Computing Educators Oral History Project
An Interview with *Michael Clancy*

Conducted Tuesday, March 10, 2016
In San Francisco, California, USA
Interview conducted by Barbara Boucher Owens

Context: Interview conducted during the 2016 SIGCSE Technical Symposium. The location was near where work was being done, so in the background throughout one can hear various thumps, bumps, hammering, and drilling.

[0:00]

B: This is an interview with Michael Clancy, teaching professor emeritus from the University of California at Berkeley, conducted by Barbara Boucher Owens. This interview is being recorded on March 10th, 2016, in San Francisco, California, the United States of America. It is part of the Computing Educators Oral History Project.

Did I pronounce your name and affiliation correctly?

M: Yes, although there's several titles for teaching faculty in the UC system. They all seem to be changing at the moment. The former title of Senior Lecturer was what I prefer best.

B: Okay. Are you Senior Lecturer Emeritus?

M: Yes, I am.

B: I'll use that. I looked at the web and the web's title on the most current page I could find. The new name, is not as … we'll use that.

When I start these interviews, always, I start way back. And begin with your parents. Tell me about your parents, their education, their work life. Anything computing related?

M: Well, certainly nothing computing related. The … oh let's see. There was me and my two sisters. My mother didn't work for a while. My dad was a court reporter for a long time. And we went to school.

B: Where did all this happen?

M: All this happened … I grew up in Illinois. We … I was born in East St. Louis, which is right across the river from St. Louis. I had first grade there. My dad moved to another position nearer to Springfield, so I was … so we moved there and stayed there for a couple years. Then finally we moved to up near Chicago, a suburb, St. Charles. We moved there when I was in … I was a fourth-grader. Since then, I went to a military academy for college — it was a day military academy, so that sounds …

B: For college or high school?

M: High school, sorry. That was out of the ordinary, I suppose. Then I went to University of Illinois for college.

B: I'm going to slow you down because we're going to have you retiring in the next ten minutes!

Did your parents have … what kinds of education did your parents have?

M: My father didn't go to college. My mother had one year of college and then she came back to … I'm not sure, actually, when she went off to college. It was Mount St. Scholastica in Kansas, I think, was where she went.

B: You talked about sisters. You had sisters. Tell me about them.

M: Two younger sisters, both dead now as it happens.

B: Oh my.

M: The … it was interesting how …. I was recognized pretty early as a prodigy, or words to that effect. So I was like the king of the kids. I think I got … could have gotten more attention from my parents as a result.

One symptom of it, for instance, was I would go through these events and my sister would go through these events, and it would be kind of simultaneous. I would graduate from grade

school and my sister was making her first communion or something like that. Those coincided, and naturally I got all the hubbub. And then … so she was graduating from grade school and I was graduating from high school, and so on. Again, I got all the attention, and she got very little. Same thing for college and high school.

[5:17]

Then I went off to college and grad school and did my thing.

B: You had another sister.

M: Younger, yeah. She was four years younger than … my sister Mary Kay, she was three years younger than I and four years younger in school, and my sister Maureen was just a year behind her. Boy, I didn't get to know them very well. It turns out, I guess, that they both idolized me. I found that out later.

B: Did they go to college?

M: I think they both attended it. They both went for a year to community college. And I don't … I couldn't tell you what they got their associate degrees in.

B: Okay. You touched on this, because one of the things we ask is what were your parents' expectation and you said it was different for you than for your sisters vis-a-vis education and what you might do. Sounds like they — I'm not trying to put words in your mouth — they treated you differently.

M: Probably. I think so. Well, here's a small thing. They got money for their good grades and I didn't. Now whether that was some change in the way that kids were supposed to be handled then, I don't know about that. One could read that as, well, they needed the money for their incentive whereas I didn't need that kind of thing.

B: When you were in elementary school … so you didn't … did you start elementary school before you moved the first time? When did …

M: Yes. And then the way it worked … I had been … my grandmother actually was a force behind getting me evaluated, and how … IQ tests and things like that.

B: Really?

M: She also arranged … I could sing pretty well when I was a kid, so she arranged with a friend to include me in a recital. I was three at the time. So I sang "How Much is that Doggie in the Window".

B: Would you like to do that for the tape? (laughter) Oh, my. Is that your maternal grandmother?

M: That's right. So she … so my first grade in grade school, was, basically I just sat in the back of the room and read the Encyclopedia Britannica. So that was cool, I had fun with that.

Then we moved to near Springfield and the grade school I was in there didn't know what to do with me apparently. Around Christmas, for instance, they had me making those chains …

B: Paper chains?

M: Yeah, paper chains, which was a ways away from reading encyclopedias.

B: Were you disruptive?

M: No.

B: Or just bored?

M: I didn't know any better; I just did what I was told.

B: Okay.

[9:41]

M: Then we moved to St. Charles, near Chicago. Again, the teachers there were much more able to deal with an outlier in their midst. What they had me do there, starting about in sixth grade, was to … there was just then a new grade school building, so it had intercom and stuff like that in all the classrooms. The teachers had me write scripts for news events. So I wrote a radio script for the Battle of Hastings, for instance. I'd write these things and get a couple of friends along and we'd perform them over the intercom. So that was cool.

B: Were these private or public schools?

M: Catholic schools.

B: Parochial schools?

M: Well, the one near Springfield was a public school. The other two were private.

B: Are there particular teachers that you can remember? It sounds the one near St. Charles was the school …

M: Sister Paul Immaculata was my hero teacher. For some reason she went away the next year. Anyway, she was the one that had the good idea.

B: You did the radio scripts. How about the other subjects in elementary school? What do you remember?

M: Well, let's see. I don't remember much. I got good grades, so I must have been dealing with them in some good way.

B: So you finished sixth grade.

M: Then the other teachers kept up with the radio programs. They thought it was a cool thing.

B: And then what after sixth grade?

M: Seventh and eighth.

B: Was that at the same school?

M: Yeah, right.

B: The same school. Any particular teachers then? Or events? Or clubs? How did you occupy your time?

M: Well, part of it was the radio. Geography we built things, so we were split up into groups and we had … One thing we did was to make a model of South America. So there was … we used wax to be the oceans on either side. Popcorn was some other aspect of the Andes, for instance. Stuff like that. Nothing else sticks out in my mind about any other extra stuff we did.

B: Did you do … did you participate in …

M: We diagrammed sentences. I loved it, too. And it was contests — like the girls against the boys. I won more than my share, probably. So that was cool.

We also had, I guess, now that I think of it, there were math contests, too, that I did well in. There were a few girls in the class that were almost as good as I was, so occasionally they'd win. The boys not so much competition.

B: Did you participate in any after-school activities?

M: No.

B: Nothing. No choirs? Grandma getting you to sing didn't continue?

M: The choir actually was for girls.

B: Oh.

M: The only time I got an opportunity to sing myself was Christmas. There was a special Christmas choir. I soloed "Jesu Bambino".

B: Oh!

[14:55]

M: Now getting into … let me know when we should get into high school.

B: Well, I have a couple of other questions about elementary school. Do you remember summer?

M: Oh, there were thirty-two kids in where we lived. Summer was just great, because the kids would swarm and be out of their parents' hair. You look at it in comparison to what we have now with everything a kid does is regimented and nobody gets to go out and explore. It's just so sad that that's happened. We were … there was a woods near our house, and we'd explore the woods. We'd play baseball in the summer and we played football in the fall and we played basketball in the spring and we'd play board games in the winter. It was just … having these mobs of kids was a really neat thing, I think.

B: Yeah. OK. So then you put elementary school behind and you went to a military high school did you say?

M: Yeah, uh huh.

B: Can you talk about that?

M: Well, it was … there were two campuses. One was a day campus and the other was a boarding campus, so I was a student at the day campus.

Another thing I did — maybe I got into high school too soon — there was a diocesan spelling bee every year and I won it one year and that happened in seventh grade. The prize was a scholarship to a year of high school, so that was a help. The … I guess the problem my parents I had was their choice was between the military school, which had a reputation at the time for being academically quite good, versus going to the local public school, and it had kids that didn't behave and stuff like that.

Anyway, so it helped that several of my classmates from grade school went to the military academy.

B: What was the name of it?

M: Marmion. M-a-r-m-i-o-n. I did well. I was second in the class for the first batch of grades and then the guy that was ahead of me moved away. But, let's see … what was I studying that year? It was pretty well tracked. Everybody had a religion class; there was math; there was English and Latin and PE. And, let's see …

B: It was all male?

M: Correct. Oh, and military.

B: So that was in addition to PE? Were there military things that you did?

M: We had a glee club in first year of high school and we performed for the Christmas concert. I did a solo and did "I'm Getting Nottun for Christmas". I still have the yearbook. I was dressed like a little bratty kid with a big lollipop. So that was cool.

And there was a Latin contest every year and so I finished in the highest scores for that. [19:50]

Other than that, there wasn't much opportunity for after-school stuff because the high school was 10 miles from where my parents were and so I had to take the bus every day. Other than an occasional football or basketball game, I didn't do much other …

B: Are there particular teachers there that you remember?

M: Father Stephen was our first year math high school teacher and he was quite good.

Father Bernard was the Latin teacher that year and he had this — you were allowed to hit kids — and so he'd give us Latin homework and he'd go and stand over some kid and ask for the answer to a problem, problem 3, and if the kid got it wrong, Father Bernard's book would come crashing down on his head.

B: Oh my!

M: The book was like … curved. I never got hit.

B: That was a negative remembrance I think. Negative if they'd been doing that, but not for you.

M: Sophomore year was kind of boring. Let's see, anything amusing in junior or senior year? I remember my high school guidance counselor was just … he was kind of clueless about where to advise me to go.

B: So how did you go about choosing what to do for college?

M: Well, I looked around. The … I applied to the University of Illinois, Illinois Institute of Technology, and University of Michigan. We decided … we, my family, decided we would go to look at the University of Michigan to see what there was there. So, we show up in Ann Arbor and there was a blizzard that night and so my mother freaked out. And she said "Well, we have to go home." Other than that … we were able to stop at Battle Creek and get a tour of Kellogg's, but had absolutely no clue about what was available at the University of Michigan.

Again, several of my classmates went to U of I and so I just tagged along for the ride. And what I think — you'll hear this again from me — is that places where I had a decision to make, the decision was obvious. So I always went the obvious way. So going from grade school to high school, well, we had the money and we had the scholarship and we had several of my friends going there. Going to U of I, well, again a bunch of people went there and it was an okay school. And then it went on.

B: So talk about Illinois.

M: Ah. Let's see.

B: Well, did you know what you wanted to major in? I'll start you off.

M: No, I knew nothing about what I was…. Our high school guidance counselor said: "You should be an architectural engineer because you know math and you know science." Okay. So I got admitted to U of I as an engineer and the first year I took math, I had an honors math course which was really great. The instructor's name was Ralph Faudree and he's at University of Tennessee, I think, somewhere in that area. I think he just retired.

[25:08]

B: Faudree?

M: Faudree. He's … his research area was Ramsey numbers. He had several papers with Paul Erdos.

B: So your Erdos number is very low.

M: Well, but not …

B: Did you have any papers with?

M: No, no.

B: Oh darn.

M: The other thing that was really good about Faudree was that he invited — there were like 15 of us in the class — and he invited the class to his house and we played Diplomacy. I've never … never since then have I run across anyone who invited his class over to play Diplomacy.

So anyway, math was going really well. German was okay. Chemistry I hated. I had been a lab partner of my best friend in high school and he did all the experiments and I just played with making sculptures out of glass. We both took … we were both roommates in first year college and he was taking … we were both taking this chemistry course. And he got an A in lab and not so good scores on the exams, and so he ended up with a C. And I got a F in lab and better scores on the exams, but I also got a C. So chemistry was awful.

Then, the other course we were taking was mechanical drawing. I was borrowing my other roommate's drawing set; there were three of us, we shared a triple in the dorm. The third roommate and I didn't always get along and so I was worried that he would limit the access to his drawing set, so I was … something had to give, I was not happy with the situation. I went to see my advisor, and he said — or my advisor at the time at least — I said, "I have to drop something. I'm having these problems with my roommate and having these problems

with chemistry and having these other two courses." And the advisor said, "Have you thought about switching colleges?" I hadn't thought about it. "Oh! That's perfect. I could be a hath major!" Which I did like because of this guy.

So, after the first semester, I switched to Math in the College of Letters and Sciences. The math courses that you get at that level; Calculus 1. Calculus 2. Analysis 1. Analysis 2. That's not the kind of math I like. So, I was searching all around for a major. So, one possibility was, I took an Intro Psych course, and I liked psych so I continued on in that.

[29:06]

I took a programming course, CS1 basically, and I hated that, and I swore never to touch a computer again. It was terrible. The guy — we were learning both Fortran and PL1 the same semester — and the PL1 compiler was just getting tested and so you'd get a bug and you never knew whether it was your bug or the compiler's bug, so that was a problem. The other thing was that this guy was not a good teacher. He would be writing on this … transparencies, actually, except that they were on a roll, so to get to a blank place you roll it a few times. So, he'd be writing on this roll of transparency and, you know how it is when you are lecturing, you get to the point where you're not writing anything to accompany anything. Like most people, your hands are idle. What this guy did, when the opportunity came for idle hands, he picked out an "i" that needed dotting and he (rrRRrrrRRrr) and you'd be watching from the back of the room to see this dot growing and growing, so that was really gross. And the other thing was; this was a big class, over 100 people in it, and nobody past the first row could hear what he was saying because he was just mumbling. It was a terrible course and almost derailed me from my future.

Let's see, what else was there? Choices of major I had. Basically, it was math, which was bad math, and computer science, which had all these bad connotations, and psychology was ... If you'd asked me in my sophomore year what I was going to major in, it would be psych. Two interesting things happened. One was, I took an Industrial Psychology … no, I took a Personality Psychology course in junior year, where we learned about Freud and Jung and all that. I remember thinking, "These guys don't know what they're talking about." So, I decided … that swayed me away from psychology.

The other thing that happened was … sophomore year I had a job at the student union coat check place and you might think that that would be a easy job, and it was easy, but I could never get anything done, because I'd start reading, for instance, and somebody would come for their coat and I have to figure out where I left off. I read some more and interruptions were happening pretty quickly — every couple of minutes of so. So I was looking for a different job and one of my friends said, "Well there's jobs at the computer center. Why don't you apply for one?" And so I did and found out later that the guy that applied before me didn't get hired and the guy that applied after me didn't get hired. And I got hired.

So, what I was doing was being a computer operator, wrapping up decks of cards and handing them out … taking them from the user and handing them back. But what I ended up doing the summer … I stayed the summer after sophomore and junior and senior. I stayed at school for all of those, mainly to make money, although when you compare tuition now at

University of Illinois with was it was — but it's the same thing at Cal, basically — it's just out of control.

[34:38]

But, at any rate, summer after sophomore year, I was an operator and I got assigned to the midnight … the graveyard shift. And that was where all the grad students came in to do their computing and that was where the system programmers came in to do their diagnostics. And I got a chance to watch and learn and listen. And they … all these people that I was interacting with said, "Well, you ought to take some more computer science." And I said, "Oh, the first one was so bad." And they said, "Well, take it pass/fail." And so I was going to take it pass/fail and then more advice said, "Well why don't you take it for a grade; it can't hurt." So, I took the — it was machine structures course back then — and the teacher was very good. He ended up writing me a letter of recommendation for grad school. John Gary was his name.

B: Gary?

M: Gary, yes.

B: G-e-a-r-y?

M: G-a-r-y. Anyway, so he … I enjoyed this course and got back into it. Making a long story short, I ended up majoring in math, minoring in psych and linguistics. And I didn't take … I didn't want to take the hardware course and I also didn't want to take the numerical analysis course. Both of those were required for a CS major and so I said, "Well, I'll worry about CS majoring when I go to grad school."

Ask me more about college.

B: Well, you had to take something besides math and psychology and …

M: Junior year of math came to good math.

B: Okay.

M: Groups and rings and stuff like that. Linear algebra. Logic. I took a … senior year, I took a grad course in computability and I remember that everyone in the class had to explain some part of the Turing machine. How it worked. And how you could prove stuff with it. So, I was feeling much better about math. CS was great after that first course. Psychology, I took a industrial psychology course in summer after junior year and again, there was this feeling … it was inherently interesting, but you'd look at what people were doing with it, and there were kind of obvious tests that people should have been applying and people just weren't taking advantage of the research in psychology to do anything and so I felt kind of depressed about that. I took a logic course … sorry, a linguistics course. Took a couple of them, in fact. Three, in fact, to which …

B: At the undergraduate level?

M: Yes. One was a grad class and two were undergrads, I think. So that ended up being a minor. It was close enough to computer science and math that there really was a lot of overlap there.

B: So, now you're in your senior year …

[39:38]

M: I took the system programming course and didn't do very well. Got a B because … because the system programming I was doing as part of working for the computer lab was better and more interesting than what I was getting in this course. The linguistics stuff, I … that was part of my class load that year. There was a bio course for poets that I took because of … it was a requirement, a bio course was needed for the college requirement.

B: So like "rocks for jocks", this was bio for poets?

M: It was. Yes.

B: Okay. I was thinking of an Eric Roberts type — real biology and poets, but I think you're talking about easy biology.

M: Well, the thing I tried, I tried several of the alternatives they were giving me. There was physiology. I tried that, it didn't work out. Let's see, another thing … The next to last thing I tried was botany and I remember the first lab was to go out and identify the trees on the quad. And so there was our lab class, going out and looking at trees. Other people would look at us as if we were confused in some way. Anyway, I felt self-conscious. I felt really self-conscious in this identifying trees exercise and so I dropped that too. And it was only after this bio for poets came around.

B: So how did you start thinking about graduate school and going about … what? I mean you could have gone to graduate school in any number of things given your background. And how did you pick a graduate school? Did you go directly?

M: I did go directly and that … if I had anything to change in my life, I think I might have spent a year in the real world cause … I was always a little suspicious that I would be teaching the students stuff that wasn't accurate or wasn't topical or something like that. I worried a little about that, but not enough to change my life in any way.

I discovered that … I taught a course for high schoolers, a programming course, senior year. And that was fun. I thought, "Gosh! Maybe this computer science stuff is fun. Maybe teaching is fun." And I went to my advisor and I said, "Should I be taking some education courses?" And he said, "No, no, no, no, no." So I didn't take any education. But I was … by senior year I was pretty clear that I wanted to do computer science and I wanted to teach somehow.

[44:00]

And there was kind of a dramatic … one aspect of that was … so I mentioned I had had this graduate course in computability. And the instructor was apparently very thrilled at my performance and so he wanted me to go to Princeton and be a grad student in math. And I

didn't want to go to Princeton in math. But he kept pushing me, kept pushing me, kept pushing me. So I was applying for the National Science Foundation fellowships and so I wrote … I had no trouble writing a thousand words or whatever you had to do to say why I was interested in computer science. *[deleted 6 seconds of disturbance]* So, he wanted me to apply to Princeton as well and the two applications were pretty similar. So basically, I just copied the computer science application and changed all the computer science to math.

B: Math. [chuckling]

M: Fortunately, they didn't accept me, so that was fine.

B: And then, who gave you some idea to do something?

M: Oh yeah, good point. So hanging out with the grad students in the midnight to eight shift, that was cool. And they said, "Well, you know, you could go here and here and here. Here are really good schools."

B: Oh, what year is this?

M: 1971.

B: OK.

M: 1970 actually. Yeah. So I was in college from 1973 to 1977, I think. Is that right? No. When did I start college? I was 21 when I was going to grad school, so that would have been 1971 I started grad school. Anyway so …

B: Yeah, I'm just trying to figure out the … sort of the time frame. What was going on in the world? And as you are looking for where to go.

M: Vietnam was going on in the world and occasionally sprung up on campus. And I remember … so my political views at the time were … my parents were pretty solid … well, my mother was a pretty solid Republican and my dad, I think, he leaned more Democrat, but he never said much about it. He was in the War by the way. He got drafted and then came back with … he was in Anzio, going up the cliffs of Italy under Patton. He got injured and he came back. Got all healed and everything, but he never wanted to talk about his experience.

Anyway, back to college.

B: Not Princeton. Not Princeton.

M: Right, not Princeton. So I was getting a lot of guidance about where to go. So I applied to MIT and Cornell and Stanford.

The summer after junior year, a couple friends and I took a road trip out to California and I can remember saying … I had relatives in the Bay area at the time, so we stayed with them. And then we took a trip to Stanford. And … you've been to the Stanford campus?

B: Many times.

M: So, I remember Palm Drive. And I'd say, "Oh my gosh, we're not in Kansas anymore." So that … this was one of those places where I had a decision to make and it was obvious. Because I was so enthralled by Stanford and my cousin … I had family out there, so …

Subsequently, I did a road trip to the Boston area. And I remember stopping in at Cornell to tell them I was going to go to Stanford. And I talked to David Gries and he was trying hard to get me to change my mind, but I didn't. It was funny to encounter him much later in life. "I'm the guy that wandered into your office and said, 'How do I turn Cornell down?'" Yes, that was choice of a grad school.

[50:40]

B: And? Particular people that influenced you, how long did you …

M: Don Knuth is my hero.

Grad school was, I think, the happiest time of my life. Both because there where just … well, my time was mine own in a way that an undergrad situation wouldn't be. I mean, there's always due dates in your undergrad courses. And so my time was my own and there was just so many smart people to talk to and, in particular, the department at the time was really … really supportive of experiments with teaching. So, I always get … my second semester at Stanford it was, I TAed my second semester and decided, "Well, I like this teaching business." So, I ended up teaching several different courses. And another thing was … so talking about teaching with your fellow grad students was something that happened a fair amount.

And then, another thing that I ran across was … there used to be fellowships funded by the Danforth Foundation. And apparently the only requirement for this is that you end up in teaching career. And so the Danforth Fellows formed this nice little group of grad students interested in teaching and they were from all over campus. And somehow I and a couple of my CS colleagues found out about them and we started hanging out with these people and that was really neat. They've given me a lot of ideas about how teaching might take place better and how to improve teaching and how to measure what students learn, and so forth.

I mentioned Knuth. I TAed for him my … late in my career at Stanford and ended up with my first publication but he … The course that he was teaching and I was TAing for was called Problem Seminar and basically it was just … Knuth would toss out a problem every couple of weeks and the people in the class would work on it. And my job was to be the scribe, basically, and keep track of all the discussions. And add a few things of my own if that was relevant. And so what I was doing basically was to put together a case study for each of these problems. And so that sunk in. And Knuth said, "We can talk about that."

[55:13]

B: "We'll talk about that." I know.

Were some of those colleagues in CS, people that ended up teaching in CS?

M: Yes. Yes. Yes. David Wall was one. My hesitation — I don't know where they are.

B: Okay. Okay. They're not people you kept up with.

M: They were … Scot Drysdale is the only guy I can think of right now.

B: Mm hmm. So did you leave Stanford with a degree or … ?

M: No.

B: What caused you to leave?

M: Well, I defended my thesis without having written it up yet, so I …

And then there was the issue of a job. So I was … I expected to finish in 1977 and … so I had been on the interview tour and my thesis would have been on … algorithms, graph algorithms, so defining, exploring which … what kinds of algorithms you could apply such and such an approach to to get a solution. And the world didn't need many theory faculty … any new faculty members at that time.

And the other thing that, I think, may have biased my application was … So I wrote up a research statement, which was tiny, and then one of the things I had been involved in the year before was teaching Intro [CS], team teaching Intro, and we had some interesting ideas about how to do that. One was … *[deleted several seconds of loud interruptions]*

B: We'll resume.

M: So. One of the things we tried in this course was to … we gave oral exams, thinking that might be a more accurate … source of information for what they knew.

The other thing we did was, we produced, after every programming assignment, we produced a case study of how one might go about solving the problem. So case studies are infiltrating my brain here. And … so anyway, I wrote up a document that was … that's like this thick [uses hand gesture to indicate a thickness of two inches] about … a case study about how we taught our course. And, so it was amusing.

Jerry Feldman was a head then at Stanford and was just in the midst of starting the Computer Science Department at Rochester. And so I applied there. And I applied to Brown. And … oh, Purdue was another one. And Feldman, in fact, had pounced on my application. And he said, "Well, Mike we know you can teach, but what about this research?" I didn't have a real good answer to that. Brown turned me down. Purdue turned me down.

[59:53]

I had interviewed early with Elwyn Berlekamp, who was chair of the CS division at Berkeley at the time, and it was a really bizarre interview. He came down to Stanford to talk to people and somewhere on my resume it mentioned that I played bridge. And Berlekamp spent the whole half hour of the interview telling me about his bridge-bidding program. So that was weird.

So there I was almost without a job and one possibility. Ruven Brooks at Irvine, he was at Irvine then. He had a post doc opening that I could have filled.

And then the other one … so after I defended my thesis, we had a party. And the party went into the night. And I get a call the next morning from Manuel Blum at Berkeley and he said — they also had seen my two-inch thick dossier on this course we taught — and it turned out that what they were looking for was a teaching faculty, not a research faculty. And in particular, Blum was interested in … where things were at the moment was … Blum called it the "mess in Intro." There were self-paced courses that one person was in charge of. There was … there were small lecture sections that another person was in charge of. And then there was somebody else that was in charge of some other aspect of this. And it was just a mess. Nobody was talking to one another. And so I was … they invited me down to clean up the mess in Intro.

And they called the morning after, it was 9:00 o'clock; 9:00 in the morning, the morning after I had partied into the night. And Manny said, "Well can you come up and talk to us?" And I said, "Sure, when?" And he said, "Well how about 10:00?" So, I dragged myself out of bed and went to talk to them. And they were apparently impressed and they hired me. So they were my only job offer essentially. So again, here was this decision I had to make that the route was clear. Anyway.

B: Well, start there. We're at Berkeley and you … I've known you a lot of the time and known of you before that. You did a lot at Berkeley. Why don't you start with — did you clean up the mess?

M: The first thing I did was — Intro was taught in lots of little sections — and part of that … it wasn't just computer science people running them, it was like people from outside. Engineering faculty from outside computer science. So everybody had a different agenda and there were problems.

[65:32]

The first thing I did was to turn all these little sections into a big course in a more … what we know now as a traditional big lecture and a bunch of little discussion sections. A little ways along … so I showed up in 1977 and — I'm getting my dates wrong here — yes, 1977, okay. And I taught Intro. I taught combinatorics. And I taught Data Structures. So … small improvements for each of those I would try.

And then along came in 1982 … no, earlier than that, 1981 probably, or 1980. Marcia Linn and a colleague of hers showed up at my door and they said, "Well, we'd like to study people learning to program and we heard you teach a lot of them. Can we collaborate?"

B: And Marcia Linn is in … what department …

M: She's in the School of Education.

B: Right.

M: And so she said, "Well, we'd like to study people learning to program and we heard you teach a lot of them. And can we collaborate?" And I said, "Yes" and it changed my life. Partly, it just was my view of teaching and my understanding of teaching. I would try different things in class. For instance, I tried illustrating parameter passing by throwing frisbees and that had some good features and some not so good features.

At any rate, I'd try these things, kind of seat of the pants, and I had no really good way of evaluating what went wrong if it didn't work or what went right if it did. And what Marcia was able to help me with was she would say, "Oh yeah, you're using technique XYZ and here is how they do it in math and here is how they do it in physics." What that did for me was to raise the level of abstraction in how I thought about teaching. In such a way that I could go to physics or chemistry or math and see what innovations they were doing involving teaching and see how they could be adapted to work in computer science. So there was that. Just the view of what teaching is all about and how innovations can be shared.

Another thing with Marcia was, she's just the most organized person I've ever encountered — well, one of them at any rate — and she had already been involved with National Science Foundation support in various aspects of learning the program. And so where we … where I got involved was, they were … she and two other education colleagues were studying student autonomous learning, so looking at conditions that would increase the ability of students to work on their own and to explore on their own. So then, Marcia watched me doing case studies and she said, "Ah, maybe we can combine here and maybe case studies help students work independ … autonomously." And so that was the first thing we started with.
[69:34]
I think the next grant involved case studies and then a grant following that … involved teaching LISP in Intro and so we … the nice thing is that we are getting kind of acclaim for all these things, really encouragement from NSF. And the other thing is that when someone from Berkeley talks, people listen, and I benefitted from that, I think. So, she and I started working together then. And that collaboration lasted quite a long time and we still keep track of what each other's doing. She's teaching a course in technology and design this semester and I'm helping out with it.

B: What was the next phase?

M: The other thing that was going on in there, we switched from quarters to semesters in 1983, so we were doing some pretty heavy curriculum development there. We thought that projects were good, relatively large projects. We wanted … we thought that a course without big projects was just kind of not getting very deep into how much students should know about programming. So, we were involved in this course, it was a five-unit course. It was lab-centric, as it happened. We decided that an important part of this Intro course should be

people working together, and … we had lecture too, but it was four hours a week of lecture and six hours a week of lab. And, of course, students were exhausted by the time they finished it.

Somewhere in the middle of all that, I got a note from Jim Braswell at ETS saying, "Could you give us your opinion of this new AP course?" And so I didn't have a very good opinion of the AP course because it was so much on details and not enough on the activities involved in designing a big program. So, they made me put my money where my mouth is and join the committee.

B: Was this about 1984? So was it BASIC at that time or was it Pascal by that time?

M: It was always in Pascal.

B: Was it always Pascal? Okay. I came on when it was in Pascal.

M: And so my goal then was to get part of the course based on a case study because otherwise you couldn't tell if students knew anything about these programming skills — debugging, organization, that kind of thing. So that took a while. They didn't actually get the case study on to the exam until I had left the committee, so about a year after I was no longer on the committee did they start with a directory manager case study.

B: You stayed involved with AP for a long time.

[75:46]

M: I did, yeah. Part of it was learning how to write good multiple-choice questions, so I learned that there. The … I was a reader for … until I timed out, so that would have been what? Six times? So yeah, I was … and then subsequently, I was involved in … well, the switch to C++ … well, to C++ and then to Java. And then I was involved in writing the other case studies as well; the marine biology and then … let's see, I didn't … Cay Horstmann did most of the development for the most recent case study, the Grid World. So I wasn't involved in that. But the stuff that came before it was … I spent a lot of time.

B: Why do I remember so much about bowling?

M: I wrote bowling as well. That was … bowling I thought was more accessible then. It was something that was accessible, that showed the teachers what the case study stuff was all about and how you could use it in a class. Whereas the thing we were looking at for … well, the directory manager [case study] was bigger and might have been a little more intimidating.

You knew I started the tradition of bowling at [AP] reading.

B: I did. Tell the story.

M: Well, I was being a reader and also I talked about this new case study that people might use in their classrooms until the … if they were in a hurry to do it before the actual thing came out. And we were at Clemson University and doing the reading. And there was a bowling

alley on campus and so it seemed appropriate to accompany the case study bowling, bowling scoring, with actual bowling in the bowling alley. So we did that. I can remember it being a very informal activity. We were sorted into groups and we weren't keeping score, I don't think.

B: We did. But it was one person would throw the ball and then the next person would finish up.

M: Yes! Yes! Oh that's right. Right. So if you got a … that was pretty fun.

B: Then what? What were your next projects? That you … at Berkeley? What about SIGCSE? You got involved in a lot of things.

M: My involvements in SIGCSE were, along with curriculum kinds of things, there were all these issues about dealing with big … dealing with a lot of majors and a lot of students and with teaching faculty also. So I was looking back at some of these things. I was on several panels, for instance, that involved how to … working with teaching faculty and setting up teaching faculty at tenure institutions and that kind of thing. So, my involvement with SIGCSE was kind of … in a variety of ways. Let me check some notes here.
[79:54]

B: You got involved with ICER to some degree.

M: That came after, actually. There was a … an entity called the Empirical Studies of Programming and that was a predecessor of ICER, basically. And we submitted … let's see, on one of those … the fourth or fifth of the Empirical Studies of Programming overlapped with our … with the work we were doing with LISP, so I think that was our first publication there. And one thing led to another. ESP 5, 6, and 7, I had been invited to be on the program committee. So I was involved in that starting in — well again, I'm having trouble with the dates, but we can look this up. At any rate, there was … the 7th ESP never got to the point of an organized workshop or meeting or anything. It was just papers published. And so a couple of years passed, I think, and then ICER started. So I was on the program committee from … well, I've been on all the ICER program committees and then the one at Berkeley, I also did the local arrangements and that kind of stuff.

B: So after the LISP adventure, what was the next Berkeley adventure?

M: Let me say more about LISP first.

B: Okay. Sure.

M: One kind of event that sort of stands out in my mind was … while we were doing this research into how people learn to program in LISP, I was teaching our Intro course for four semesters running. So, it was nice to be able to take advantage of the overlap between what I was teaching and what I was doing for research. The … one thing that I noticed— some background was … one of the things I was doing as part of the class was to explain the LISP evaluation algorithm pretty early. So I said, "Here are ten lines of code for how you get a

value out of an expression in LISP." And the problem, of course, is that that evaluation algorithm may be short but it's certainly not simple; really, seriously recursive. And I'm sort of embarrassed to note that I was trying to get people to deal with those LISP evaluation algorithms two weeks into the semester. And I was surprised when students were having errors involving evaluation really late in the semester. I can remember just thinking, "What's going on here? Why are they not getting it?"

[85:54]

Well, let's see, what came after that? Betsy Davis joined our group. She had just gotten her Engineering Bachelor's at Princeton and so she was interested in education and she got admitted to the SESAME program, Science and Math Education program at Berkeley. And she joined our group to … because it was sort of interesting. And she kept track of — she don't know LISP — and she kept track of the kinds of problems she ran into as she was trying to learn to program in this language. And sure enough, she was having the same problems as the students were involving parentheses and quotes. Confusing one for the other and that kind of thing. So she said, "Well, gosh, if I'm having this problem with parentheses and quotes, what must the students be dealing with?"

So, she devised a list of think-aloud problems and one of the aspects of our arrangement … a requirement we had of students in the class was that they show up for an interview. We kind of treated the CS1 like Psych 1 in terms of "not only do you have to learn the material but we have to experiment with you". So, she posed to students these problems and had them think aloud. And she came up with some misconceptions that seemed to fit very well with the behaviors of the students. So, for instance, we noticed things like … a misconception would be you have to have parentheses around every argument to a function call. Or you have to quote everything. Or things like that.

Once we had these prospective misconceptions, we could then give them exercises that would target those misconceptions and make the students become aware of the reality versus the error of their ways. It worked. I remember thinking, "Gosh, one of my colleagues … my colleagues in the department that are doing research, when they come up with some success in their research, they don't have anybody to … who can they brag to among their colleagues?" Whereas here, there were 200 people in this class; they once were lost and now they're found. It just made me feel so … satisfied compared to my research faculty colleagues. That here was … success in my area was like immediate, so that was really neat.

Let's see. Do you want hear any more about these activities?

B: Well, one of the things … as you were doing this, you were developing a coterie of people who were interested in the same things as you. Can you talk a bit about your role as a mentor, as a guide, as a pusher into CS Ed research, teaching?

[90:06]

M: I'm not sure what to say about that, the … because in general I am kind of skeptical about my role in pushing research. The … we had … I mean, I'm thinking most of my mentorship went toward teaching assistants in Berkeley CS. We … I invented the two courses they have that … The first is, these days now, required of every first-time TA in the department. And the second one is a Design a Course course, where students pick a course they want to design

and then the discussion sections that are based on that have the participants design homework, exercises. Design a case study. Design exam problems. Pick a book. Pick a grading policy. Those kinds of things. That course has provided, I think, over the years a nice opportunity for mentorship. Participants in the course really get a big dose of the kinds of things I think are good and not so good.

B: You also wrote a book with Cooper. You want to talk about that at all?

M: Well, I can give you some history. Doug was a very impressive guy. He started school at Cal and dropped out after his first semester and went on to do these various things. I think he was in the Merchant Marine for a while and did a bunch of travelling. Finally, he came back and he was taking our Intro course. And he said to his instructor, who happened to be a grad student at the … he told the grad student, "Well, this book is terrible" and the instructor said, "Well, right, but nobody has time to write a better one."

So, Doug also was a housemate with one of my TAs. So the TA sent him to talk to me. And Doug said … Doug comes in and says, "The book you're using for this course is just awful." I said, "Right, but nobody has time to write anything better." And Doug said, "Well, I'll write a better book." So, he did and I was watching from the sidelines and contributed stuff here and there. And *Oh! Pascal!* happened. We were in … its big drawing card, I think, was it was written in a style that was much more informal than the competitors, and that was good. And it also focused on these aspects of how you put a big program together and why you do it one way rather than another and so forth. And finally, it was really in the right place at the right time. That was one of the little boomlets; the first little boomlet that … in enrollment. So we were fortunate that as we were producing the book that enrollment …
[95:34]

B: For the boom?

M: Yeah.

B: Can … what professional service are you proud of? Things that you've done.

M: Well AP.

B: AP.

M: SIGCSE stuff in general. One of the things I did recently was … I found my little talk to the … for the first-year SIGCSE people that I gave in 2009 and …

B: When you were the lecturer for the first-timers luncheon?

M: Yes. So it was nice to kind of look back and say all these things I have been doing with SIGCSE have been a lot of fun.

B: Cool.

What do you consider your biggest challenges in your career of teaching, mostly at Berkeley but … ? Were there any particular roadblocks that you can think about?

M: Well, let's see … one … I mentioned these two courses for prospective teachers and …

B: You really didn't talk about what the substance of the first course was.

M: Yeah, well, that's because we didn't have a very good idea of … I mean, it was … things we tried sometimes didn't work and we didn't have good reasons why. And then you get these booms, with lots of students and therefore lots of TAs. And there were times in this course where there were … where enrollment was like in the fifties and …

B: Fifty TAs?

M: Fifty TAs. Yes.

B: Wow.

M: I was never able to satisfactorily handle number one, how you run a decent discussion in a class of fifty. What I mean by a decent discussion is not only … it's a really heterogeneous batch of people. So there's the TAs for the grad courses and the TAs for the project courses and the TAs for the theory courses and the TAs for the lower division courses and the TAs for the lab courses.

B: All in the same … ?

M: All in the same room and you don't want to bore them. Also, I had this kind on ongoing skepticism of is it better for them to be involved in this course for 3 hours a week, I guess it was, or are they better off planning for their course that they are TAing and helping … because what we really would like is for the … whatever we're doing in the class, to be useful for student's learning in the courses that are being TAed. So I don't think…

[99:54]

B: So now did Design a Course replace the first course for TAs?

M: No.

B: It's a follow up.

M: It goes beyond. It goes actually with a 4-year graduate degree … for your Ph.D., you need a couple of minors. So for instance — and a minor would be some number of graduate courses. So a statistics minor, for instance, would be 3 graduate statistics courses. So, you need an inside minor and an outside minor. Berkeley is just rather more heavier emphasis on course requirements than people at other institutions so we put together a teaching minor that involved more teaching, plus this Design a Course course, plus also they had to take a course from either Education or the Information School, or one of those that … where they learned about research relating to CS Education. So, this Design a Course course was part of the

teaching minor, which, I guess, probably 5 to 10 people take … do that every year. Plus it's just a great course to teach.

B: That sounds like fun.

Do you think you can talk about any compromises you had to make in your career? You talked a little bit but not much. Were there … you seem to have had a quite good career at Berkeley.

M: Stanford tried to hire me in 1989.

B: Oh yeah?

M: Yeah, it was after Stuart Reges was … it would have been to replace Stuart Reges. Berkeley made me a counter-offer that I couldn't refuse.

Another thing I tell TAs for instance is … it's my impression that faculty members don't get a lot of over appreciation. So I look back at my own career and say, "When did they praise me?" One was they gave me tenure, so there was that. Second, they outbid Stanford for me. The third, when I was promoted to Senior Lecturer. And the fourth was when I retired. So, it's …

B: We're going to wrap this up. Do you have outside interests other than computing and teaching?

M: I sing in a church choir.

B: So your singing came back.

M: Well, it's still kind of gravelly because of the Parkinson's.

B: But I meant the 3-year old now gets to sing.

M: Yes.

B: Yes.

M: I once was a bridge player but now not so much of that.

My wife is … she works at Wilderness Travel in Berkeley. And what they do is they set up exotic trips, so treks and such like. And I've been able to share in some of these trips. And so we …

B: What's your favorite?

M: We were … my wife and I were scoping out Pakistan to … the people in … the arrangements people in Pakistan wanted Wilderness Travel to set up an official trip there. So they sent my wife out to scope out the possibility of that. And this was the July before 9/11. And it was … between the scenery and the exoticness of … there. Yeah, Pakistan was my favorite of all the batch.

[105:41]

B: You haven't talked much about your family. Just about your wife and would you talk just a little bit about your family?

M: Certainly. My wife, actually, she was the … probably the third person at Berkeley that I met. My second visit to Berkeley. The first visit was after the … in the early morning, when I was talking to Blum about the mess in Intro. And then I showed up later in the week to fill out some forms and she was there. Time passed. And she had been married before and she got divorced. And then we got closer together and we … she eventually ended up marrying me for my Kaiser card.

B: So health insurance wins, huh?

M: Yes, she was … when 9/11 happened, they cut … Wilderness cut back a lot on staff and she volunteered to be one of the staff cut back. That's when she needed health benefits. But …

I mentioned that grad school was my … was the happiest time of my life.

B: Yes, yes.

M: Close behind that, I think, are many, many trips. Many, many, most of interacting with my wife. We have a granddaughter now who lives in Truckee up by Lake Tahoe.

B: So there were children?

M: Karen had a son.

B: So this is from her first marriage.

M: Her son.

B: So your grandchild is in Truckee. How old?

M: Eleven. And her son lives up there too. It's a great age.

B: Yeah.

M: She calls me up from time to time for … we set up a Skype connection for helping her with her math homework. And she's on the honor roll, so sometimes I suspect she's only doing this to boost my ego. It's kind of fun … it's kind of fun to just see the differences between how I learned to do stuff in grade school math and how they do it now.

The rest of the family, they all … there was a lot of dying recently.

B: Oh, I'm sorry.

[109:13]

M: Yeah it was … my younger sister, she had been … so after my parents died — that happened in … before 2010. And then my two sisters and brother-in-law moved into the house. And so one of them was … my sister Maureen, the youngest of the two, she was the breadwinner. And her husband, Kurt, lived with them. And then Mary Kay was the middle and she lived in there too. And what we had over the past year-and-a-half was Maureen died in September of last year. And then Mary Kay died in April, I think. And then Kurt died recently too and …

B: Oh dear.

M: So within the space of not much more than a year.

B: Oh my. Oh dear.

M: So that's been eating up some of our time, is getting all that organized.

B: All settled and dealing with it.

What … what's the future that you see for Computer Science education? What's your dream that you want to see happening?

M: Well, it's got … somebody has to figure out how to deal with all the enrollment. And actually there … John DeNero at Berkeley is coming up with some good ideas, I think, on how to do that.

Another thing, which I haven't had a chance to say anything about, is lab-centric instruction. I devoted quite a bit of my life to putting together curriculum for use in a lab-centric concept … a lab-centric situation. And for the tape, let me explain. So, our underlying assumption is that students don't learn a whole lot from lectures and so we think that it's sort of conventional wisdom that students learn by doing. So, a good place for encouraging this learning by doing is in a lab, where ideally you can … students … it's easier to get help, and to get stuff explained, and so forth.

And so in our lab-centric format, we've thrown out … well, the traditional format, at Berkeley, at least, is three hours of lecture and two hours of lab and one hour of discussion section. And we changed that to be one hour of lecture and six hours of lab. And then the lab would consist of a bunch of lab activities. It's administered online, so it's … in some ways it shares characteristics with a MOOC. What are our organization is involved, I think, is referred more in a sort of blended context. And … so there's a quiz that starts every lab and so the TA can look at the quizzes and pounce on students who seem not to have … not to understand. And so that targeted tutoring can clear up the problem much more quickly, we believe. The 6 hours a week gives you the luxury of doing things you might not have had

time to do in the traditional format. More formative assessments. Stop and check. Things like that.

[115:14]

We never … well, a long time ago, we had students working together, figuring … it was sort of a greedy thing. If students are working in pairs, then that's half the things you have to grade. And the problem was sometimes groups need group therapy. And we as computer scientists are — most of us are really not equipped to provide that, as our education was in computer science, not psychotherapy. And so at some point the hotshot students got fed up with partners that were parasites, basically. They called them Klingons, because they'd just cling-on.

B: I like that. I got that.

M: And so we throttled back on the amount of collaboration we were involving. But the problem is that there's been a lot of research on collaboration and almost all of it's good. And so, another thing that 6 hours of lab gave us the luxury to do is to monitor the groups. So any time there's … on the homework, students are doing pair programming and they're monitored by … the TA gets them to switch driver versus whatever … On projects, the TA checks and checks in each student on the project to make sure they're … make sure each student is pulling his or her own weight.

And there's various other good things about lab-centric instruction. I have a list here. Another thing is that, a lot of times with homework and class activities, in our traditional format class, the … you have lab exercises that kind of get familiar with thendetails. And then there is homework. And then there's projects. The height of that step up is for many students, too high. And another thing that 6 hours a week of lab lets us do is a more gentle gradient of the activities, so that's a really neat thing.

I mentioned a lot of assessments. More opportunities for students to help one another. And they seem to be more productive.

One of the things that I should have done that I didn't was to set up some sort of A-B comparison between the lab-centric version and the traditional version. And I didn't do that mainly because of … I think all the people who teach that course at Berkeley are kind of set in their ways. I didn't work as hard at … *I* didn't work as hard at setting up a comparison as I should have. But the course is taught in lab-centric format every summer at Berkeley and so I still keep my …

[119:52]

B: … tabs on it; have your finger into the pie.

As a wrap up to this, could you pontificate on what you would tell a young person starting out in computing. You're teaching all these students; what kind of advice would you give a student starting in computing?

M: Starting in computing?

B: In computing. Considering a computing career.

M: Ah. It's hard to say because it's so dependent on the instructor. I mean … in my own experience, I … if I didn't end up working at the computer lab, I would have been lost to computer science and probably unhappy. Who knows.

So, one thing I'd advise a prospective student is to just pick the right instructor. Or pick the right format of class. The … another thing about lab-centric instruction is that it's — it gives you, again, 6 hours a week of luxury — of doing different activities in your course. So the kind of instruction you might want to use with a traditional male autistic computer science person might be very different from what you might … or activities that somebody with kind of broader interests might choose. I mean, one source of optimism, I think, is this emergence of data science and … I'd look at that as a source of problems that a wider variety of students can get involved in. And once they're snagged, …

B: Then you've got'em.

M: … then you've got them. So it's at the Intro level that we need to do the right thing and it's hard because there's so many flowers blooming.

B: That's an exciting way to … you ended with such an optimistic look at computing education, at the possibilities, and that … Your face shines when you talk about this last phase. It's wonderful. I'm really glad that I've had the chance to talk to you about that.

If there's one little story you want to think about that you'd like to have us remember you with? Do you have a short story you'd like to tell us, that "oh boy, that's Mike"?

M: Maybe something will be in my notes here. Hang on.
[124:05]
The story is what I did when I retired. The … I had this stereotype of retirement, as there'd been over the years all these neat things, all these fun things to do, which I'd never had time to do because I had the day job. Then I retired and I started doing all these things. That overcommitted me actually. And Karen, my wife, started nagging me about how I was working harder after retirement than before. My wife thinks I work too much and she is certainly right there. And it is compounded by another weakness I have, which is I am not a very efficient worker, so that gets in the way from time to time. I'm hopeful that she'll be able to adjust to the new me now that I'm retired, more efficient worker. So, I recognized this at some point and I chose a focus, some proposed activity that fit the focus I might do. And if it didn't fit the focus, no matter how fun it was, I'd do that when I'm 80. And the focus was to design the World's Best CS 2.

B: All right.

M: So what I'm doing about that, I mentioned that we're this group of us, that are supported by NSF as it happens, to design a concept inventory for CS 2. And visits to … let's see, I attended a workshop on Open DSA, Open Data Structures and Algorithms, that Cliff

Schaffer and his colleagues are doing. It's an online book basically with tie-ins to visualizations and so forth. And so I'm keeping an eye on that to see how … to if the facilities he provides can be useful, can be useful for my World's Best CS 2.

B: Cool.

M: And it's worked out. It seems to be the right amount of stuff to do while still keeping openings for travel. Interacting with our granddaughter. That kind of thing.

B: Good, keeping a focus. All right.

Well, Mike, thank you for giving us the time, the project the time and thank you for all you do for CS Education.

M: This has been a lot of fun.

B: A pleasure. Thank you.

[128:01]