses.
902   Writing an assignment, a new assignment, in the introductory programming courses, our
903   team estimates is an undertaking that's somewhere between 50 and 200 hours. In other
904   words, a tenth of a person year. You couldn't do that every year, you know, with every
905   assignment. There just isn't enough clock time. So you have to reuse things and redevelop
906   them. And that's unlike any other discipline that anyone can think of. Putting together an
907   assignment for the humanities courses or the ethics courses that I teach, I mean, I put some
908   time in, but nothing on that scale. Tons of it.
909

910   And so those are big pieces. So … but class preparation is a big part of what I do. University
911   administration has been a big part of what I've done for … that was … I worked in the
912   engineering Dean's office. I directed the undergraduate program in computer science for
913   twelve years. I was chair of the faculty senate. I've chaired several of the senate committees
914   at one point in time or another. I was principal author of the student judicial charter that
915   replaced the old honor code charter a decade or so ago. Because, after all, computer science
916   has more honor code cases than any other department, I figured I should put my time in
917   there. So university administration takes a lot of time. Writing books takes a phenomenal
918   amount of time. It's what I do mostly. It's what I really think my job is, writing books. And
919   I'm working on books 6 and 7.
920   [89:53]
921   **B: Titles?**
922

923   E: Well, one is the *Programming Abstractions in C++* that I've just redone for the course that
924   I'm teaching. And the other … well, I haven't … I mean, the book that I'm still working on
925   is the intellectual side of computer science, so I'll probably be working on that for a number
926   of years. But I've … as I said when we were walking over, I really want to put together a
927   monograph, a short book, on the title *Why Programming Matters*, to talk about issues and
928   educational theory and the way one should look strategically at the computer science
929   curriculum and why the trends that we've been seeing in recent years to de-emphasize
930   programming are so damaging to the field. You know, that would be fun to do. So that
931   finding time, carving out time, which I use now the summers for, to do that intensive work as
932   necessary to write a book is critically important.
933

934   **B: One of my favorite all-time computer science reads, and useful reads, was your**
935   ***Thinking Recursively.***
936

937 E: That was a good book.

938

939 **B: And it was in Pascal, and it's now in Java and somehow I missed that. So how do you**
940   **think you can …**

941

942 E: Well, you know, the Java book has not … I mean, it has not been successful. Neither of my
943   Java books were successful in the way that their earlier counterparts were.

944

945 **B: Why?**

946

947 E: I don't … I think I missed the moment. I don't think that people are moving to Java at all.
948   You know, there was this belief, that I bought in to, that Java was the best language for
949   teaching introductory programming. I didn't believe that from 1995, when it came out, until
950   2000. And we kept Stanford in C longer than most institutions did. But by that time I thought
951   that there were good reasons to believe that moving to Java, about the time that the AP did,
952   was the right choice. But it turned out to be so problematic that I think, by the time the book
953   appeared, everyone who was going to change had already done so. And they had made their
954   peace with whatever book that they were using. And so the idea of adopting a new book for a
955   language which probably wasn't going to be the *lingua franca* that we had hoped it would be
956   — and that I wrote a paper, you know, "The Dream of a Common Language [: the search for
957   simplicity and stability in computer science education]," taking the Adrienne Rich title and
958   making that be, you know, what we might find, as we had in Pascal — that there might be a
959   new language that would have that characteristic, and we thought it might be Java. It's not.
960   So that these books appearing in 2005 and 2007 didn't really have that possibility. And then I
961   don't know that they're as good a book, because when you're working in a simpler language
962   you can concentrate more on the big ideas and not so much on details. But I don't know that,
963   it also may be that books have not been as critical to the success of courses. I mean, there's
964   so much material available online.

965

966   I was talking a little bit with Rich Pattis recently about whether he and possibly I (and I
967   would be happy to just give him all my stuff and have him do it), but put out a 30th
968   anniversary edition, in 2011, of *Karel the Robot*. It should happen. And his argument is that,
969   "Well, Eric your book is already available." My book is available, my revised Karel, which
970   we have a little copyright notice on front of, "Is available through resellers on the Internet."
971   It's just there! You can get it, no problem, for people who don't have any connection with
972   Stanford. You know, it's just … that, for books … the whole publications crisis is enormous.
973   And you know, every year I get many complaints from parents who buy the 1994 C book
974   from Addison-Wesley. And they complain about the quality: "It looks like it's a
975   mimeographed off-print comic sort of style that Addison-Wesley is selling for $95.00!" And
976   I say, "Well, I don't have anything to do with that. They've got to make whatever money
977   they can because they're not going to be in the business long if things continue to go as they
978   are!" We'll lose publishers, we'll lose newspapers, and with it, the content creation that's so
979   critical. Blogs have their utility, but they're mostly concentrators for people who have put
980   money into generating that content. And when those content providers disappear, the
981   bloggers won't be able to replace it.
982 [95:38]

983 **B: Can I move you to a different area now? Because we really have talked quite a bit …**
984 **There are two places that we haven't mentioned. Have you ever … do you get grants**
985 **and what do you … is that … you haven't mentioned that as part of your …**
986
987 E: I've gotten some. It hasn't been that much of a career path. I've gotten, in fact, some very
988 large grants. I had a grant of over a million dollars over the life of the grant to develop the
989 computing curriculum in Bermuda. This was a grant from a consortium public/private
990 partnership in Bermuda, so there was some money … mostly not applied to Stanford,
991 because it's difficult for a foreign government to justify, but that, in terms of the total
992 expenditure, a lot of money was being spent in Bermuda by the government, but
993 supplemented by the companies in Bermuda that needed to find a way of training people with
994 IT skills on the island. Because the costs of relocating or bringing in people to Bermuda,
995 given the enormous pressure against population growth on the island. The fact that you're not
996 allowed, for example, to bring in a car. You know, all those things make it harder to recruit
997 off-island for that kind of person. And when, after years of Tory rule, the Labour party won
998 the prime ministership in Bermuda, there was a huge increase in the incentive to provide
999 indigenous black Bermudians — well, not really indigenous, I suppose, but the long-standing
1000 black Bermudian population — who are economically advantaged, you know, relative to the
1001 Caribbean, for example. Bermuda has, if not the highest, one of the five highest GDP per
1002 capita in the world and incomes are extraordinarily high. But they're so much higher for
1003 white Bermuda and the British Bermudian legacy of colonization than they are for the
1004 population, long ago, of African origin, that there was a new political imperative to change
1005 that.
1006
1007 And so, when we were contacted by Bermuda Ministry of Education and asked whether we
1008 could develop a curriculum … I mean, everything … all the stars were aligned to make that
1009 work and my courses, or the courses that were developed as much by my students as me,
1010 have been taught now for a decade in Bermuda to every high school student. And it's
1011 changed markedly the employment patterns on the island. And so we've used *Karel the*
1012 *Robot* there. We've used our Java technology there. We've built a really nice curriculum.
1013
1014 And, of course, there has been interest in that curriculum from all sorts of other places. Los
1015 Angeles Unified, the largest district in the country, has expressed interest, which we couldn't
1016 possibly satisfy. Bermuda is … we put together a national curriculum that looks like an
1017 experimental curriculum anywhere else. It's two high schools, that's all there are. A
1018 manageable number of students. There are, I don't know, 400 high schools in LA Unified?
1019 And the opportunity … the big cost … what we ended up spending most of our money on is
1020 not paying graduate students to design a curriculum — I mean, that's cheap, relatively — to
1021 providing professional development opportunities for teachers so that they can teach the
1022 curriculum. That's where the money goes in doing good pre-college education. And you have
1023 to over-prepare. You have to train more teachers than you need, because some of them are
1024 going to leave schools. They have the skills to go out and make much more money doing
1025 much less work. "Let's do that!" So finding some way to make a self-renewing pool of
1026 teachers there. Each new generation is taught by the preceding one and making all that work.
1027 [100:41]
1028 **B: It coincides with your passion, so therefore you do that.**

1029
1030   E: It enables me to do things I couldn't do if I didn't get the grant …
1031

1032   **B: I suppose that may be the answer to the next question I have, which is what professional**
1033   **organizations are you part of and how do those roles affect your career or your**
1034   **aspirations for the discipline?**

1035

1036   E: Well, I've been heavily involved in a number of positions for the ACM. I was chair of the Ed
1037   Board for a couple of years. I was on the Board of SIGCSE, which sponsors this conference,
1038   for a number of years until I took on the Ed Board role. I was the principal author and mover-
1039   and-shaker for the Curriculum 2001 computer science volume. I did the Java Task Force
1040   leadership. So I've had a number of leadership roles in the professional society. Mostly
1041   because I think that those are important to disseminating and making it possible to have
1042   success with the materials that we have been able to generate. And if they are going become
1043   more widespread, they have to have some kind of backing. And professional societies are one
1044   possible approach. So are leading universities. (And I actually think that it might even be
1045   more successful if Stanford were to sort of endorse a curriculum. That's just the way that
1046   these things work.)

1047

1048   But you need … you can't be working alone. This may come out of my political history.
1049   Michael Harrington said, "An unorganized socialist is a contradiction in terms." And so
1050   having been schooled at organizations through the political side, I think that we need to
1051   organize ourselves professionally, because the whole is greater than the sum of its parts. I
1052   was the president of Computer Professionals for Social Responsibility for six years and was
1053   on the Board for more than ten. I don't do anything with them now, but was very active in
1054   the 1980s and 1990s. I'm on the Board of an organization that looks at … looks to develop
1055   the commitment that students have in the sciences and technology for using their work in
1056   ethical and socially productive ways. It's … the organization is called Student Pugwash,
1057   named after Pugwash Conferences International, recipient of the 1995 Nobel Peace Prize.
1058   This group of senior scientists internationally that came together in 1957 around nuclear
1059   issues. That was spawned by a manifesto by Bertrand Russell and Albert Einstein. That
1060   organization is still looking to bring students together internationally to think about how
1061   science can be used in socially productive ways. So I've had a lot of involvement in such
1062   groups, which is probably why I tend to go home around 11:00[pm] after I get up at dawn.

1063

1064   **B: It doesn't sound like you need a whole lot of sleep.**

1065

1066   E: I need more than I get, I'm sure.

1067

1068   **B: Can you talk about any of the challenges … you've talked about a few: the challenge of**
1069   **too heavy a workload and not enough people to hire when you were at Wellesley.**
1070   **You've talked about some of the challenges a bit at Stanford, but not much. Have you**
1071   **had challenges that have made you rethink your career or that …?**

1072

1073 E: Oh, absolutely! And I'm in the process of having more of them. I believe that the work of
1074   programming is getting substantially harder year by year. Not all of it. I believe it is far easier
1075   than it used to be to get 90% of the way to where you want to be and just wildly harder …
1076 [105:19]
1077 **B: That 10%.**
1078
1079 E: … to close that gap. Debugging is just qualitatively harder and different than it used to be.
1080   The kinds of problems I spend my debugging time on wouldn't have existed 15 years, 20
1081   years ago, and you get to these things which only come up when there's the wrong kind of
1082   concurrency on network applications. And that when one person is using a browser and
1083   there's this distributed system that involves many different layers. Almost every faculty
1084   member in computer science has talked about how their students, in the beginning, believe
1085   that the mistakes, the fault "dear Brutus" is not theirs. That whole question. You know, "The
1086   compiler is doing it wrong here!" And we carefully explain that, "No, it's not the compiler
1087   that's doing it wrong." I believe that now 15 % …
1088
1089 **B: We used to say the hardware failed.**
1090
1091 E: Right. Or something like that yes. But it can't be in ourselves.
1092
1093   And I believe that approximately 15% of the problems that I've chased down now are bugs in
1094   code that comes from the manufacturer of … whatever it is that I'm using. Java is full of
1095   bugs. It's gigantic. I don't know that the bug rate is any larger than it used to be. But
1096   certainly the corpus is so huge that — and no one understands it all — and so you're in this
1097   position … Here's an interesting difference. I've talk about these things in code developed
1098   with someone who works at Google. The idea that when you're debugging there are two
1099   seemingly related, but not necessarily distinct, activities. One is finding the bug and one is
1100   fixing the bug. And what all of us were trained to do is to find the bug and then fix it. But
1101   nowadays those are separable. I have many, many bugs that I can find, but not fix because
1102   I'm not allowed to reach inside where the bug is and fix it. The whole encapsulation process
1103   that object-oriented programming has led us to has, I think, made it much more difficult to
1104   fix the things that are wrong. You send an e-mail message to the … to Sun or whoever is the
1105   person in charge of it. And then three years later maybe it gets fixed. The time cycle is just
1106   not … so what you end up doing is coding around that problem.
1107
1108   But in some ways the other disconnect is even odder. That I find that there are many bugs
1109   that I can fix, but not find.
1110
1111 **B: You don't know why it happened.**
1112
1113 E: Right, I have no idea …
1114
1115 **B: But this makes it work.**
1116
1117 E: … and found a work-around, I mean, whether it's …
1118

1119　**B: A good one!**

1120

1121　E: … better than a window in the bathroom [referring to having earlier helped the interviewer
1122　　　fix a problem with the bathroom window in her hotel room], we don't quite know what we're
1123　　　doing here, but that seems to fix it. It is something that happens in software all the time. And
1124　　　there's this … I think, a certain loss of satisfaction, or things seem a little less, you know,
1125　　　elegant, if you're in that position as much of the time as I think we seem to be … I spend
1126　　　more time …

1127

1128　**B: You spoke of the passion for programming, that that talk of passion seems to come**
1129　　　**from our generation. And I don't hear the word love or passion used as much with the**
1130　　　**next generation. Are you attributing this in part to that …**

1131

1132　E: Well, I think that's because it is more frustrating than it used to be. When you discover that
1133　　　there's a bug that "if only," or a work-around, that's more common. One of the things that
1134　　　happened in the Java Task Force was that we absolutely wanted to be able to determine the
1135　　　name of the main class or, equivalently, as it turned out, to be able to determine whether a
1136　　　class was loaded already. There's a method that would give that to you. And if only the
1137　　　designers had decided to make it public, we would have access to it. It would save enormous
1138　　　amounts of coding. But in someone's idea of what clients ought to be able to do, that was not
1139　　　part of it. And that kind of frustration … you know, I can see it, I can almost taste it — "Why
1140　　　didn't you give me access to that?" — is a frustration that I don't think we had in our day. As
1141　　　I said, when you're coding at the client level of web applications and are writing JavaScript
1142　　　code, 90% of the code, by the estimates that I've seen, goes into type casing for browser
1143　　　incompatibility: "If this is Internet Explorer before version 4.0 do this. If it's version 4.3 then
1144　　　do that. And then if it's Netscape give up here! And if it's Opera, you know, do something
1145　　　else." That is not interesting and edifying programming. And it's impossible to make it
1146　　　elegant. Moreover, it's impossible to make it stable over any long period of time because
1147　　　new versions are being promulgated all the time and no one can keep up. So that's a
1148　　　frustration. The lack of any convincing way to create a legacy in software is difficult. You
1149　　　know, that everything that you build is ephemeral and will be obsolete, if not on the day it's
1150　　　delivered then some …

1151　[111:40]

1152　**B: … day before …**

1153

1154　E: Right, some time not so different from that, plus or minus one, right? And that I think people
1155　　　find, you know, difficult to really work hard if that is in your way. I mean, it's very lucrative.
1156　　　But being in management is more lucrative, even companies where the rhetoric is that "code
1157　　　is king," you know the Microsofts and the Googles of the world. It's still the case that the
1158　　　management track earns more money faster, and people who may have liked the technical
1159　　　part at one time just are captivated by the pattern of advancement. Or the number of people
1160　　　from computer science and physics that prior to last year's meltdown went into the financial
1161　　　services industry or working for money management or hedge funds or quantitative funds
1162　　　and helped precipitate the economic collapse that we are dealing with worldwide. All the
1163　　　incentives were wrong. You could be creative, you could be … you could work very hard,
1164　　　but not as hard as I think most of the proto-Morlocks who sit in front of their screens and just

1165   code are forced to work. So it's very hard. I don't know. I mean, I'm not always sure that I
1166   can recommend this discipline to my students.

1167

1168 **B: That will be one of our final questions, you tell me a little bit about that. I'm instructed**
1169   **to ask you about: (A) first, any compromises you think you've made in your career …**
1170   **things that you would have done differently, but not …**

1171

1172 E: Well, I mean there are certainly things that I wish I had done differently. But the question is
1173   could I do it … had I known the right … this is the perfect information here, could I have
1174   known better? I'm not sure that I can identify any of those. I think … I probably, in one case,
1175   I think I probably should have left the research lab two years before I ended up going back
1176   into teaching. It was obvious to me that I was not doing what I loved and … but …

1177

1178   But I don't know, I did make this decision to hitch several of my wagons to the Java star and
1179   I don't think that that was necessarily correct. But I think … I mean, many people believed it
1180   even more strongly than I did … and it was probably the best opportunity that we had at the
1181   time. You know, it's a question of when … for bridge players, [knowing to play for the drop]
1182   rather than take the finesse requires you to take the percentage play or peek, but, you know,
1183   that's cheating! When someone gets lucky after doing it wrong, you don't want to try to
1184   reinforce that behavior. People are lucky all the time in every discipline. But I think that I
1185   made strategic choices that were right.
1186   [115:28]
1187   I don't know how this is all going to play out. You know, I'm certainly eligible to retire. I
1188   don't know that I'm going to do that anytime soon because I … you know people are, and
1189   should be, working longer now than they did a generation ago. And I'm still … I think …
1190   you know doing a great deal of good for those students. They may be particularly the ones
1191   who are taking my courses in other kinds of things … at least serving as a role model for
1192   someone who can be interested in humanistic sides of what people think about.

1193

1194   The other … the course that really sort of started me on that vein at Stanford was a course
1195   that I haven't taught for almost a decade. But a course called, "The Two Cultures: Bridging
1196   the Gap." Drawing on C.P. Snow's very famous 1959 essay about the split between the
1197   technological / scientific / intellectual pole on one side and literary / intellectuals on the
1198   other. I got together with a professor of English to teach a course in which we each … not
1199   just talked about the passions of our own field, but talked about our passions with the other
1200   field and how being familiar with each could generate new ideas. And since almost all real
1201   breakthroughs come at the interstitial boundary between disparate fields, being able to move
1202   back and forth in different areas and having at least some … you know, understanding of
1203   how intellectual activity has worked. I mean, having studied Latin, having, you know, been
1204   able to read philosophy, having read as much as I have, is really important to me. I would
1205   never have wanted to do anything else but that. And I think that that decision was right. And
1206   there's partly a passion that I want to make sure that other people at least are exposed to that
1207   possibility. To know that they can be successful at an institution like Stanford and still try to
1208   be broad and not be so narrowly focused as so many people are at any institution of that sort,
1209   because we need … for a new renaissance, people who are thinking in that broadly … broad
1210   and diverse way.

1211
1212 **B: You have kind of led into the next area that we usually like to dig into a bit. You**
1213   **haven't mentioned another passion that I know you have. And that's film.**
1214
1215 E: Yes.
1216
1217 **B: Is it still a passion of yours?**
1218
1219 E: Well, I mean it is. I mean, I love film. We do still go to see, you know, many films, usually
1220   more than one a week. Lauren and I both tend to work long hours and so we get together at
1221   … for the 10:00 o'clock [pm] show of something. And we're extraordinarily fortunate in
1222   Palo Alto in having 5 theaters that show non … you know, that are not showing just the
1223   Hollywood blockbusters. And to have a theater that doesn't show anything other than
1224   essentially films from the 1930s and 1940s.
1225
1226 **B: Has the Internet … did you use any of the Internet film providers, like Netflix?**
1227
1228 E: Netflix. Not so much, because partly I actually prefer to see films in the cinema. So … and
1229   we have that opportunity, which of course most people who don't live, you know, where
1230   David Packard used his family fortune to make this wonderful, wonderful resource, and
1231   make it available so inexpensively, you know it's just … that's tremendous.
1232   [119:58]
1233   The film passion I think comes out of the fact that so many of my family members worked in
1234   the motion picture industry. My great uncle is George Seaton, who directed, among other
1235   things, "Miracle on 34th Street." And that I grew up knowing those people. My grandmother
1236   was … her role is to be the drama and dialect coach for mostly non-US actresses working in
1237   Hollywood; Ingrid Bergman, for example. And so that I got actually to know a lot of those
1238   people.
1239
1240   So I, you know … this was an exciting life. It was at least as exciting as my father's faculty
1241   life. And so growing up around that and without him … my father's brother is a director and
1242   producer, as well as my great uncle. So I liked it. But I also think that there's something, I
1243   don't know if it's genetic. I made a number of documentary films, none of which will ever be
1244   released because I did the fun part. I made the film. I did not secure any permissions, which
1245   is what … you know, it's almost like programming today, you know, that you have to spend
1246   so much of your time doing things that weren't part of the creative enterprise. I love film
1247   editing, you know, and I've made re-cuts of lots of different documentary or, you know,
1248   sometimes other kinds of footage, so to make films, mostly about political history or music,
1249   history, folk music. So that those have been a passion, but I haven't done much with it
1250   professionally.
1251
1252   Every course I teach outside the field certainly neatens up what's in the field … have films
1253   that go along with them, because I tend to know the films that might apply. But that's the
1254   only way in which it's been part of my computer science work. I despair of the paucity and
1255   poor quality of the visionary films in computer science. I think we need more, but I don't
1256   have the time or the connection to resources that would be possible to make just the much

1257   better set of … and I don't think I have the talent to you know make good visionary films
1258   about the future of computing.
1259
1260   **B: You've started to touch on it, but let's finish on the outside interests. You and Lauren**
1261   **have no children.**
1262
1263   E: No, we have no children.
1264
1265   **B: How has that affected your life?**
1266
1267   E: Well, I mean obviously I was …
1268
1269   **B: Has it allowed you more freedom to …**
1270
1271   E: Well, of course it does. This is a choice that we didn't … you know, it was in some ways
1272   made for us, you know, medically. But … I certainly thought when I was younger that I
1273   would have children. But you know, it wasn't possible. And so we decided to make the best
1274   of that, of course.
1275
1276   **B: I don't see how you would have had time. Your days are so full**!
1277
1278   E: Well, surely not having children has made it possible to pursue with the single-mindedness
1279   that I like for other things. And one of the things that we've been doing recently is trying to
1280   connect better with our nieces and nephews. Lauren has no surviving family at all, but I have
1281   two siblings, both of whom have three children. And that makes two apiece; no population
1282   growth there! So what we've done is we've been inviting one niece or nephew over to the
1283   U.K. for a week. We have so many frequent flyer miles that really …
1284
1285   **B: How wonderful!**
1286
1287   E: … we just do that. So we have a nephew coming this summer and one last summer and a
1288   niece the summer before that, since we live in England each summer. And we get to show
1289   them around London and Oxford and usually some other part of the country. And our visitor
1290   this summer really wants to visit Liverpool, not just because the Beatles were from there, but
1291   because the Liverpudlean football team is very — soccer team, of course, depending on
1292   where this is being listened to — is … has this very intensely loyal local fan base and he saw
1293   news about that. And that's interesting because I know nothing about it.
1294   [125:30]
1295   **B: Enriches your life**.
1296
1297   E: And I'll get a chance to see that. My niece Kate was in London and the kinds of things that
1298   she wanted to see were … I mean, I thought I knew … I do know London well, relative to
1299   what any American is likely to know … but you know, I had never been to Madam Tussauds
1300   waxworks — Why would one go? I had no idea! — but that's what she wanted to do, so as a
1301   … you know? So it was fun.
1302

1303 **B: Wonderful. Two last things, and they are both very much related. You've read all this**
1304 **science fiction and you've been part of future visions. In two paragraphs or less what**
1305 **would be your Utopian vision of the way that computer science education is going to**
1306 **go?**
1307
1308 E: The Utopian vision of the way it's going to go?
1309
1310 **B: No. You have control, Utopia is coming, what is it?**
1311
1312 E: For computer science education. Well, certainly we need to find a way to change. You know,
1313   I think that academia needs to put more energy and, I think, consortia of company and public
1314   investment needs to go into finding ways of making the practice of our discipline more fun
1315   than it has been recently. You know, ways of building better tools and then supporting those
1316   tools. I think the biggest problem facing academia is that we can't support good tool
1317   development. I mean, if the fiber … I mean, the problem with the Java Task Force libraries is
1318   that it's a full time job or several to maintain them. And if you … had there been more of a
1319   … if they'd been more successful, maybe we could have found a way to get companies to
1320   pay for that. But I really think that non-market entities have to pay for that. It's not going to
1321   be institutions but maybe we will get federal or state support in better times; nothing's
1322   getting paid for now. Were it possible to take the ten best pieces of software or software
1323   systems that are produced in the universities and turn them over to some company that's
1324   compensated by grants to keep them running, it would make people much more likely to
1325   develop those things.
1326
1327   Open source software works in many disciplines, but I think it's been singularly unsuccessful
1328   in computer science education because the skill base among — in terms of programming —
1329   among a lot of the faculties isn't up to doing that, sad to say. And so I think that having those
1330   tools available and supported and … we see it in some cases. We just, of course, missed the
1331   Alice and Scratch face-off here [at the ITiCSE conference where the interview was
1332   conducted]. We need more of those things. Alice is having — I'm revealing state secrets here
1333   — trouble getting the next version out and making it stable. I think everyone knows that. And
1334   if you talk to the insiders, you know that there's a crisis in terms of supporting that kind of
1335   thing. Now, Scratch comes out of an institution that is famous for being able to roll over, you
1336   know, the next generation of hacker into sustaining …
1337
1338 **B: Somebody might be listening to this five years from now. Maybe you might want to talk**
1339 **a little bit about …**
1340 [129:44]
1341 E: Well, you have at the Media Lab at MIT the … a group of people that are extremely creative
1342   and have done a lot of work going … dating back all the way to the project LOGO. First, you
1343   know, attempt to use technology in teaching, you know, at a very young age, the ideas of
1344   algorithmics. And I think that Scratch, as much as anything, is the inheritor of that base at the
1345   Media Lab and Mitch Resnick is really good at what he does. I have tremendous respect for
1346   both the people on the Alice team and the Scratch team. And they're doing wonderful stuff.
1347   Scratch, of course, uses a more open source idea. I mean, one of the things that's so amazing
1348   about that is that contributions from the user community, which then are available for other

1349   people, and the Web 2.0 style of implementation. I think that has greater possibility for
1350   momentum. But it can … and, sad to say, the Alice effort was certainly given more visibility,
1351   if not, you know, more resources, through the tragedy of Randy Pausch's death. You know,
1352   everybody knows about this work a little bit more than they would have otherwise. But it
1353   would have been better had the National Science Foundation said, "Wow, these things are
1354   really good! We will keep them running somehow." And let people move on to other things.
1355
1356   You cannot afford, as a creative researcher, to undertake things that will only be millstones
1357   you know for the next, you know, decade if they are going to survive. And that's a perennial
1358   problem we … for example, in one of our iterations of the introductory course there was a
1359   piece of software, I won't mention which one, that was getting a lot of really good publicity.
1360   And we decided that we would go with it. And a year later, it had vanished from the scene
1361   because no one was there to provide that support.
1362
1363   One of the Utopian visions is the idea that we need a Samurai class that's the Bacon's Utopia
1364   or modern … H.G. Wells's modern Utopia for that matter, both have a house of Solomon or
1365   a Samurai class that will keep things running. And that, of course, needs to be paid for, it's
1366   not clear where the revenue stream is, but it's a public good. And there's been no focus on
1367   providing public goods in the educational community. We absolutely need them. And so if I
1368   had to pick one thing that would be it.
1369
1370 **B: Thank you. The last question you started to answer, so I might even be able to predict**
1371   **your answer, but if you had advice to give a young person who is thinking about going**
1372   **into computing … one short …**
1373
1374 E: Well, the fun is really there. I mean it is possible to do more magic in computer science than
1375   in any other field I know. I mean, it's just … with … starting with nothing except the talents
1376   that you bring and the creativity that you bring to make amazing things happen is
1377   unparalleled. So, of course if you can do that, that's absolutely what you ought to do. But the
1378   advice is to make sure that it stays fun. If it isn't fun, then you need to find a way to make it
1379   fun again. And that sort of restoring the passion, beauty, joy, and awe that we've been talking
1380   about ever since that first came up at SIGCSE some years back. This is, I think, the key to it.
1381
1382 **B: And finally, if there were one story that you — about you or your career what — that**
1383   **you would be remembered, everyone would say, "Oh, Eric Roberts, yeah!" What would**
1384   **it be?**
1385 [134:46]
1386 E: Well, I expect it to be the Curriculum 2001. I mean, I think that that worked. I was very
1387   happy with the way that that worked. And it's still getting a lot of use. Less in the United
1388   States, I think, than in the rest of the world, even though we wrote it with a fairly US
1389   perspective that was unavoidable, given who we were. So I think that that's what it is now. I
1390   mean, I've always believed that this book that I'm working on and have been working on for
1391   almost a decade … to combine in with some narrative flow all the things that I think are the
1392   greatest ideas in the computing world, would be my best contribution. But I have to find
1393   ways of making it real. I mean, one of the decisions, to use Java in that, which I have

1394 abandoned now because I don't think it's right, meant that so much of the work that I had
1395 done needed to be re-done and the re-tooling.
1396
1397 Maybe even going back to that earlier question about what we need. I think … I'm becoming
1398 convinced that it's impossible to have the full range of specialties in a single individual that
1399 one needs to really make the kind of progress that we should be making. I'm an expert, I
1400 mean, just really a coding expert in several different languages. Certainly in C and C++ and
1401 Java, those environments. I feel that in order to build a successful textbook today, I cannot be
1402 merely a competent user of PowerPoint, but need to be an expert in it. And I don't mean
1403 some visual technology. I mean that Microsoft product, because every publisher wants there
1404 to be slides that work in what has become, by default, and by the network externality that
1405 favors the leader, you have to provide those with a textbook today. And if they are going to
1406 work for a relatively, you know … an overworked community college faculty member who
1407 is teaching three preparations per quarter in California, or five, you know, whatever it is, you
1408 cannot afford to put your own materials together, you want good ones. So as the author I
1409 have to be, I think that I have to be that. I believe that I have to be an expert at web
1410 development in order to have good resources for … and you know up to a point, there's a lot
1411 excitement in learning those technologies. But there's too much to hold in my head and to
1412 keep current. So anyway… that's gotta … I mean, I would like that to be my legacy when I
1413 get it done.
1414
1415 **B: Well, Eric, we spent a long time and I thoroughly enjoyed this. We really thank you for**
1416 **being part of the project.**
1417
1418 E: Well, I'm flattered to do it.
1419
1420 **B: Thank you for the interview.**
1421
1422 E: OK. Well, thank you, Barbara for doing it. I think this is important.
1423 [138:21]