

Computing Educators Oral History Project

An Interview with *Susan Gerhart*

Conducted Monday, 10 March 2008

At Austin, TX

Interview Conducted by Vicki Almstrum

Copyright Statement

This manuscript is being made available for research purposes only. All literary rights in the manuscript, including the right to publish, are reserved to the Computing Educators Oral History Project. No part of the manuscript may be quoted for publication, except by the interviewee, without the written permission of the Director of the Computing Educators Oral History Project.

Request for permission to quote for publication should be addressed to Barbara Boucher Owens, either by email at ceohp@ceohp.org or via postal mail at Computing Educators Oral History Project, Southwestern University, P.O. Box 770, Georgetown, TX 78627-0770 USA. The request should identify the specific passages to be quoted, describe the anticipated use of the passages, and identify the requestor.

We recommend that this oral history be cited as follows:

Susan Gerhart, an oral history conducted in 2008 by Vicki Almstrum, Computing Educators Oral History Project. Online: ceohp.org.

- 1 [0:00]
2 **V: So, to put the official start on it, this is an interview with Susan Gerhart from her own**
3 **company, apodder ["A-podder"]; is that the way to say it?**
4
5 S: Yeah, apodder.org is basically a website, the name for the activities I am doing.
6
7 **V: And we'll be talk more about that. This interview is being conducted by Vicki**
8 **Almstrum. This interview is being recorded on March 10, 2008, in Austin, TX at The**
9 **University of Texas at Austin. It is part of the Computing Educators Oral History**
10 **Project. Did we give and pronounce your name correctly?**
11
12 S: Say it again?
13
14 **V: Susan Gerhart.**
15
16 S: That sounds good.
17
18 **V: All right. So I'd like to start from your youth, your roots, and ask about your parents.**
19 **Did they have college degrees? The type of support that they gave you growing up ...**

Computing Educators Oral History Project (CEOHP)

20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65

S: My father grew up during the depression era and he was a scholarship student at Kenyon College [in Gambier, OH] for a couple of years, but he never graduated. And Kenyon College was a liberal arts college in the nearby town where he grew up.

V: And that town was ...

S: Mount Vernon, Ohio. And my mother was not ... never had college education. And she had worked in drug stores in Utica, Ohio ... was the town where I grew up.

V: So they had high school education.

S: Yes.

V: And your dad a couple of years beyond that.

S: A couple of years of college, right.

V: And what was your dad's field?

S: He was an accountant for Pittsburgh Plate Glass Company in Mount Vernon. Manufacturing glass. Sheet glass.

V: And you mentioned your mother worked for drugstores. What did she do for them?

S: Clerk.

V: OK. So it was not the medical side of it or the prescriptions ...

S: That's right. Retail. In a family-owned drugstore before the days of chains.

V: Yeah, way back, before chains. So your father had some mathematical leanings, since he was doing accounting.

S: Yeah.

V: And self-taught, essentially, after high school? Or the college he had was enough to help him?

S: Actually, I believe he probably got his accounting training during the War, during World War II. So he was in the South Pacific, as ... in the army, basically keeping track of equipment and things like that. So I think he probably got most of his accounting training in the military.

[3:45]

V: How long was he in the military?

66 S: Probably three years.

67

68 **V: And was this before or after you had come onto the scene?**

69

70 S: Ah, he was shipped out the night that I was born.

71

72 **V: No!**

73

74 S: Yeah! [chuckles]

75

76 **V: Oh my!**

77

78 S: So I don't think he saw me until I was two years old basically.

79

80 **V: So your mother had a period of being a single parent.**

81

82 S: Well, she was living with her parents and my aunt and uncle at that time.

83

84 **V: So you really had extended family as part of your early days.**

85

86 S: Yeah.

87

88 **V: Do you think that those family members had ... Part of where I want to go is the**
89 **influence that your parents had, but since there are such close extended family ties, it**
90 **could be interesting to hear what mathematical or scientific background they had that**
91 **might have helped influence you.**

92

93 S: Let's see, my aunt probably had the most influence there. And she was also in ... I don't
94 know if you would call it accounting ... but she ended up running the business office for a
95 rural electrification company. And nothing in particular mathematical there, but she was —
96 my aunt — was a very exploratory person, you know, go fishing and things, but there was
97 nothing that was mathematical in the family background there particularly.

98

99 **V: So you went to school for how long in Ohio?**

100

101 S: My entire elementary and junior high and senior high was in the same town, in Utica, Ohio,
102 and then I went to college at Ohio Wesleyan, which was about 45 minutes away from the
103 town where I grew up.

104

105 **V: Were you a good student?**

106

107 S: Yepp! The valedictorian type.

108 [5:25]

109 **V: Were you very active in other areas?**

110

111 S: In music, in the band and orchestra.

112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157

V: What instruments did you play?

S: Flute and piccolo. And some of the ... I believe the ... there was a science, (I think something like a science club), and science fairs, things like that, Girl Scouts, 4-H ...

V: Ah, 4-H ...

S: You remember that?

V: Oh, yes! So, what did you do in 4-H? Which areas?

S: I actually sewed a blouse once [chuckles]. And I think ... that led ... I don't remember whether the 4-H led to it, but to a summer job, actually, at a 4-H camp ... washing dishes. That gave me, sort of, my first job ... in being an assistant at a summer camp nearby.

V: About how old were you then?

S: I was about 16, ... 15, 16, 17.

V: So, as you went through elementary and junior and senior high school, what are your memories about the math and the science that you studied?

[6:55]

S: We had a very good high school math teacher ... two or three good math teachers ... one, in particular, that I can remember. There is a significant event that occurred here, which was Sputnik. And that occurred ... what was the year? ... in 1957. I graduated from high school in '61. So, after Sputnik there was much greater emphasis on math and science. And I think, unlike today, it was much more effective. It was really very concentrated. And so teachers were ... math teachers were ... they weren't gods, but they were much more respected and had much more responsibility to help the next generation. And there was ... the new math was coming along at that time, which was basically set theory. The math teachers really had the chance to do, I think, a lot more with the students that they could pick out as ones that would be good for math and science.

V: Were your math and science classes tracked in any way so that there was a special line for honor students and a separate one for others?

S: There was a college prep, and then there were a couple of us who were ... we had a chance to take a calculus course ... basically, sort of an individual-study type of calculus course, given by the math teacher. But this was a fairly small high school, so there were not a whole lot of tracks.

V: So, what size was the high school?

S: Probably the graduating class was about a hundred. And this was at the time that many high schools were being merged ... very small schools were being merged together into a larger

158 school, so there were people coming from different communities nearby, you know, about a
159 10-15 mile range, so that these were consolidating high school districts.

160

161 **V: Were there any of your teachers through elementary, junior high, and high school who**
162 **were especially significant, or another administrator at the school?**

163

164 S: Yeah, the Latin teacher was particularly ... I think particularly ... dynamic. She was a very
165 remote person in many ways. Silver hair and very ... she looked Latin ... like a Latin teacher
166 in many ways. But she worked us hard and, of course, I remember no Latin now, but it was
167 probably a more rigorous course than some of the others I had. And a physics teacher who
168 was young. I think this was like his first job right out of college, and he was very proactive
169 and took me to a science fair. And then the math teacher that I mentioned, who also was
170 fairly young and was trying to do the new math thing, what was new math at the time.

171

172 **V: Was this a man or a woman?**

173

174 S: Man.

175

176 **V: Okay.**

177

178 S: So, the only female high school teacher that I can remember having much effect was the
179 Latin teacher. Most of the teachers were male.

180

181 Then the principal of the high school, who again was probably on his first or second job, who
182 became the principal of the high school, was very supportive. And he was the one who got ...
183 he was a graduate of Ohio Wesleyan, and he kind of steered me, he and his wife steered me,
184 in that direction. Mainly from lack of other choices; I had no idea where to apply to college.
185 Ohio State was kind of the default school. And then Ohio Wesleyan was a liberal arts
186 college, because I got a scholarship there, that was the choice that worked.

187 [13:00]

188 **V: Before we move more into the college stuff, let's talk a little bit about your siblings. You**
189 **have a brother, I know.**

190

191 S: Mm hmm.

192

193 **V: Do you have any other siblings besides your brother?**

194

195 S: Two brothers, yeah.

196

197 **V: Yes, OK. And so where are you ...**

198

199 S: I'm the oldest.

200

201 **V: You're the oldest, and so two younger brothers. What were your interactions with them**
202 **over the years?**

203

204 S: Well, the one was 3 years younger ... 3 or 4 years younger. And then the other is 8 years
205 younger and he's the youngest one ... is the one who, well, I've been helping to raise his
206 children. We've been sort of co-parents, for about 15 years, of his children, so that
207 relationship remained close.

208
209 A significant thing was my mother was ill with Lupus for ... essentially from the time that
210 my younger brother was born until she died at age 62. So, in our youth we were sort of
211 taking, trying to take care of our parents, as well as ourselves, as they taking care of us.

212
213 **V: So, that added a lot of responsibility for you as a child.**

214
215 S: Yes, yes. And it made it difficult for my parents to do as much for us, as I think they would
216 have liked to do — although they certainly did quite a lot.

217
218 **V: Once your father returned from War, your family was in its own home, not quite as**
219 **intimately with the extended family as during the time he was overseas.**

220
221 S: Well, that's right. I mean it was a separate, a separate household, but in a small town you
222 know, everything was within blocks.

223
224 **V: Ah hmm. So, you had a lot of closeness to family over the years?**

225
226 S: To the ... to my maternal family, in particular, yeah.

227
228 **V: Did either of your brothers follow a mathematical or scientific path through high school**
229 **on into college?**

230
231 S: No, not really.

232
233 **V: No. So, do you think that you had the same educational training and were sort of**
234 **reinforced in the same way for your career aspirations as your brothers?**

235 [15:55]

236 S: I think I probably got more ... maybe got more, from my parents — encouragement from my
237 parents — in terms of college because I was just a very good student. It was kind of obvious
238 which route that should take whereas my brothers were more “iffy” on the scholarly side of
239 things.

240
241 But, the high school that I went to, and now in talking about this with you, I realize that one
242 of the effective things may have been there, that so many of the teachers and the principal
243 were early on in their careers, with the exception of the Latin teacher, so they were not so
244 much trying to make a mark for themselves, but they were much more, maybe, receptive and
245 fresh in the teaching that they were doing. And, because they were young in their careers
246 themselves, you know, they were looking for one or two good students that they could push
247 along and claim as successes. And, because it was a small school, there wasn't a whole lot of
248 competition there.

249

250 **V: You mentioned the Girl Scouts and 4-H. Were those influences, as well as church, or**
251 **any other activities that you did, formative in taking you towards what you became**
252 **eventually?**

253
254 S: I don't ... I just don't remember that much of those two. Uhm, no.

255
256 **V: No.**

257
258 S: It certainly broadened the activities that I did, but there was not anything that I remember that
259 contributed specifically to science or technology careers.

260
261 **V: I can glean from what you've said that there weren't so many outside activities at the**
262 **high school itself. There was band that you've mentioned, but there weren't the**
263 **proliferation of clubs and activities that exist now.**

264
265 S: Yeah, I think that's true. I think that partially because this was at a consolidation time that the
266 clubs were not as in existence ... but, also, that it was just small. It would be very hard to get
267 together enough students to even make a band.

268
269 **V: Interesting.**

270
271 S: Some people got drafted to be trombone and they didn't want to be trombone, but, you know,
272 the band leader had to find enough people to give him a full-scale distribution across the
273 instruments.

274
275 **V: Yes, it doesn't sound the same if there are no trombones [laughter].**

276
277 **Let's see ... so on to your undergraduate education. You talked a little bit about why**
278 **you chose Ohio Wesleyan. Do you want to say anything else about that?**

279 [20:05]

280 S: It was primarily the influence of the principal. The proximity, but the distance of 45 minutes
281 was enough so that, you know, I wouldn't pop home all the time and I would live pretty
282 much like most of the students on the campus, but I wasn't that far from home in terms of
283 travel expense ... and the scholarships that were available to me. I ...

284
285 There's one important event that happened here. Right after high school (and probably this
286 was set up where the information was provided by the high school itself) I had the
287 opportunity to go to a National Science Foundation Summer Institute for high school
288 students. It was, I think, juniors and seniors. And that was at Southern Illinois University.
289 And, again, this was in the Sputnik "we've got to have more scientists and engineers to beat
290 the Russians" and Cold War type of mentality. There was a sense of urgency there. And so,
291 in that program I ... I don't know ... I took some science program, physiology or something,
292 I don't remember, but I also had a computing course. So, this was in 1961. And this was a
293 course taught by ... the Summer Institute courses were taught by regular college professors,
294 and they were, you know, they were not dumbed down, but, you know, shorter courses and
295 geared toward high school students, getting high school students interested in math and

296 science. And we basically learned how to program an IBM 650. So, there were about, maybe
297 10 students in this class. And this was, you know, at the very beginning of time with respect
298 to learning how to program. I don't even remember which what language it was, but it was
299 probably a Fortran or a Fortran dialect. It might have been assembly language. But we had to
300 program a few loops. And that really drew me in. That was a moment where I got hooked
301 because just the sense that you could program a loop that could do an array of any number of
302 any size, any number of numbers, just seemed to be such a fantastic thing. And, though I
303 didn't realize it as much at the time, but the other side of that question is: "So you can add up
304 all the numbers. How do you know you've got the right answer?" Which became the basis
305 for my later career of program correctness.

306
307 So, being able to program just seemed to me like the most natural thing in the world.
308 Programming ... I just took to programming. I had that introduction and then whatever
309 problems were assigned were ones that were interesting enough and hooked me. And we got
310 our hands on a machine ... I don't remember ... it must have been punch cards ... and we ran
311 our programs and we were hands-on. That was the defining moment, probably, in my career.
312 And from that, when I went to college, then it was natural to move on to math, being the
313 closest thing. So, that was an important ... the most important point ... the defining point ...
314 And that goes back, I think, very interestingly, to the effects of Sputnik and then to start up of
315 these National Science Foundation Summer Programs and then having some college teachers
316 drafted into, or given the opportunity, to teach those courses, and having the availability of
317 the computer.

318 [25:20]

319 **V: Something that was significant.**

320
321 S: Yes.

322
323 **V: So, when you arrived at college you knew math was the direction you were going, it**
324 **sounds like.**

325
326 S: Well, math, mainly by virtue of being the closest thing to computing. I didn't ... never really
327 liked calculus and differential equations.

328
329 **V: Mm hmm.**

330
331 S: And later on in my career, when I had the opportunity to learn logic and set theory, that was
332 the branch ... more discrete math was what I liked. And then statistics, too; there were
333 statistics courses. But, as I was in college, the chair of the math department there was very
334 forward-thinking and he got in a computer, an IBM 1620, which ...for students to use. It was
335 also the IT machine ... it was *the* computer on campus. And I don't know whether he got it
336 by donation or if the school bought it, but again, by virtue of there being not too many
337 students taking courses, and by having him offering, and he had a particular interest in
338 programming, and he also had a woman professor for at least one year — I don't remember
339 how long she was there, it was not the whole time — but she taught programming also. And
340 that was, because there were so few students, it was almost like a personal computer in many
341 ways. I could go in any time to the computer room and have access to the IBM 1620. When I

342 became a senior, when I did a senior project, I did a compiler basically for that machine, so I
343 spent a *lot* of hours programming. And having access to the hardware in the ... and having it
344 ... it was a natural part of the courses, which was not usual at that time period.

345 [28:00]

346 **V: So, what was the compiler that you wrote?**

347
348 S: Well, it was basically kind of a dialect of Fortran. For some reason, IBM was ... with the
349 1620, was distributing the source code for their Fortran compiler. So, I didn't have a course
350 in compilers, but I went through [chuckles], kind of reverse engineered, the Fortran source
351 code and had different syntax, different statements. So, like a variation on the "if" statement.
352 So, it was not a wholly different language, but it was sufficiently different that I had to redo
353 all the parsing and everything in the compiler. And ... so, I learned something about
354 compilers, basically, by reverse engineering the source code and redoing it for a new
355 language. So, it was essentially a Fortran variation.

356
357 **V: So that was your senior project or ... ?**

358
359 S: Yes.

360
361 **V: Did you write a report about that?**

362
363 S: Probably, I don't actually remember. I suppose I probably had to give a presentation on it. I
364 don't remember that there was ... I mean, there was a little bit of a user's manual, but I don't
365 think there was a report.

366
367 **V: So, were there any instructors at university ... for those ... you did it for the standard 4**
368 **years ...**

369
370 S: Yepp.

371
372 **V: ... your bachelor's degree. Were there any faculty members who were significant in**
373 **helping you see your vision for where to go besides the President [chair] who had**
374 **brought in this computer? ... And I don't know how much influence he had.**

375
376 S: The key person was the math department chair who taught most of the courses and brought in
377 the computer and integrated it into the classes and then made it available also for students
378 like me. And I wasn't the only person who was influenced by this. I think there have been
379 Ph.D.s in computer science ... about one student every graduating class when there were like
380 5 or 10 graduating math students. So it turned out a very high proportion of Ph.D.s in
381 computer science. The other professors who were influential were largely liberal arts ...
382 because this was a liberal arts college. So I took science courses, you know, chemistry,
383 biology, but it was maybe, maybe the literature courses, or the professors in the literature
384 courses, were almost all female, that I took, as far as I remember. And they were just, you
385 know, good courses.

386
387 **V: Do you want to share the name of the math professors or any of the others?**

388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433

S: Robert Wilson was the name of the math professor. And he's still alive (I think) and I've run into his son at various times in my career. I don't remember the name of the female professor. I haven't thought of those names for a long time.

V: So, as you finished your bachelor's, what were your plans?

S: Well, you know, kind of for lack of anything else, and not having much of a sense of what the job market was like, I decided to go into graduate school. And I went to University of Michigan. They had the closest ... now, there weren't computer science departments in universities at that time, so there wasn't a natural progression there. And, you know, in math, in graduate school, was not what I wanted to do. I wanted to do more computer science. So, the University of Michigan had a computer and communication sciences program, which was very broad, it was like ... it had speech, it had physiology, it had some automata theory. John Holland was famous in complex systems and taught ... some sort of a course. This was pretty far out stuff. But I didn't really want to go on in that either. I had an automobile accident at that time also so I was injured and recovering from that, so I basically stopped with the master's degree at the University of Michigan and then I got a job, sort of an instructor, at the University of Massachusetts. And then, after that I ... by then computer science departments had come into existence, and so I went back to Carnegie Mellon.

[34:30]

V: So how long were you a lecturer at ... an instructor at the University of Massachusetts?

S: About a year and a half.

V: Teaching math, or ...

S: It was just the beginning of computer science there.

V: So, this must have been around '66, '67?

S: Yes, so that was about the time that the first textbooks on programming languages were coming out and automata theory as well was becoming an established field.

V: So, your exposure to automata theory was at University of Michigan. Is that when you really started becoming aware of the discrete math side of mathematics?

S: Well, actually, probably going back into college. I don't ... there weren't discrete math courses. Everything was calculus and differential equations, but it may have actually gone back to high school, with the math professor there who tried to teach us set theory and ... or at least that was a part of one of the math courses, like a junior-senior math course. And then also during college, yes, during college, I was a summer assistant at some more National Science Foundation-funded institutes that were taught there at the college. So I was like a teaching assistant. Of course, I had to learn the stuff too and it wasn't being taught in my college courses, so I think that there was a set theory course that was taught at that time ... in the summer institute at which I was a teaching assistant.

434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478

V: So you finish at [Ohio] Wesleyan, go to University of Michigan until you're sort of forced to stop there because of the recovery from the accident.

S: Yes.

V: Taught for about a year and a half at the University of Massachusetts. You gained some experience. It sounds to me as if you understood you needed to go on, that there was more to do with your education.

S: Yes.

V: Can you talk about that transition and realization?

S: Well, it was at that time ... now we are really tracking ... my development is tracking the development in the field in many ways. It was at that time that you could start to see that there were publications and a new field was really taking shape, that wasn't math and it wasn't a branch of any of the physical sciences or biological sciences. It was a distinct field in itself and because I was in tune with programming languages and compilers, and ... not operating systems ... but above operating systems, compilers, and assemblers, that seemed like ... that kind of defined a path. And so I applied. I was accepted at Stanford as well as Carnegie Mellon, but I went to Carnegie Mellon because it was close. It wasn't Carnegie Mellon at that time, it was Carnegie Tech. Because it was within 3 hours of Ohio, where I grew up.

[38:50]

V: So, you left University of Massachusetts and started in graduate school. Did you have a good idea of a topic yet, or did that develop?

S: No, I didn't. And at the time that my class, my cohorts at Carnegie, came in, for some strange reason they decided not to have as many courses. So we had an abstract algebra course, which was hard for everybody. And we had more programming languages, which was the main field there at the time. And artificial intelligence had a few courses, but not a whole lot of structure to the program. It was the faculty teach what they wanted to teach. So, Nico Haberman came in at that time and he taught operating systems and the curriculum kind of got defined by what the faculty wanted to teach, which was OK but it wasn't as structured and I think maybe as broad or as integrated as it might have been. But, we all kind of found our way through. Now, I was hoping to have Alan Perlis as my thesis advisor. And Alan was ... he left to go to Yale at about that time, so I had a kind of disjointed Ph.D. trail. That is, I got started on a couple of things working with him but they never matured before he left and by then I kind of picked verification of APL systems, and Don Loveland, who taught logic, got kind of drafted in as my thesis advisor. But Perlis was influential. People used to say, "Perlis has a lot of good ideas, but then Perlis has a lot of ideas and they're not all good." And I got kind of buffeted around among his many ideas as to what would be a good thesis topic.

479 **V: Did you begin knowing you were in a Ph.D. program or did you think you might be**
480 **going for a master's?**

481
482 S: No, it was definitely a Ph.D.

483
484 **V: Did you earn a master's along the way?**

485
486 S: Not ... not in that ... No. It was ... I believe it was pretty much strictly Ph.D.

487
488 **V: So you were part of a cohort that pretty much followed the same courses together.**
489 **About how many of you were there?**

490
491 S: Probably about a dozen.

492
493 **V: And have you kept in contact with many of those folks?**

494
495 S: Yes, yeah. So Anita Jones was in ... and we were roommates in graduate school and continue
496 as friends all the way since then. Larry Snyder is at University of Washington, Tim
497 Teitelbaum at Cornell. And I have seen these people many times over my career, and, you
498 know, watched what they've done.

499 [43:00]

500 **V: How many years was your Ph.D. program?**

501
502 S: About four years. Yes. Four, four and a half, I think ... it stretched. Yes.

503
504 **V: And, can you tell me anything about the process of developing your research and**
505 **writing your thesis?**

506
507 S: Well it was pretty painful because I ... Robert Floyd had been there and had left. I think he
508 may have been one of the reasons I wanted to go to Carnegie, and as often happens, you get
509 there and the professor you were interested in is gone. But he had created the field of ...
510 defined program verification, as ... it was called the verifying compiler ... in an article that
511 he wrote. And then there had been one thesis in that area and I was kind of trying to follow in
512 those tracks, kind of a merger of automated theorem proving and programming languages.
513 And I had been entranced by the language that Perlis was interested in at that time, which
514 was APL. So, I took verification of APL programs as my thesis topic and I thought I would
515 get the union of everybody that was interested in verification and everybody that was
516 interested in APL and I actually got the intersection, which was me and one guy in Israel and
517 another person somewhere else. It was not an optimal selection in terms of topics, in terms of
518 ... APL was, was an oddball but fascinating language and remains so today ... you know
519 with things you can do with operators. In my thesis I had a one-line Hamming code ...
520 Hamming encoder program ... you know, so it was all APL operators strung together, 26
521 operators or something like that to do a Hamming code. And that was the basis for the
522 verification ... some of the verification techniques that I was looking at. That was an oddball
523 language and it wasn't particularly interesting to the rest of the verification field either. I
524 mean, it didn't have much generality to it, I guess, is the problem.

525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559
560
561
562
563
564
565
566
567
568
569

V: You mentioned from very early on this idea of how do you know you've gotten the right answer as a precursor to your interest in verification. Can you reflect a little bit on how you became aware that verification was going to be the area in which you specialized?

S: I think probably Floyd's article on the verifying compiler just brought together a number of ideas there. There was a cartoon, I don't know whether it was in his article or it came separately, but it was something about, somebody was in the first frame of the cartoon, was, "We can now answer this great big question by adding or multiplying (I don't know) some large number of numbers" and then somebody else naively says, "But how do you know you've got the right answer?" And that just struck me as being a pretty fundamental thing to be concerned about. And also very hard to answer because if you are computing something, do you have a different way of computing it? You know, computing is a sum of numbers. Do you have a different way of doing it? And, Floyd's article was very obscure but it was clarified later in other work. I think Jim King's work, the use of assertions. That you have an assertion working through the loop that assures you that you're getting the correct result at the end ... mathematical induction.

V: And so, you were at University of Massachusetts teaching and you were already becoming aware that this was the direction you were going to go.

S: Yes.

V: So, you were pretty focused as you decided the programs to which you were going to apply?

S: Well, I just picked the programs that seemed to be the most relevant, the most interesting, yes. And it was computer science. By then computer science was defined.

V: So this was in the late sixties, or earlier?

S: Starting in '67, I think.

V: OK. It is interesting to me knowing about the computer science education timeline because Curriculum '66 is a defining moment. And then also knowing that Dijkstra line and all of the things that were happening in '67 through '71 there ... sounds just like it was an exciting time to be "you."

S: Yes, in probably around '70 or '71, Dijkstra gave a seminar in Albuquerque, hosted by University of New Mexico, and I was able to attend that. So, people have been finding out ever since then that they were at that seminar that Dijkstra taught and we didn't know each other but it was kind of a gathering place where people had similar interest and Dijkstra taught that. I remember that at the end of his (Dijkstra's) course he gave us a chance to pose a problem to him and I can't remember what the problem ... oh, it was like a ... organizing a family tree. You get the pairs of parent and child and you want to organize it into a tree. We

570 gave him that problem [chuckle] ... he didn't do very well with it. He had never programmed
571 those kinds of algorithms. He had a little trouble finding the assertions.

572

573 **V: Interesting.**

574

575 S: And it was just not a familiar data structure to him. Well ...

576 [50:45]

577 **V: Hmm ... Is there anything else from the time when you were a student that you would**
578 **like to share?**

579

580 S: Well, I think there was one more course that I took that was influential and it was philosophy
581 of science [at Ohio Wesleyan]. And I wrote a paper on mathematical induction in that course
582 also. And again there was a professor who was fairly young. And it was more ... the
583 realization that there was structure to theories of science, science had ... it wasn't just
584 something going on ... that there was structure to it. And I don't think I ever had a strict
585 philosophy course, per se (I might have), but I find that area very interesting now when I
586 look back at it, partially because I have a friend at Santa Monica College who is teaching
587 robotics in a philosophy course, so we talk a lot about the rules of philosophy and religion
588 and mind and things like that, that are the larger topics. And by having a ... I think having a
589 liberal arts education was critical to how I developed.

590

591 **V: I can see it in some of the things we've talked about as well now in how you're adapting**
592 **to your vision loss that that has had an important influence as well. So it's interesting to**
593 **get this filling in on some of those parts. So, now you've completed your Ph.D., that was**
594 **in '71?**

595

596 S: I think it was actually '73. The oral thing.

597

598 **V: OK. And so, after that your career ... isn't exactly a ping-pong match [chuckles] but**
599 **there are parts that are very clearly focused on education and parts that are clearly**
600 **focused on research.**

601

602 S: Yes.

603

604 **V: I don't know the easiest way to talk about those two aspects, so I'll leave it open to you**
605 **to start.**

606

607 S: Well, yes, I went from opportunity to opportunity. Not all opportunities turned out but the ...
608 why don't I just go through chronologically.

609 [53:50]

610 **V: That sounds fine.**

611

612 S: And then you can pick out what's interesting there and I'll try to highlight something. So, I
613 ... after I left Carnegie, I really didn't know exactly what I wanted to do. I wanted to go, for
614 some reason, to Canada. I don't know if it was the [Vietnam] war or whatever, but I spent a
615 year at the University of Toronto. And that gave me, actually, much broader exposure to

616 more computer science than I'd gotten at Carnegie. A different ... more like a British culture
617 of computer science. Then, my thesis advisor, Don Loveland, was ... became the chair of
618 Duke University and I was hired there ... very standard computer science curriculum
619 developing at that time. I taught, I think, you know, programming ... programming
620 methodology, became a sub-field around then.
621

622 After four years at Duke, I was not having a whole lot of fun. Not much social life. I liked
623 North Carolina, but I wasn't having a lot of fun and one of my graduate students, somebody
624 who had been a year ahead of me, was working at the Information Sciences Institute at USC.
625 And he liked a paper that I wrote on correctness-preserving program transformations. Also at
626 the time that I was at Duke I had a couple of summer jobs. One was at SofTech with John
627 Goodenough. That turned out to produce a paper that really brought a lot of attention to my
628 career. It was a seminal paper. It wasn't all that earth-shaking, but it brought together a whole
629 lot of ideas, so that was on program testing. And program testing kind of fit in with
630 correctness. They were thought to be opposing types of ... ways of doing things and I tried to
631 bring them together. And so I had ... and I also spent a summer at ICASE at NASA Langley,
632 where I got exposed to more NASA-type things.
633

634 But, I wanted to have a little more fun in life and went to the University of Southern
635 California with Information Sciences Institute based in Marina del Rey. And I lived in Santa
636 Monica and I had ... ah ... I was in my thirties at that time and I lived the single Southern
637 California life to the hilt ... and developed a relationship there, too. One of the things that
638 was neat about Information Sciences Institute was that a lot of the Internet work was going
639 on at that time. In very early periods I had a joint seminar between my verification project
640 there and Jon Postel's Internet protocol project. Jon Postel, I think, is one of the key figures
641 in the Internet. He died about 10 years ago, but he was a leader in the development of
642 protocols. We were trying to merge those two areas. And we did write some papers on
643 protocol verification. So I kind of got in sync with the Internet at that point. Let me stop there
644 and see if you've got any questions.
645

646 **V: No, this is ... OK.**
647

648 S: When I was at ISI I also got ... I was kind of a hot item for a while after the theory of test
649 data selection paper got out there and the program transformation work. I had a body of
650 papers ... publications ... and ... that were pretty interesting to a lot of people. So I got to do
651 some seminars at Newcastle in England and got more European exposure; got to go to a lot
652 of the [ICSE and IFIP] Conferences and really a much broader and more international set of
653 colleagues.
654

655 **V: Had you traveled outside of North America before that?**
656

657 S: No, no. I ... all my European travels were really for conferences. So, Information Sciences
658 Institute, we developed a verification system that was quite elegant and, mainly due to the
659 work of one of the people in the project who just had a flair for, you know, very good taste in
660 user interfaces. Now this was done in Interlisp. He later left and became a newscaster. He
661 was not interested in computing.

662 [60:00]

663 **V: What was his name?**

664
665 S: David Thompson. We had a good project there, and I was the project leader. Unfortunately,
666 as will happen with DARPA Projects, DARPA-funded projects, the funding shifted to
667 another field, so that came to an end. And, you know, you hate to have a project die. But, it
668 continued on a little bit. Actually, Dave Musser was the brains behind this, but he had left to
669 go to RPI. And he continued the project for a while but eventually it totally died. But it was
670 one of the first demonstrable prototypes and at one point in a magical evening a couple of
671 guys from MITRE, who were going around to the verification projects, trying to see if we
672 could verify a security kernel, and Dave Thompson and I and these two guys sat down with
673 our verification system and we verified this fairly significant little security kernel ... some
674 security properties of it. And, you know, it was the sort of thing where, you know, you just
675 sit down, you've got your system together, you get the minds who know something about the
676 project and know about the tool, and we did more in that one evening than I think we've ever
677 done in many projects where we ... you know, you plan, and you've got a strategy, you're
678 going to do this part and then that part, you're going to prove this and that. We just sat down
679 ... we just did it, you know, the energy flowed through it. That gave us another boost because
680 it was a significant technological accomplishment to be able to get through that.

681
682 So the ISI AFFIRM project died. And I went ... had a contact, Nancy Martin, at the Wang
683 Institute of Graduate Studies in Massachusetts. And so I ended up on the faculty there for
684 three years. So that was ... that was a good time. Also, because this was a Master's of
685 Software Engineering program. There wasn't a software engineering curriculum ... you
686 know, who knew what you taught in software engineering. There weren't any books. We
687 collected papers and used the papers and developed the courses and much of that curriculum
688 later became the basis for the Software Engineering Institute curriculum. In fact, you know,
689 some of the people went to SEI [Software Engineering Institute At Carnegie-Mellon
690 University] after the Wang Institute died. And so I spent three years there working with
691 projects and there I became interested in logic programming, which was starting to get hot
692 due to the Japanese fifth-generation project.

693
694 And I learned Prolog and I actually reprogrammed the verification system from ISI in Prolog.
695 And went to Japan, actually, for one of the fifth-generation projects. To me that was one of
696 the fascinating and lost treasures of computing, that logic programming was such a different
697 paradigm. And there wasn't much in the way of object-oriented programming at the time.
698 You know, you had imperative ... isn't that what it is called?

699
700 **V: Yes.**

701
702 S: Imperative programming, just very sequential, yet concurrent programming, and then logic-
703 programming rule-based approach which, to me, has been lost and could be ... have solved
704 ... many of the problems. Many of the systems we're building now would be built better and
705 more simply with a logic-programming or a rule-based approach. And that got me interested
706 then, when MCC [Microelectronics and Computer Technology Consortium] was formed, the
707 Research Consortium, and I had a contact with Les Belady, who was the head of the software

Computing Educators Oral History Project (CEOHP)

708 technology program, so I moved to Austin for several years — about six years, seven years
709 — until the software technology program ended in a very demoralizing way. I had a project
710 there, which was called ... *A Transition Study*. So, we had ... we put together ... our own
711 little consortium of about twelve or thirteen companies and government agencies, NASA and
712 NSA and Kodak and NCR and Digital Equipment and organizations who contributed a small
713 amount of money to learn about ... what was the variation of formal methods at that time.
714 But that project was not able to continue.

715
716 So, then I worked for about six months, one of my MCC colleagues put together a project
717 that was an international study. Him, Ted Ralston, Dan Craigen from Canada, who I'd
718 worked with for quite a while, and me, and we went and did interviews on how formal
719 methods (as they were then called) — so the verification term morphed into formal methods
720 — how they were being used in companies. So we talked to Boeing, the French
721 transportation company GEC Alstom, Lloyd's Register, and NASA Center at Goddard —
722 about twelve different companies, and that was another paper that ended up having a lot of
723 citations, because it was a structured empirical study, it wasn't that we did technology things,
724 we just interviewed people.

725
726 And, then I needed a real job and ... because that didn't pay very much ... and needed ... and
727 went to the National Science Foundation for a year. Nico Haberman, this was the ... he was
728 the Assistant Director of NSF ... he hired me to be the division director for what was then ...
729 I think it was called CCR then (Computer Computation Research). It was a theory and
730 software engineering program and I was at that time ... my niece and my brother, were living
731 ... started to live with me. My father was also in a retirement home nearby and I couldn't
732 maintain the Washington contact when I had everything in Texas ... all the family in Texas,
733 so I came back and took a job at the University of Houston-Clear Lake, as a director of an
734 institute. They'd been a part of my project at MCC and I developed a good relationship with
735 somebody from NASA, Bob McDonald, and Charles Hardwick, who was at the university,
736 and we ... so I sort of became the director of this institute. And that was a bad time for
737 NASA, with the companies, the space companies, coalescing, consolidating into the United
738 Space Alliance, or whatever it was, and money going away. So that died. Then for about five
739 years I worked on my own developing some search tools, software search tools. Did some
740 consulting, again working with one of the MCC colleagues.

741
742 But I was also having vision problems at that time. So at the time just as I was starting the
743 job at University of Houston-Clear Lake, I had a major retinal detachment and surgery and a
744 long recovery and had later vision problems, two or three times. But after a while my brother
745 and I decided we wanted to get jobs in the same area, and so we happened to pick Arizona,
746 moved to Prescott, where he ... his job was a casino dealer and I had a job there at Embry
747 Riddle University for five years. Then, about three years ago, I was fired by Embry Riddle
748 for lack of, they have ... uh ... ran out of students, just like many places. And we, we're not
749 on very good terms for reasons that related to women who were ... wanted to see the
750 University change. And I was having vision problems and it was a good time to get out of
751 there in any case. Since then I've been retired and learning a lot and continuing to program,
752 actually, in Java, continuing to develop a student project I started there, a pod catcher.

753 [71:45]

754 **V: So, in the times that you've been in classrooms and teaching, what have those**
755 **experiences been like?**

756
757 S: Well, if we work ... if we work backward from the Embry Riddle time, one of the interesting
758 things is the contrast in how structured, you know, computer science is now, compared to
759 what it was when it started out. In the beginning, you know, you didn't have textbooks and
760 exercises and, you know, standard curriculum. You know, you just pretty much had to put
761 together all your own material and to the best of your knowledge figure out what the course
762 was about. Now you can, you know, pick up any number of database books and you can pick
763 among what you want to emphasize. And it's all highly structured material. I love teaching
764 databases because that covers everything in computer science. You know from the logic of
765 SQL and operating systems in concurrency transactions and ER diagrams that cover software
766 engineering. And so, you know, I see the big thing now in computer sciences is the "pick and
767 choose" issue. You have so much structured material and it's a matter of what's your choice
768 of topics to emphasize to use the materials that you have available. To use the textbooks and
769 the ...

770
771 **V: Yes. Do you have a teaching philosophy that you can share?**

772
773 S: I think projects are extraordinarily important. When I look back at my career, when I ... the
774 project I did ... the compiler ... that I did, I actually wrote an assembler-type ... instructional
775 assembler-type project when I was at University of Massachusetts and I programmed again.
776 These were not programs in teams. But these were individual projects that I had. But, that,
777 you have to program enough to get into the complexity of the product, that you understand
778 what the technical problems are ... and, you know, so you'd have to be working. Now it's
779 mainly working in team projects to do that, which brings a whole different dimension. But,
780 you know, the thing I think is lacking in many curricula is there's just too many, you know,
781 just small exercises. And you have to have a big enough one to really teach you the
782 complexity, the hardness of the complexity issues, as well as to develop your confidence. So,
783 once you know that you can start a project, and you're going to get into it and it's going to
784 get horrendous, but you can ... you have to figure out then how to deal with those problems
785 and you can believe that you can get to the end of it so that you don't stop. So, I believe
786 students need to be given experience where they get into the messes and have to deal with the
787 complexity and make mistakes and fail. Working in teams, I think, is also very important.
788 And I used ... I used the ... what's it called? ... the team framework that ...

789
790 **V: Personal Software Process?**

791
792 S: Yeah, not the personal, but the ...

793
794 **V: Team Software Process.**

795
796 S: The Team Software Process. I just used the matrix that defined the different roles on teams.
797 And I did this, also, at the Wang Institute in a more informal way, but defining ... having
798 defined roles to follow, you know, manager and QA, and tried to get the students to ... not
799 necessarily to go with the role that most matched their personality. So, pick ... like if

800 somebody is more naturally ... like I had Air Force students often at Embry Riddle. And, of
801 course, they've got rank and you know who's going to be the leader and the manager. Well,
802 you put the manager in the QA department so they learn more about the technical stuff. And
803 you put somebody who may be, not necessarily, a leader type, but you put them in the
804 managers' role. And sometimes they find out they really hate doing that kind of work or
805 playing that kind of role, and sometimes they really take to it. But they learn some different
806 experiences from being in different roles. And I did this with the software engineering lab
807 and then later with the senior projects. So, a lot of ... of mix-and-match types of things,
808 where you have the role defined well enough so that they understand what their
809 responsibilities are and they learn a few techniques, but they also find out whether that's a
810 good role for them ... going on. And, also, they understand better when they are working in a
811 team. They're more empathetic about, more understanding of what goes on in a different
812 role.

813

814 [Added note: I did not use PSP or TSP in toto because I wasn't fully convinced of the utility
815 despite colleagues being devoted to the techniques. In addition, the process was too complex
816 in the context of limited course time. But that one matrix of team roles covered a lot of
817 management issues and got the projects up to spec with minimal overhead and also allowed
818 allocation of responsibility for failure.]

819

820 **V: How has your teaching style changed over the years?**

821

822 S: Well, toward the end I became very much the active ... what is it, active ...?

823

824 **V: Active learning?**

825

826 S: Yes, active learning. And I've always been ... liked projects vs. lectures. So in discrete math,
827 I would have ... only about half the period would be lecture or whatever, introduction to the
828 next topic, then cover some of the things in it, send the students up to the board in teams of
829 one or two or three and have them, you know, try to solve problems together with me going
830 around to coach them. And [chuckle], that backfires on ... and I took a course at a SIGCSE
831 on active learning and the guy who taught the course warned, he said, "Nobody knows how
832 to evaluate. They don't know how to evaluate that teaching style. Your evaluator comes in
833 and sees the students wandering around the room and 'Are they learning', you know, 'What's
834 going on?'" But I much enjoyed using that for a couple of years, because I think that they did
835 learn a lot more. I think I always put more emphasis on exercise, on picking the right
836 exercise, in having, you know, some sort of a significant project in the course. And a subpart
837 of the course, the database course you would build a little database at the end. And that,
838 rather than trying to cover the subject matter. I would make a judgment as to what was
839 important about learning, say databases, and forget the rest of the material that ... you know
840 ... their job is not to learn the field of databases in a research sense, but to get some blend of
841 the practical and the theory and as much of the subject matter as you can, but to try to get it
842 put together in some sort of a project. So in terms of change, you know, from the early days,
843 it's probably much more of a dropping, trying to cover less.

844 [81:50]

845 **V: Do you have any particular stories to relate about any of your students or any of your**
846 **classes?**

847
848 S: Well, one of the student stories was actually at Embry Riddle and it was a ... we had a
849 project. We got a grant from the National Science Foundation on computer security
850 education. This was in their Federal CyberCore or something, needing more education in
851 computer security going on, and one of the students and I worked one summer to ... he did
852 the programming, I didn't know Java at the time, but he learned it and did it. And we built a
853 buffer overflow applet that you could demonstrate in a computer security course. We put it
854 on the web and as far as I know it's still there and it's still being used. Actually it's being
855 used more outside the United States than inside the United States. But I learned so much
856 from this student, Jed Crandall, who, I think, is getting a Ph.D. in computer science from UC
857 Davis. And I've had this experience a number of times, that I like it when I can feel like a
858 colleague to the student. You know, when there is something I don't know, but they do
859 know. And we can work together as more like equals, in order to complete some project,
860 which it's usually a project that I've set up, but it's not necessarily that I am the leader, but
861 we are trying to work as co-equals.
862

863 **V: Professional organizations. What professional organizations have been significant in**
864 **your life?**

865
866 S: Well, I've been a member of ACM on and off. IEEE on and off. I'm a member of neither
867 right now because I don't read the print publications and I've kind of lost interest in trying to
868 get the digital versions of it. ACM harmed my career a few times. They published these
869 papers that were anti-verification and that influenced ... in the Information Sciences Institute,
870 at that time it influenced the DARPA funding. And it wasn't that they didn't have the right to
871 do the publication, it was that the papers were ... not ... the papers were attacking the field.
872 This was ... the Fetzer, DeMillo, Lipton, and Perlis papers were ... they were ... they were
873 not reviewed by ... they were kind of written in the factually ... factual sense when they
874 blended a little bit of what was real and what might be. They set up straw positions and were
875 ... I just thought they were biased and unfair papers and I've resented ACM ever since then
876 for that. These papers should have been reviewed more or had counter ... when they were
877 published, had the counterpoints published along with them at the same time. And the same
878 thing has happened with AI and other fields, but this was my field. So, I was a member of the
879 IEEE Board for *IEEE Software*, you know, did a lot of reviewing, but I've never worked
880 much with many of those professional subgroups.
881

882 I've, you know, on the women's side, been involved with Systems since the beginning, since
883 the bathroom.
884

885 **V: Yes.**

886
887 S: And ...
888

889 **V: Right here in Austin, TX.**
890

Computing Educators Oral History Project (CEOHP)

891 S: Right here at the Renaissance. And ... but that's also been on-and-off in terms of being
892 interested and posting and reading all the stuff. Now I pretty much read all the articles. I was
893 involved with the funding, actually, of Anita Borg when ... I think when she was trying to
894 get funding, or we had some of the early conferences, where we were defining the things that
895 NSF would be doing, and I worked with trying to set some goals there. I was a member of
896 SWE for a while, Software ... Society of Women Engineers. One of my students at the Wang
897 Institute, whose name ... Betty ... Betty ... Betty something [Shanahan], is ... she's the
898 executive director of SWE now. She was the one woman in the *Soul of the New Machine*
899 book, was involved in that; she's a hardware engineer. And ... I've never been loyal to any
900 particular professional organization.

901

902 **V: Has supervising undergraduate or graduate students played much of a role in your**
903 **career?**

904 [88:45]

905 S: Supervising in the sense of projects and students?

906

907 **V: Yes.**

908

909 S: Oh yeah.. And, like, most recently there at the Wang Inst ... or at Embry Riddle, right, with
910 this security education project we had three or four students who ... three women ... one
911 woman and three male students ... who were ... worked on the project at various times. And
912 I've always tried to get into the senior project, to be the supervisor of the senior projects, if I
913 could. I've done that, you know, probably done dozens of those kinds of student projects.

914

915 **V: But haven't had much in the way of graduate students?**

916

917 S: Um, no. No, I've never taught in a graduate student program other than the Wang Institute,
918 but that was a more ... along the model of a professional school, not the long-term graduate
919 program.

920

921 **V: Right. OK. Have you spent any time volunteering in professional activities?**

922

923 S: You mean like using computing outside of computing ... ?

924

925 **V: Right.**

926

927 S: Not that much. When I look back at Austin I was involved with the thing that Elaine Rich
928 and the other Elaine set up.

929

930 **V: TWIST, Tomorrow's Women In Science and Technology.**

931

932 S: It was the Expanding Your Horizons.

933

934 **V: Right, so TWIST was the umbrella.**

935

936 S: Right. And tried to work in that and ... I don't really think many other cases ... I've been
937 trying to volunteer my services with respect to accessibility and assistive technology at the
938 place that I live now but there aren't enough organ- ... I can't find the organizations that are
939 bringing the people together to make the contacts for volunteering.

940

941 **V: But I would think that your blog is an example of service ...**

942

943 S: Yes.

944

945 **V: That would be interesting to put on the record.**

946

947 S: Yes. So, OK, after basically becoming legally blind in 2006 and fumbling around with a lot
948 of the technology that was available, computing technology that was available, in 2007, I
949 started writing a blog and I thought, "Now I'm not, I'm representative of someone who is
950 very tech savvy and I'm willing to put money out, you know, to pay for the equipment that I
951 need to keep me going, but I'm not a part of the regular rehab system." Things are very
952 structured, so that if you're a veteran, or if you are employed, or you want to be employed, or
953 if you're in the educational system, there are rehab, rehabilitation services and, you know,
954 that will fund ... fund you to get some training, but I'm not ... I'm on my own, basically,
955 learning on my own, and I also think that those organizations, basically by their very nature,
956 are not necessarily going to be as far along in the technology cycles as I am.

957

958 So I've been ... as I've been trying out different software packages: this works, you know,
959 even if it's a little strange, like a magnifying mouse, a mouse with a magnifier that you can
960 get from Microsoft. You know, it's just a little mouse, but it has a magnifier that can be
961 useful to you. So I'd write up these, these little things, kind of thinking of myself as being an
962 advisor to the baby boomers who were going to be losing their vision, want to maintain their
963 technology communication abilities as much as they can, but are not going to have the rehab
964 services. And even if they had the rehab services they wouldn't necessarily have the same ...
965 they wouldn't be given the same span of possible choices as I might be able to give. So, I've
966 been trying to write up that experience. And my tag line is "Adjusting to vision loss with
967 class, using technology." And looking at this as an ongoing process of how I change. The
968 blog is not just about technology but is also about a few of the heroes that I've found, that are
969 writing books or providing material. And they inspire me. So, I write about them and I write
970 in a more personal vein than I would if I were doing this ... this is not technology papers.

971

972 [Inserted comment on the blog: This blog is moving deeper into technical aspects of
973 accessibility, e.g. standards, driven by experience from straddling the culture of disability and
974 generations of technology users. I am morphing into an activist as I identify barriers for
975 visually impaired people on the web and in everyday life. Even more significantly, following
976 the curb cuts principle, user interfaces and social processes will lead to improvements for
977 everybody by removing these barriers. Accessibility, usability, universal design, etc. are
978 poorly handled in computing at a high cost of unemployment, market limitations, and
979 damage to reputation of our field. One message for computer educators is to maintain
980 accessibility quality of their own web sites and those produced by students, learning
981 themselves about the growing field of accessibility engineering.

982
983 [Using my newly found respect for the professional speciality of accessibility, I try to post
984 blog articles directed at both the sighted but ignorant and the Vision Losers in transition to
985 new modes of work. I find myself articulating situations like Synthetic Voice Shock for
986 elders, how whitehouse.gov mangled accessibility principles, computational thinking for
987 better use with screen readers, and questioning the premises of visual programming. When
988 my blog stats show queries like “rapidly losing vision,” I appreciate the opportunity to
989 translate the positive spirit found within the blind community into technology pathways for
990 those like me in continuing transition and promote a classy, positive attitude.

991
992 [A recent interview with Dame Wendy Hall reminds us how absolutely amazing is the
993 computing technology developed during our lifetime. For me, this has been the 3 decades
994 from working with Jon Postel at ISI to writing on a free Wordpress blog platform. I use
995 technology shrunk from the room size IBM 650 and IBM 1620 to handheld text readers. I
996 learned the cultural language of disability from podcasts and book sharing collectives. I
997 found my inspiration from a blind writer my age in San Francisco, a college dropout open
998 source developer in Australia, and a social entrepreneur MacArthur fellow in Silicon Valley,
999 among many. I think the challenge for computer educators is to mesh the "classic" computing
1000 curricula with this “modern” momentum of social change.]

1001 [95:00]

1002 **V: Have you had many opportunities over the years to serve as a mentor?**

1003
1004 S: Well, more to males than to females. When I look back at it I find it disappointing that I have
1005 not had ... not as many female students to work with as males. Ant it’s not just the numbers,
1006 but also quality of work. The women that I’ve had were in my classes, like at Embry Riddle
1007 ... were not as committed, I would hate to say this, but not as committed to computer
1008 science. But part of it was because they were more interested in other things that were kind of
1009 outside my range. Like, one student interested in computer security but also in global security
1010 in kind of the cultural aspects as well. So I’ve felt like I’ve tried very hard to keep women in
1011 computing, but I’ve seen a couple of cases where ... the women just felt that they could not
1012 compete with the males ... you’ve got a smart ... “*Unlocking the Clubhouse*” kind of thing
1013 ... you’ve got a real smart male and the female feels bad about it and it’s very hard to keep,
1014 to bolster, the female’s confidence and keep her involved. So I have not had ... not been
1015 involved in any of the mentoring ... structured mentoring activities (I don’t think).

1016
1017 **V: Are there any particular challenges that you’ve faced in your work environment over**
1018 **the years?**

1019
1020 S: Well, partially because I was ... I took the opportunities that came along. You know, I’ve
1021 had more organi- ... been in more failing organizations [laugh] than I would have liked to,
1022 you know, organizations that have died. And they died because they were out of sync with
1023 their times or, you know, financial (it just happens). And there are a lot of lessons from that
1024 because when you’re going through a period of one or two or three years where the
1025 organization is dying on you (e.g. declining student enrollments or declining funding), it
1026 affects you personally a great deal. It’s hard to keep up your morale when your job is falling
1027 apart.

1028
1029 At Embry Riddle I had real challenges with dealing with male colleagues because of the
1030 background of the institution being maybe 7:1 students and about the same ratio of faculty
1031 (male to female ratio) and a number of women banded together basically to change the
1032 situation ... making, trying to make it clear that women were not getting promoted and
1033 women faculty were uncomfortable being excluded from male activities or feeling that they
1034 were not being given the opportunities that were needed, and having to deal with male
1035 professors stating that women did not belong in engineering and other professors saying that
1036 the gay student's lifestyle was an abomination and it was their responsibility to change it.

1037
1038 And it's not that these people don't ... are not entitled to their opinions, but there is a
1039 diversity code that is published. And, if the diversity code is not followed in some sense then
1040 women who are, are, I think, women who are standing up and trying to get the support of a
1041 serious diversity commitment are further harmed by their standing up activities. And, in these
1042 two cases, the faculty later became chair of the faculty and on the tenure and promotion
1043 committees and things that were, I believe, unacceptable, would be unacceptable to most
1044 women. But these things happen, and when you stand up, you're a troublemaker. And you
1045 are a troublemaker because if you didn't stand up there wouldn't be any trouble.

1046 [101:00]

1047 **V: Looks like there were some real difficult times there.**

1048
1049 S: But it was also a learning situation for myself in terms of, I had to decide to what extent I
1050 would put myself on the line. If you're at the end of your career (and I know of another
1051 woman who has gone through a ... she went through a specific discrimination and retaliation
1052 thing, but ... we've talked about this often ...) at the end of your career you can stand up and
1053 do things you could not do earlier and, furthermore, you know better. You know ... you just
1054 have the past history, you say, "This has got to change and I'm going to see what I can do to
1055 make it change. And the harm that might come to me, because I'm at the end of my career, is
1056 not as significant because it's just got to change. And so the benefits ... if I don't stand up
1057 now against this, then this will go on." And it's not just me alone standing up against it, but
1058 others, you know, who are also willing to put themselves on the line, you know, not just one
1059 person, but a group trying to make it change. And it's painful, but it happens and at the end
1060 of your career you can take some chances you wouldn't otherwise.

1061
1062 **V: So, you've talked a little bit about outside familial connections, and, especially over the**
1063 **last fifteen years, with your niece. And you've mentioned, briefly, a relationship in**
1064 **Monterey. Let's turn a little bit to outside of work, outside of research, as we are**
1065 **winding down and talk about what family and relationships ... how they have**
1066 **influenced your life.**

1067
1068 S: Well, with the ... the raising of ... the working and raising of the children, I ... now I
1069 understand how hard it is for women to maintain balance among family and work and ... the
1070 benefits of the time that goes into the family. I didn't understand that, you know, when I was
1071 younger and I, you know, for one reason or another I just never made the, you know, the
1072 choice to have a family. I got one later in life.

1073

1074 In terms of friendships, I've maintained a lot over the ... through my different jobs.

1075
1076 And in terms of male-female relationships there's been one that's lasted for about thirty years
1077 (off and on) and recently, actually, more on than off in terms of as we've grown older and ...
1078 had more understanding, I think, of each other.

1079
1080 The fact that I've had vision loss has put me into a totally different world of contacts that
1081 have been quite interesting, both from a technology point of view ... I've seen a lot of
1082 interesting ... interesting tools that I would never have been able to appreciate ... you know,
1083 just sort of a kind of technology drive that I think is fun because it is ahead of the ... where
1084 some sighted people are. But also, I've made a number of contacts that I would not have
1085 otherwise, which seems extraordinarily strange that at a time when I can appreciate much
1086 more, relax much more, because I'm not in the competition, I'm not in the ... I'm not a
1087 player, except where I try to be. I would like to be able to interact more with people but I
1088 can't see their faces, and I have all the awkwardness of the vision problems that now
1089 interfere more with developing additional relationships at this point in my life.

1090
1091 **V: A lot of challenges that you wouldn't have thought about ...**

1092
1093 S: Yes.

1094
1095 **V: ... earlier, ten years ago, say ...**

1096
1097 S: Yes.

1098
1099 **V: Are there any other strong outside interests that would help us understand you better?**

1100
1101 S: Um, let's see. Well, I left out AAUW among the different membership things that I've been
1102 involved in, and that's been helpful to me recently. Mainly as I get older and I fit more into
1103 the AAUW demographics in the place where I live, which is largely retired women. And I'm
1104 reading *The Age of Turmoil*, by ... the Greenspan book, for my book club tomorrow morning
1105 [chuckle] and much more involved in ... trying to get involved in ... group activities, where I
1106 have no particular domestic interest, you know, baking and so forth just did not capture my
1107 interest very much, but more diverse intellectual interests. And, if I were able to, I would be
1108 much more involved in nature activities, but I'm much more limited in that domain. I've
1109 traveled a lot on nature trips and eco-type trips, Belize and Guatemala and the Galapagos and
1110 the Barrier Reef in Australia, and places that ... Baja a great deal. When I was younger I
1111 much enjoyed taking those kinds of excursions.

1112
1113 **V: Fun stuff.**

1114
1115 **If you could give advice to a young woman starting out, what would it be?**

1116
1117 S: When I look at the field ... I went to this conference called "She's Geeky," which was kind
1118 of a spontaneous un-conference held in California last October, and I realized there are the
1119 very technological and the accidental technologist. And, you know, the accidental

1120 technologists are ... many of them are IT administrators, database administrators, and so
1121 forth, and that can be a very challenging job. And then there are web designers and these
1122 don't need the same structured approach to computer science as if you're a hardware
1123 designer or a software quality [specialist] or things like that ... that ... um ... that when they
1124 start in, they need to get as much of the substance as possible. And not get ... don't, um,
1125 don't fool yourself into thinking that because you can build web design, web pages, that
1126 that's going to be a whole career. That you've got to have a lot more substance ... you're
1127 going to have ... your career's going to change over time, the technology is going to change
1128 over time. Whatever it is that you do, whether it's graphic design or the hardware, or, um ...
1129 you've got to get as much of the substantial courses, and I don't mean computer science
1130 theory, but as much of the rigor, you know, the ability to think through and to troubleshoot
1131 and to know the technology, because, if you think about people with a job at 25, are they
1132 going to be doing the same thing at 35, at 45, at 55, at 65? Well, there are a lot of women at
1133 the 65-year range who are doing programming, but many more who will have dropped out.
1134 So, how are they going to deal with ... and they can't anticipate what all those changes are
1135 going to be, but they're going to be different people and there's going to be different
1136 technology and how are they going to make those transitions through different decades of
1137 their careers? Well, the main thing I think they have to have is as much substance as they can
1138 in whatever aspect of computing they're doing.

1139

1140 **V: If you could change one decision you've made along your career path, what would it**
1141 **be?**

1142

1143 S: Ah, that's a hard one, actually. Because every decision that didn't work out so well
1144 [chuckle], I actually tried to make the best of. I think when I made the change from the
1145 National Science Foundation to the University of Houston-Clear Lake, I did that for family
1146 reasons and I think I needed to have looked more broadly for the job opportunities. At that
1147 point I was 50 ... around 50 at that point ... because that meant significantly less income
1148 over the last 15 years of my life when ... or my career life ... where I would have had more
1149 benefits available to me. I had a lot of tradeoffs at that time and a vision accident that
1150 happened at that time, but I should have ... I rushed into a decision. And I should have
1151 looked at more organizations, a broader set of organizations, at that point. Now looking back
1152 at it I would be much more looking at non-profit types of opportunities.

1153

1154 **V: And your career now has turned more in that direction. That's sort of interesting.**

1155

1156 S: Yes.

1157

1158 **V: So, as we wind this up, is there any story that you want to tell so that it's going to be**
1159 **remembered?**

1160

1161 S: Well, you mean a specific story or a general kind of?

1162

1163 **V: It's up to you. Anything you would like to add.**

1164

Computing Educators Oral History Project (CEOHP)

1165 S: Kind of a thing ... OK. I think, for some reason, in my career I wanted to get experience in
1166 all different types of work. I wanted to be in industry, or close to industry ... sort of industry.
1167 I wanted to be in a government, and I've become much more interested in government. And I
1168 wanted to be in academia. But I never wanted to be in any one of these things my whole life.
1169 And so, that the ability to go back and forth in these has been very broadening and, I think,
1170 you know, people need to think about doing similar kinds of things, to get as broad a kind of
1171 experience, even though they are going to work in organizations that fail, and they're going
1172 to work in places they hate, you know, the broader experience in the long run works well for
1173 you.

1174
1175 But the other story is ... I look back to 1961 and my first programming and I still love to
1176 program. I'm learning Python and Java, and that, you know, if ... people have got to get
1177 hooked into something that they want to keep coming back to. For me that's programming.
1178 And to have that ... the joy of being able to write a program, even if it is not good to much of
1179 anybody else but yourself ... but to be able to plan it through and get it done, and have
1180 something, you know, that is usable, and the experience along the way as well as seeing the
1181 product, is something I would wish that everybody would have that chance.

1182
1183 **V: Very good. Oh, and in closing I just want to have on the record that you were one of the**
1184 **people who helped spark the Computing Educators Oral History Project in 2003 in**
1185 **Reno, Nevada. Barbara Owens remembers you walking up to her and saying, "You**
1186 **have to capture those stories." [laughter] Do you have any memory of that, just to end**
1187 **with?**

1188
1189 S: Yes

1190
1191 **V: Anything to add?**

1192
1193 S: Just that Barbara was at that meeting. I think she was introducing or giving an award to
1194 Harriet Taylor from NSF and I had sort of forgotten that I'd met Barbara before when I was
1195 here in Austin and we'd been in college together. And, you know, just ... I don't know what
1196 made me think about that except for the fact that it was, maybe, the Harriet Taylor thing that
1197 made me realize that there were a lot of stories to be told and nobody seemed to be interested
1198 in women of this ... of our age. And, you know, there's the ENIAC pioneers and, of course,
1199 everybody's interested in the War, World War II and that age of women, but we were the
1200 women who were at the ... our careers were paralleling much of the history of computing as
1201 it was developing and there had to be some kinds of interesting stories there are and I'm sure
1202 glad you guys are carrying it on.

1203
1204 **V: Thank you so much, Susan. This has been great. I appreciate it.**

1205 **[108:40]**