



Kevin Ahern Oral History Interview, June 29, 2015

Title

“Biochemistry, Free and Easy”

Date

June 29, 2015

Location

Valley Library, Oregon State University.

Summary

In the interview, Ahern describes his rural upbringing in Illinois, his move to Oklahoma, and his undergraduate experience at Oklahoma State University. He then discusses the laboratory experiences that ignited his passion for science and that led to his pursuit of graduate degrees in Biochemistry. In reflecting on the Oklahoma State years, Ahern outlines his graduate research as well as the genesis of his love of limericks, puns and wordplay. From there Ahern details his move to Oregon State University, his work in George Pearson's laboratory, and his post-doctoral fellowships in San Diego.

The primary focus of the session is Ahern's activities as a staff and faculty member at Oregon State. He describes his early work as a writer, both at OSU and for scientific magazines, and notes his involvement with helping to revise the second edition of a popular biochemistry textbook authored by two OSU professors. He also shares his memories of his early experiences as a teacher and his initial thinking on how he might better connect with students. Of particular note are Ahern's reflections on his use of songs, limericks and the internet in improving the educational experience for OSU undergraduates.

After discussing his research and patent for Boomerang DNA Amplification, Ahern recounts the story of his meeting and marrying his wife, Indira Rajogopal. In this, he describes their wedding in the Biochemistry department library and the far more formal ceremony that took place in India a year later.

The session then returns to the evolution of Ahern's methodology as a teacher, including his robust online presence. He likewise discusses his passion for advising students, his work as Director of Undergraduate Research, and his collaboration with his wife on multiple open access textbooks. The interview concludes with Ahern's thoughts on teaching courses through OSU Ecampus, a few notes on family life, and his words of advice for students of today.

Interviewee

Kevin Ahern

Interviewer

Mike Dicianna

Website

<http://scarc.library.oregonstate.edu/oh150/ahern/>

Transcript

Mike Dicianna: Okay, today we have the pleasure of capturing the story of Dr. Kevin Ahern, professor of Biochemistry and Biophysics, an author and a limerick aficionado. Today is Monday June 29th, 2015 and we're at the Valley Library here on the OSU campus. My name is Mike Dicianna, I'm an oral historian for the OSU Sesquicentennial Oral History Project.

Well, one of the things that we endeavor to do is capture the entire life story of our interviews, so how about a quick, brief biographical sketch of your childhood, to start with, like where were you born, early childhood memories?

Kevin Ahern: Sure. Well, I was born in a very tiny farm town in the Midwest, west central Illinois; little town called Fowler, Illinois. Its only claim to fame, really, was that a very famous author had once lived there, and that was William Scott Gray, who actually was a distant cousin of mine, and he was the person who wrote the *Dick and Jane* readers. And so, I was very fascinated by that, by him. I grew up not even knowing that. Really it wasn't until I was an adult that I later became aware of him and his significance.

Tiny farm town, not much around it, pretty lonely kind of existence growing up. I always felt that not having other kids my age around was really important for me and my imagination. I think that you live a lot of your life—my wife says this—that you live a lot of your life in your head, because you learn to do that. And I was, as a kid, very much of that sort. I lived there until I was seventeen years old, and I think it really helped to make me the person that I am. Now, there were obviously downsides of that. It was fairly boring, it wasn't the most stimulating environment to be in, but I had great teachers. Some of the best teachers I ever had were at the little tiny school where I went to both grade school and to high school, that was there. The town's small enough that we had about five towns that went together to make one high school. So, it was very tiny. Everybody knew everybody, everybody knew everything about everybody.

Obviously a farming community. I had pretty bad allergies, so I had asthma very bad as a kid growing up. So, while my peers got jobs on farms doing things and so forth, I couldn't bale hay. I tried it once and I almost killed myself. Couldn't bale hay, couldn't do things like that because I just would just clog up and it was very bad. So, that kind of limited options; didn't have any spending money, didn't have anything like that. And neither of my parents were educated at the time. My mother later went back to school to become a veterinarian as an adult, after she had raised her kids. But growing up, neither of my parents had done anything beyond high school. So, it was pretty much a non-academic kind of environment to grow up in.

MD: So your high school days, it was small high school. How many students?

KA: Yeah, little tiny high school. My graduating class had seventy-two students, and that was—I didn't actually graduate from that high school all the way. I still sort of claim it as that. When I was in high school I was a very, very, I think, repressed and very, I can't think of the word...shy I guess is the best word to say. So, I was very quiet. And it was very interesting to me when I went back to my twentieth-year high school reunion. Of course you go back, you know, and you never know what you're going to see, what you're going to do.

I didn't really like high school a lot, I have to say. I went back and had a wonderful time, but the amusing thing to me was the number of people who had no idea—of course if you change, you know, they don't know who you, what you look like, and you tell them your name and they go "hmm, can't place that name," you know, and you think you must not have made too big of an impression on people when you were there. But, so I didn't really have—I mean, as a high school kid I was pretty nerdy. I studied a lot, I loved science; there was a time when I wanted to be an astronaut and things like that. But that was high school, I think.

MD: Well, your undergraduate experience was at the other OSU.

KA: The other OSU, yep.

MD: Oklahoma State. At least they have the right colors. And you graduated in 1976. Now, what was your major, what kind of coursework did you have there?

KA: So, I tell my students today that, you know, don't be like I was. I was a pretty clueless kid. Part of it was, again, my parents didn't have an educational background, so I didn't really have much guidance from there, didn't have a lot of guidance from academic advisors either, unfortunately, and probably partly my own fault. I didn't seek it as much as I should have. Bounced through a variety of majors, including Pre-Veterinary. I started as a Forestry major, I was Animal Science, I was Agriculture. And finally my senior year I had met an advisor through a girl that I knew who said "you know, you could probably get a Zoology degree if you'd wanted to do that, given the various classes that you've taken." And I thought "why not." So, it got me out in four years, I got a Zoology degree. And my wife laughs at me that I really know nothing about animals. So, and it's true.

[0:05:38]

MD: Now, your days in college were during the final years of the war in Vietnam.

KA: Yeah.

MD: And was Oklahoma State involved with the anti-protests?

KA: Yes.

MD: And, you know, because OSU here was not really crazy. They had to go down to U of O for that.

KA: Yeah. I would say Oklahoma was not a lot unlike Oregon State was, and is, for that matter. They're both sort of little islands surrounded by very conservative people, more so in Oklahoma than here in Oregon. But it wasn't a hotbed of protests. I came very close to getting drafted. The draft—they ceased the draft essentially the year I was eligible. So, I had a number, my number was about halfway in, but they had pretty much wound things down for that by the end. I think about, you know, how your life changes if you had had that happen. Of course, I know people who did get drafted and who didn't make it back and things like that. So, pretty fortunate. Very, very fortunate.

MD: Well, what other kind of activities were you involved with? A member of a fraternity? Extracurricular?

KA: Yeah, like I said, I was a pretty boring guy, Mike. As an undergrad I still sort of retained that shyness. And I tell people today that I was very shy and they say "oh, you couldn't be shy" and stuff like that, and I'd say "yeah, you can be. You can overcome that. And I really made an effort to do that." As an undergrad I really didn't do much besides work—I paid my own way through—work and go to school. I didn't have really anything in the way of extra-curricular activities as an undergrad. And again, I tell my students that's not a good idea. You learn a lot by the socialization that you get with others, and learned from others and so forth. I had friends, it wasn't as if I didn't have friends, but I was not a person who was doing organized activities. And it was a mistake. I think there's no doubt it was a mistake. But it worked out in the end, I suppose.

MD: So, you moved on, and by 1981 you ended up with a master's in Biochemistry, again here from Oklahoma State. Now, tell us about your thesis research. It sounds like it had an application for agriculture, because it was "Separation and Characterization of Retinoids in Chick Bile."

KA: Yeah, pretty great title.

MD: Chickens?

KA: Chickens, yeah. Yeah, the best thing that ever happened to me professionally was upon graduating from Oklahoma State University with a bachelor's, I had no clue what I was going to do, I had no clue how things worked, I didn't know how the job market worked. I literally thought—it's a true story—when I got my bachelor's that the job offers would just start flying in through the door. And that's, you know, my parents had said that. My parents had said, you know, "you got a college education, everybody's going to want you" and so forth. And to my surprise, that didn't happen. And so, what I got was a job working in a laboratory with a wonderful person researching Vitamin A. And I had never in my life done research. The only labs I had ever taken were classroom-associated laboratories. And in those days, which was the seventies, undergrads really didn't get much involved in research, so it wasn't too surprising that that happened.

But I got a job working in his laboratory and it was the most eye-opening thing to me. The jobs I'd had prior to that were of course like flipping burgers, I moved furniture, I even made tombstones once for a period of time, with somebody, of course. But the laboratory environment was stimulating, it was around people who were really interesting and fun and fun to talk to, and very mature, very—just a different kind of environment than I had been associated with. And so what I found was, first of all, I could use my head doing my work instead of using my body, which is what I had done prior to that point.

[0:10:09]

So, that was really good. And then I discovered the sort of way that science worked. You know, the hypothesis-driven science and testing hypothesis and going back and evaluating and so forth with that. And the work was just absolutely delightful, because I could do it—it was fairly automated, so I could set something up and go do something else and come back and it was taken care of and so forth. And that was great. Now, we did work on chickens, we worked on chick bile and that was partly because—well two reasons for that. One was we had tried working with rats, and rats don't have a gall bladder. And the idea was that we could collect bile from these rats. We were interested in a special metabolite of vitamin A that is not stored. So vitamin A, the main form of vitamin A is stored, but this metabolite wasn't stored. So, we wanted to collect it as quickly as we could. So, we didn't want to have it sitting in the gall bladder or something like that.

So, we tried rats, and none of us had the ability to cannulate a bile duct, which means sticking a little tiny tube in the, yeah, in the what I guess, little vein or whatever it is that the bile comes out of the liver from. And so, we gave up on that. And chickens had a gall bladder; we decided that was okay to do, and we had access to chickens. So, I became the sort of chicken expert. I knew how to decapitate a chicken and to—so we could collect its bile. And I think that this really, I was probably the only one who was able to do that. Everybody else was pretty much grossed out by the whole process. I mean, when you decapitate a chicken it gets pretty crazy.

But I was able to find some really cool things, and it was during that experience working in that laboratory where I first became a scientist, which was that I for the very first time understood a system. And that really opened my eyes to what one could do with science. And so, it was about that time that there was a professor in Chemistry who was the husband of one of the graduate students in the laboratory. He was a very bright guy and he came to me and he said "what are you doing futzing around with this lab stuff for?" I said "what do you mean?" He said "well, why don't you get yourself a degree? Why don't you go to graduate school and get yourself a degree?" And I looked at him, and I had tremendous respect for him, and I said "Mark," I said "I can't afford to go to graduate school."

And he said "what do you mean you can't afford to go to graduate school?" he says "they'll pay you about what you're making as a tech working here." And I said "they pay you to go to graduate school?" And I had been working in the environment for that period of time and it never sunk into me. Nobody ever told me. And he said "of course." And I thought well, that's pretty amazing. And so, I got checking out and what he had said was true. They were paid about as much as for the graduate students as they were paying for me to be a tech, and I thought wow, this makes sense to get a degree.

So, that's what got me into going to graduate school. At first I thought oh, a master's is really all I want, all I really wanted to do. And the mentor at Oklahoma State says "oh," he says "I think you should get a PhD. You should get a PhD," and I said "I don't want a PhD, I don't want to do that sort of thing." So, he became my mentor for my master's degree, and it was during that process, which took about two years, because I had to pick up some prerequisites and so forth that I hadn't had with the Zoology degree, that I really blossomed as a scientist and I really realized the value of research and the importance of research. And to me it was stimulating. It was absolutely stimulating. I loved that environment.

And so, the upshot of that was by the time I finished my master's I thought I should get a PhD, which is what the mentor originally told me. So, I pursued places that would let me do a PhD and I, by that point, knew it wasn't to my benefit to get a PhD at Oklahoma State, because bachelor's, master's, PhD didn't make any sense. And I got married, I was married to a young woman for a period of time, and she really helped me to see the west coast. You know, "you should think about going to the west coast." Her mother had come from the northwest and so forth, and so I applied to a variety of places besides the northwest, but also the northwest. And one of those, of course, was right here, and it was the best thing that ever happened.

[0:15:02]

MD: Well, during your times in the lab it says—I read that you had a colleague by the name of Bruce Halley and that you guys began posting jokes and puns and funny observances on the wall calendar of the—so, then you had a thing called "The Calendar Edition"?

KA: Yeah, yeah.

MD: Is this the nexus of all this?

KA: It was, actually. So, Bruce and I, Bruce was a postdoc, he was a very, very good friend of mine, still is, and we both have very similar kind of sense of humor; really like puns, wordplay, twisting words, making things like that. And so we—I started it, actually, I started something called "The Calendar Edition." So the way it would work is you'd walk into the lab and every day that you thought of something new or funny that you would write the date and then you would write what it was and so forth and then you would try to outdo the previous person. And very just competitive with this and hilarious. They became the sort of thing that everybody in the department came and read. They would just come in—

MD: Yeah, what's going to be there today?

KA: What's the latest thing, you know. And so again, stimulation and so forth. It was really great. So, The Calendar Editions went on for about three or four years. My mentor at Oklahoma State still has them. He's got a collection of all The Calendar Editions. They were really the, I think, well genesis, definitely, of the things that I do today in terms of humor. I've always liked funny puns, comedy sorts of things. And that has evolved quite a bit to where it is now. But the story—and I'll jump ahead if that's okay, but I had the—I had lost touch with Bruce over the years and it had been quite a while since I had heard from him, and we had connected by email back in about 2011 or so. And it had probably been, oh, twenty years since I'd had much interaction with him. You know, late—early nineties or so. And he said "you know, we should start The Calendar Editions again, because the two of us, we can do this by email and so forth." And I thought you know, I really loved The Calendar Editions. That would be really cool to do.

And so, I wrote a limerick for him and sent it back to him and I said "here you go," and I dated it and sent it off to him and he said "oh, that's pretty cool." And so I thought well okay, I'll send him another one, because we're always trying to outdo each other, so I figured I'd just start piling them up on him and I'll stay ahead of Bruce. We were kind of dumb. And so, I sent him three or four of these limericks, and I thought I could write limericks fairly regularly, why don't I just keep writing limericks and keep writing limericks. So, I started writing limericks and sending them off, sending them off. He would send some back occasionally, but I don't think his heart was in it quite the way mine was.

And that became the—what I now do is a limerick every day. So, I've done a limerick a day for the past three and a half years, and I credit Bruce, both for the original inspiration for The Calendar Editions as well as for the sort of getting me thinking about limericks. Really wonderful, you know, great guy.

MD: So, when you were here back at the correct OSU—

KA: The correct OSU, yeah [laughs].

MD: Now, you were a research associate doing some postdoc work with Dr. George Pearson's lab.

KA: Yep.

MD: And now, that was with the American Cancer Society. What was that research all about?

KA: Sure. So, I actually worked with George under two capacities, both as a graduate student and then later as a postdoc. So, I'll say a little bit, they were both—the two projects were pretty intertwined. It was at Oregon State that I became interested in molecular biology, and that was actually what brought me out here. And I sort of saw that as a direction that the biological sciences were headed. And so, I connected with George and came out here to pursue my PhD with him and got my PhD with him, had a wonderful, wonderful experience with that. George is a person who's very much a father

figure, a paternal sort of person. I had a wonderful relationship with him. He's a great guy, he and his wife Margot I know very well and count them as good friends.

And I had a very successful graduate stay here. It was I think quite varied. It wasn't, I think, as focused as it could have been, but by the end, things really came together and I made some pretty interesting findings that we have publications out of those. But at PhD time of course you decide you're going to go do postdoc. And so, well what am I going to do for postdoc, what am I going to do for postdoc? And so I don't know, so I'm thinking well, developmental biology is really interesting, and this is where we're starting to be able to analyze individual genes and their relationship to how organism's develop and so forth.

[0:20:25]

And so, I started looking for postdocs with that and actually landed a postdoc in San Diego and went down there, and that's actually where I met my current wife, who was at this lab in San Diego. And didn't have a very good experience there. The lab; made some wonderful friends in the laboratory but I just really didn't like the laboratory environment, I didn't like the way that research was done, although I have to say I learned a ton of stuff. Probably the biggest learning experience in my life in terms of science. I learned more things about molecular biology than I ever dreamed I would. It was really a very stimulating kind of environment to be in. But I—the lab, I won't say much more about that, but the lab experience was not good.

And so, I started thinking well, what do I want to do with my life? I've gone all this way, I've got my PhD, I'm doing postdoc, what do I want to do? And I really didn't know at that point, and that was a kind of a bad place to be. All this time, all this effort and so forth and now I thought I'd certainly know what I wanted to do, and now I don't know what I want to do. And so, I came back to Corvallis, actually. I had done a lot of things with writing. I had been an editor for a journal for a while and I came back to Corvallis to interview for a position as a writer, actually, at Oregon State. And actually I think that one was with the EPA, if I'm not mistaken. I can't remember the details of it. But in any event, came back for an interview and when I came back for an interview I connected, of course, with George and said "you know, I'm just really not—things aren't going that well down there. I'm just not really sure what I'm going to do." And he said "well, why don't you come back here and work with me for a while, while you sort things out?" And it was music. I just said this is a no-brainer, no-brainer coming back here.

So, came back as quickly as I could, which wasn't very long after that. And I had a fellowship from the American Cancer Society, which is what you have there, and I was able to bring that with me and that paid my way to continue to work with him as a postdoc. And so, I sort of continued a project that I had worked on as a graduate student and worked with his students as well. He had several graduate students at that time. And he and I were also putting some finishing touches on some papers. And so, we did that for a little bit over a year. And then I did one of the dumber things I ever did in my life, which—it wasn't dumb in the sense that I had to have a job, but it was dumb in the sense that the job that I applied for and got was the business manager of the Department of Biochemistry at Oregon State University. And I got that job in 1989, and here I was, I have a PhD, I was trained as a molecular biologist, I was a writer, I was an editor, I was all these things and I was running this department.

MD: An office, yeah.

KA: That I knew nothing about. And not only did I know nothing about it; it wasn't the most stimulating environment to be in. I did get to interact with colleagues, faculty and so forth, through that. But it was just, it was a very not a good thing. That not a good thing I ended up doing for nine years. It was a long time. But along the way I had done—my writing career was really taking off; I wrote for, I became an editor for, *Science* magazine, I was an editor for *Genetic Engineering News*, I later became a contributing editor for *BioTechniques*, and a variety of things. And so, the writing was going great but nothing else was going very well. And in 1998 I had been futzing—I'm a computer nerd, so I was futzing with stuff with the computers, and the chairman of our department is Dr. Chris Mathews, wonderful person, wonderful colleague, and he and another member of our department, Ken van Holde, had written a very popular textbook on biochemistry, published by Addison Wesley. And they were finishing—well they had finished their second edition and they were starting the third edition and I had shown Chris some things with HTML and how you could link things and how you could do all this and that sort of stuff with your information.

[0:25:14]

And to my surprise, one day he came and he said, you know, "We're really looking for kind of a neat hook for our new book. Would you be interested in being an author on our book?" And so, that music to your ears, and I said, "Hell yeah." And so, I took on that, became a third author on that book, and he was actually my boss at the time because I was running the department and he was the chair of the department, and so I reduced my time to half time and—so I could work on the book and begin my exit out of the office into what turned out to be teaching. And I volunteered to do some teaching for him because I really liked the idea of teaching this or teaching that and so forth, and so I did that and it provided a very good exit strategy to get out, and the teaching went really, really well, way better than I ever would have expected. And so, I always made sure when I get my evaluations and I'd put them on top of my desk so that when Dr. Mathews walked by he saw them and he said, "Oh, you're doing a very good job of this, you know." And so, that ultimately completely got me out of the office. And that's wandering beyond your original question, but, you know...

MD: Well, and one of the things that you talk about when you're saying—you have a teaching philosophy. We'll get into this a little bit more—

KA: Yeah, sure.

MD: But getting students over the hump and fear, and foreboding and into the lab investigating new stuff, I mean, this is—was that part of your decision? Do you really want—you know, you're student based.

KA: Yeah. I had always thought I would be interested in teaching. It wasn't until about this time that I described to you that I had actually done any teaching. I had never been in a classroom. I—you know, graduate teaching assistant or something like that, but nothing more than that. And so, when I got the chance to teach, the very first thing that struck me was what you mentioned there, which, that I saw that students, when you said the word "biochemistry," you just go [gasps]; you could hear that gasp, and then I realized that there was just something that was very wrong about that; that part of the reason people gasp is the subject itself seems scary. Part of the reason people gasp is that they're—and I don't want to be too negative here, but they've had experiences with professors that, shall we say, they're hearts aren't in teaching. And the combination of those two for a very daunting subject like biochemistry seemed to be very counterproductive.

And so, I really made an effort in that very first class I taught, which was just a baby class, but I made a very strong effort to try to connect with the kids, talk to them as a person, not as a professor, not as somebody up here, and try to even that level out so that you would at least cut through that level of the professor being approachable, which I thought was really important to do. And that was really what worked really well. The students responded to that; the students, I think, did better because of that, and moreover, the students interacted with me as a result of that. And that really stuck with me. It really stuck with me very much. And so, the experience turned out to be just an extremely positive one, as I said. And of course I was writing a book, I was doing all these other things now, but this just sort of crystallized everything that this was pretty cool to be doing.

And so, after that first class went really well, the chair said "well okay, why don't you try this little bit more advanced class?" and I said "sure." And so, I tried a little bit more advanced class, and similar results, similar sorts of things. And that more advanced class that I started doing things like putting things online that students could access and so forth, because I thought that access was really important and that there were more things that students were going to learn besides what they could copy down as quickly as I wrote.

MD: Yeah, that was probably pretty early for that type of innovation.

KA: Yeah, it was, yeah. That was late nineties, and at that time video wasn't practical to do there, but I was putting audio online. So, I recorded my lectures and post the audios so the students could listen to them again. And that went really well. Again, that they appreciated, I think, the effort that it made to do that. They also appreciate the abilities to listen to things a second time. So again, cutting through that sort of barrier that had been there before made a very big difference. And again, the response was very positive. So, I was feeling pretty good about that. And the book was coming along fairly well by that time and was getting some very good vibes from all that.

[0:30:39]

And at the same time, that was about the time I also started as an editor for *Science* magazine. And so, man I got everything going on right now and just busy as all get-out. But you know, I've always been a person that does best when I'm at my busiest. And I don't know if it's the adrenaline or just the lunacy of my brain, but it works really well when I'm really, really busy. So anyway, Dr. Mathews came to me and said "well you know," he says, "I've got a bit of a problem," and he says "you know, I've got this Biochemistry 451," which is a non-major's class of—very big class, the other classes I'd been teaching were small, so you could—pretty easy to have those connections with the kids. And he said "I've got this big class," and he says "and it's usually team-taught and the person that teaches the first part of the term is doing something and can't teach, and I wonder if you'd be interested." And I was foolish enough to say yes, I was. I had never—the other classes I taught weren't central biochemistry. One was a sort of survey class about molecules and the other was about molecular biology, which I knew a lot about, but this class was now central to biochemistry. And aha, man I hadn't had biochemistry in twenty-five years, you know, and how well is that going to work? And like I said, I was foolish enough to say yes, and it turned out that I—the other person teaching the class with me was my PhD mentor, George Pearson.

Well, that turned out to be a wonderful thing. It turned out to be absolutely great, but I will tell you the very first time I set foot in that classroom and my mentor is there watching me do it, I lost half the hair that I've lost on my head with worrying about that. And that was just extremely daunting. But what it did was it made me work very hard to prepare, to do the lectures, to do the stuff. I wrote a lot of material for that, and part of the writing was to give to the students, but part of the writing was also to kind of refresh my memory about central biochemistry. And so, I taught that first half of the term, which was five weeks, and the experience went really, again, went really, really well. Everything—it just kept building and building and things were, by that time, were going very positively. And I was feeling very good about that.

And I got to the end of the term and I thought I should really do something special, something to kind of commemorate the fact that this—I've taken this step now and I've done it and it's worked. And I had known of this book called *The Biochemists' Song Book*, which Dr. Mathews had actually shown me years before. It was written by a professor in England, and his idea was to take popular tunes and change the words and write them about biochemistry, which is of course what I do. And I thought well, you know I could do that. And so, I sat down and wrote a couple of songs that I thought would be of amusement to the students. And so, the last day of class, I didn't tell anybody, I didn't tell George, I didn't tell the students or anything, but I walk in prepared to sing two songs to the students. And so, I finished with my lecture, and I didn't tell them I was finished with my lecture. What I did was I pulled up the words to the songs on the screen and I broke into verse, right in front of them.

Well, I can't sing worth a crap. I mean, as you've heard my videos, I am a really bad singer. And the look of shock, the look of that shock turn to amusement and then that look of amusement turning to just hysterical laughter was just wonderful. And of course for a ham like myself it was, again, music to the ears. I keep coming back to that phrase, but it was such a wonderful thing. And George thought it was really an interesting way to end the term—the end of my part of the term, and so forth. We had a wonderful, wonderful experience with it.

[0:35:05]

And so, that's what actually gave rise to the songs, was that. And then I started writing songs. I would write—originally I'd write one song a term, and so at the end of every term I would sing a new song to the students and so forth, and that later changed where I'd just start writing songs when I was thinking of songs. But that was the genesis of the Metabolic Melodies, actually. So, yeah.

MD: Yeah, I'm going to download some of those, too.

KA: Oh, I'll give you CDs.

MD: Tell you what; I want to mention a couple things. One of the things that you invented and patent—you have a patent for the Boomerang DNA Amplification.

KA: Yeah, yeah.

MD: Now, is this amplification for all types of DNA, or is it real specific?

KA: Yeah. It's a good question. I had the idea for this, what became the patent, not too long after I had gotten divorced. I had been working in the office for a little bit and there were a variety of things and I got divorced and I was talking to the woman who is currently my wife and she and I were talking about a problem she was having with trying to amplify a portion of DNA. And so, there were techniques that allow you to amplify DNA fairly—I won't get too technical here, but fairly easily; that take a couple of pieces of information necessary from the DNA and allow you to use that information to make billions of copies of it. So, it's what they use on CSI and they get a drop of blood or a hair or something and they can figure out the DNA of the person that had that. And the problem that she had was that she only had one of the two pieces of information that she needed. And she said "you know, there really ought to be a way that we can do it with one piece of information."

And as soon as she said that, I thought—and this was related to my PhD—I thought about the virus that I had worked on for my PhD with George Pearson. And it sprang into my head, and this is usually how I get my ideas; I get a visual thing of it, I get a visual image of how to make this thing work. And I said "well, why don't you do da da da da da?" and she looked at me and says "say that again?" and I told it to her and she says "nobody's ever done that before." And I knew the area well enough; I thought yeah, I guess nobody ever has done that before. And so, I said "well, we should do something about this."

So, I came in and talked to Chris Mathews, who at that time was my boss, working in the office, and I said "you know Chris, I had this interesting idea that I think might be patentable." And he said "oh really? What is it?" So, I sat down, I showed it to him and he said "well, that's an interesting idea." He said "how would you like to have some space and materials in my lab to develop it?" Because for a patent you have to demonstrate that it works. You can't patent an idea; you actually have to show that it works. And I said "sure."

And so, I worked nights in his laboratory probably for a couple months to set it up, and then to later demonstrate that the technique actually worked. It wasn't as good as the technique that used the two pieces of information but it allows you to amplify things that couldn't be amplified otherwise. So, I revealed the idea to OSU's patent office, which is what you're supposed to do when you've got a patentable idea, and they liked the idea a lot and they said "well, if you'll sign over the rights to us then we'll do our standard thing with you in terms of royalties and so on and so forth." And I had no money at the time and I said "well, I can't pay for patenting, so sure." It was a great thing.

And they liked it enough that they actually got a start-up company started to use the idea for the patent, and they were actually housed here on the OSU campus for a while. And so, they took the idea and ran with it, and meanwhile the patenting people, I got to interact with the patent attorneys and so forth and we actually pursued the patent and later got the patent. But what happens with patents in molecular biology, and I knew this at the time, was if you don't do something with them very quickly, they can become obsolete very quickly. And so, I told them this. I said "you know, you've got to do something with this patent." And the company was—their sort of approach to dealing with this quickly was we'll get the company going. Well, the problem with getting a company going is that a start-up company has got a lot of issues about starting up that aren't necessarily the same as developing this idea over here.

And so that—and it was a wonderful experience, I will say this, and I met some very neat people with this, but because of the rapidity with which things were happening in this area, the patent never got fully developed, as a consequence; that the company later sold the rights off to somebody else. And I was told that OSU broke even on it, which was good, because there was about a thirty thousand dollar cost to get the patent. But that was a good experience, no question about it. It was stressful, and of course when you're racing and trying to get things and you've got an idea and you think you got to get the idea demonstrated before somebody else has the same idea and demonstrates it. It was a really interesting time. It really was. That was probably, that was early nineties.

[0:40:37]

MD: Yeah. And so, now this technology is used today, or is it—

KA: No, it's not really used.

MD: They've gone past it now?

KA: Yeah, they've gone past it. So, they've figured out—there are other people who figured out other ways to solve that problem of having only one piece of information and not two. Two pieces of information work really well. So, the technology that's out there is Polymerase Chain Reaction; it's called PCR. The person who invented that won the Nobel Prize for it, and justifiably so, because it was a brilliant thing that he came up with. The reason that people were interested in my patent was my patent was essentially the first patent that amplified DNA that would not be dependent upon the PCR patent. So, most patents, because PCR is so widespread, requires licensing of that to do any of these other technologies that are out there. So, people were really interested in that because it had potential to move around the PCR patent, which is expensive to license. But the newer techniques that came along, they were more powerful than mine, and so the power really was what overcame that resistance to licensing. They still would license it, but they got the things that they really wanted. Mine took more manipulation to get what they wanted. And so, I wasn't unhappy, I mean I'm happy today that I got it.

MD: Oh yeah, to say that you have a patent, yeah.

KA: Oh yeah, it was cool.

MD: Well, there's a wonderful story that I wanted to touch on, when you and Indira met and came up here, and I understand that you were married in the Biophysics Department library and that she went back to the lab.

KA: [laughs] to the lab, yeah, yeah.

MD: I mean, it sounds like a wonderful story, I've got to have it.

KA: You've done some good research here, yeah. So, Indira and I, yeah, we are, I guess if anybody are soulmates, Indira and I are soulmates, and we still are today. We had—of course we'd known each other for a long time, and after my first marriage fell apart, Indira was a wonderful, wonderful source of support, and I think helping me to keep my sanity, which at various times I struggled with [laughs]. And she really helped me to do that, but more importantly I think she really helped me to understand what mattered and how to focus my energies in a positive way. That was really something that I had never learned to do prior to meeting her. And that, as much as anything, made me what I am today. That was just absolutely incredible.

So, we had decided we were going to get married, and neither one of us wanted any big production of any sort. We wanted to tie the knot and do all of that, but that was really all that we cared about. And so, we had bought a house on Garfield and we were living together and decided well, it was time to tie the knot. And it was getting to November and we wanted to get it done before the end of the year. And we really hadn't done much with it, so I had a friend who was one of these mail-order ministers and I had known him, actually, since Oklahoma State. He had been a friend of mine at Oklahoma State and he was out here. His name is Ralph Reed. And I said "Ralph," I said "are you still doing weddings?" and he said "yeah, why?" And I said "well, you know, I'd like to get married and I was wondering if you'd be willing to tie the knot for me?" He said "well sure."

So, he wanted to know our plans and so forth. I said "well, I'm not really sure what our plans are going to be, but whatever it is it's going to be very informal." And he said "well that's fine," he said "I've had weddings where all I basically did was sign the certificate." And I said "okay, that's the kind of thing we're looking for, because we don't want anything fancy or special or anything like that." So, we kept our plans pretty secret from everybody, we didn't send invitations out, we didn't do anything like that, and on December 4th, 1992, we walked into the department and we told people that we were going to get married. And; well "really? When are you going to get married?" and we said "today." Well, I think they all thought that both of us were nuts.

[0:45:20]

And so, I asked if the Biochemistry library—we'd just moved into the building a couple of months before that—I asked if the Biochemistry library was open that day, because people use it for various things, and was it open? And well, yes, as a matter of fact it was. And I said "okay." So, I called Ralph and I said "okay, we're going to get married in the BB library. And so, our wedding party—and I joke, but it was absolutely true—our wedding party consisted of anybody who

happened to be in the hall at the time, and we said "well, come on in, watch us get married." And I guess I had told a couple of people, but for the most part that's what the thing was. And Ralph married us. There was no ceremony as such, and we signed the papers right there. And Indira literally was working in the lab that morning and she took half an hour out of her lunch to get married and went back to the lab, finished up her—she was purifying a protein, and when you're purifying a protein, that becomes your baby. You can't just stop in the middle just not let it go, because the protein will die or not function properly. And so, she went back and she finished purifying her protein, and we later had a reception that night at American Dream Pizza and had a great time, as well.

MD: Well, then I understand that you ended up taking a trip to India.

KA: We did.

MD: And then met her family and everything.

KA: We did. About a year later Indira's mother, who was a wonderful lady, had a lifetime of health problems. She'd had rheumatic fever as a child, she'd been fairly disabled by strokes, so she had been unable to come here and visit us and so forth. So, we felt very impelled to come back. And of course I hadn't met—I had met her brother but I had not met either of her parents or other family members. So, we went back in 1993 to see her family and meet her family. And her mother says "well, I want to see you get married here." And we didn't feel that we—neither one of us wanted to have a big reception or anything like that, or a big ceremony, but we also wanted to make her mother happy, who was ailing pretty badly by that time.

And so, her mother's sister organized a, what by Indian terms is a fairly small wedding on the coast there, that lasted only four hours. You know, an Indian wedding can last a week. It only lasted four hours. And that was at Indira saying "we're going to keep this simple, we're going to keep this simple." And I have no idea what I'm getting into.

MD: Yeah, you have no clue, yeah [laughs].

KA: No idea whatsoever. I told Indira, I went back there and I kept saying "what's going to happen? What's it going to be like? What am I going to do?" It wasn't like today where I've got YouTube where I can go look up and see what one looks like or any of that. "Well, what's going to happen?" and she says "oh, don't worry about it, don't worry about it." And I said "my god, you know, I mean I haven't met these people, I have no idea what the traditions are, I have no idea"—and of course I know how American weddings are, which are very rigid, very practiced, very rehearsed and so forth, and she said "don't worry about it." And I said "you know, that's easy for you to say, right?"

So, we went to the event, and even the day before I said "isn't there a rehearsal? Isn't there something we do or whatever?" she said "my cousins will take care of you, don't worry." And so, it was true and we got to the thing and we had a ceremony that was in Sanskrit. So, I didn't understand a word that was being said, but her cousins sort of took me along and translated for me, told me what to do in the various things. And Indian weddings are very different than American weddings in that there's a real casualness to them. The best story that I had of that was I had taken my camera to take pictures, of course, everything that I was seeing and doing, and one of the cousins offered to take pictures of me and Indira in the ceremony, because of course I couldn't do that. I said "oh wonderful, thank you." And we get to the most important part of the entire ceremony. Now, if you think about this in an American wedding where they're getting ready to pronounce the man and wife or whatever, that's probably the most important part of the American ceremony. Western ceremony, I shouldn't say American ceremony. And we're at this very, very important point and the guy with the camera, that I'd given the camera to, says "wait, wait, wait, wait!"

Well, this is like, you know, "does anybody know why these two should not be married," that's the first thing you think of, and I'm going "what's going on?" And the person who's performing the ceremony says "what's wrong?" and he says "the camera," he said, "I need to change film." And so, he comes to me, he says "I don't know how to change the film." I said "oh, okay." And so, in front of three hundred people at this thing, I open up the camera, I change the film, and nobody even blinks. Now at an American, think what would happen if the photographer at the American wedding says "wait, I got to change the camera, and the groom's got to do it." It all went, you know, it was cool. It was nerve-racking though, I'll tell you that. It was like oh my god. I told Indira, I said "I have no idea what I promised." You know, it's all in Sanskrit, what did I promise?

[0:50:31]

MD: Yeah, really. Was "obey" in there? [laughs].

KA: [Laughter]. But it was wond—and everybody was wonderful there. The family was very, very accepting of me, and of course you don't know that before you go. And they were very accepting of me, they were very kind to me. Their native language was Tamil, although almost everybody in India speaks English, and they were very careful, for the most part, to speak English in front of me, as a courtesy, which they wouldn't normally do. And I just was very, very, I felt very accepted. It was very cool.

MD: Yeah. Well, that's just wonderful. Well, I'd like to talk a little bit about you as a teacher, because everybody that I've talked to about you has, you know, you're a hoot. And...

KA: I'm a hoot [laughs].

MD: Yeah, and it's one of those things that you're one of those institutions here at the institution, especially in biochemistry.

KA: I should probably be institutionalized, is what I should be.

MD: Yeah, [laughs]. But one of your methods is these scientific melodies. And you alluded to them a little bit ahead of time. And now you've published a number of—now, is there any chance that we're going to see a DVD or a tour?

KA: Well, I would do a tour, but it wouldn't be me singing, I think. The melodies really have taken a life of their own. They—I have a website where I—well, back up a little bit; so, the melodies, I can't sing, so I've had students and friends and other people who have recorded them for me. So, the first person who did a lot of recording the tunes from was the son of one of my colleagues, Andy Karplus; the student's name is Tim Karplus, and his undergraduate major was music, and so when I started singing the songs very badly people said "you should get somebody to record those." And I went looking for people and I didn't really have any great ideas, and then I talked to Andy one time and he said "well, my son does a lot of stuff with music, maybe you should talk to him." And so, I talked to him. And so, Tim recorded quite a few of the early songs that were there.

And so, I started collecting the recordings, and at first I thought oh, I'll make a million and sell all these and all this blah blah blah, and realized—that was actually when I realized that it was more important for things to be out there than it was to make money on them. And so, when I tried selling them on my website I sold a few, but it was like this is not a good—plus there's also concerns about well, are you doing something copyright-wise that's going to be problematic, et cetera, et cetera. So, I decided to start giving them away. And I consulted with legal people about this and so forth and they thought it was a much better way to go; you're not making money on it, the worse that's going to happen, somebody's going to come to you and say "cease and desist" and you're done. They're not going to sue you. "Okay, that's good."

So, I started giving the songs away on the website. And back in, what, 2002, 2003, thereabouts, I was able to track them on the website, so I could tell how many were being downloaded. And at that time they were being downloaded at the rate of about a thousand a month. Now that's, you know, for a non-scientific—I mean for a non-popular recording, I thought that was pretty good.

MD: Yeah.

KA: And I don't know how many's been downloaded. I estimate a quarter of a million but I honestly don't know how many have actually been downloaded. But I had, I've had other people—Tim graduated, and when Tim graduated I was looking for somebody else to record the melodies. And I had this wonderful—I got to tell you this story—I had this wonderful experience with this guy in my class who had had a career as a professional singer before he decided to go back to medical; to go to school to go medical school. And his name's David Simmons and David has a voice like nobody's business. And he's a musician and he knows GarageBand, to assemble the music and everything. And I had used him in class on one occasion, and on the occasion I had—it was a Mom's Weekend, and you know Mom's Weekend's a big deal, and so the kids tell their parents about, well they got this professor that sings these songs and so forth, so they know something about it when they come in.

[0:55:16]

So, a lot of moms come to the lectures. And so, I had talked to David ahead of time and I said "you know David," I said, "I'd like to do something a little different," I said "you know, if you would be willing to come and sing in my class, I've got a little gag I'd like to set up with them." And he says "well, what do you have in mind?" And I said "well"—and this is in Milam Auditorium, so it's a big classroom, and I said "well, you know I've got this song that I've written, it's to the tune of 'Danny Boy' and it's called 'Oh Delta G' and it's energy and biochemistry," and I said "you know, I'd like to get up there, and you know the moms are going to be there, they're going to see the whole thing, and I'm going to start singing, and of course you know I'm, I can't sing worth a crap, and I can even sing worse than usual. So, I'm going to get there and say 'okay, I've got this great song for you, I'm going to sing' and then I'm going to get into it and I'm going to pretend to the crowd I don't like your reaction, you know, I don't like the way that you're reacting to my singing, and so I'm going to get indignant and I'm going to say 'well, if you guys think you're so good, is there anybody out there that thinks they could do better?" Well, this is David's cue, of course, to raise his hand in the back, come up in front and sing it.

And David could sing opera, and I think he actually did sing opera, so he could just belt this thing out. So, I go through this whole charade and I say this and then the audience is kind of sitting there like this [leans away and makes shocked face] and David comes up to the front and I hand him the microphone and he belts this thing out in the room like nobody's business. Well, that was what convinced me David's got to be the person recording this song. So, he recorded quite a few songs. And he later got into medical school; he got into medical school at age thirty-nine, incredible guy, absolutely incredible guy, every bit as talented as a physician as he was as a musician, and probably more so. An incredible person.

But he's now graduated from medical school and is a little busy to record songs, so I'm trying to find—saying "hello, hello world, I'm looking for people to record songs for me." I'm looking for people to record songs because I've got about a hundred songs that are unrecorded. And so, yeah.

MD: Oh, wow.

KA: Yeah.

MD: And then that brings us into the little limericks and puns.

KA: Yeah, yeah.

MD: Now, I think of limerick as a teaching tool.

KA: Yeah.

MD: It must be great, especially when you're dealing with some technical topics.

KA: Yeah, you know I have a few scientific limericks, but I don't have very many. I've got one about—let's see if I can remember how it goes. Actually, I don't remember how it goes, but I've got a few. I've got one about the fact that bacteria have no nucleus, whereas our cells have a nucleus. And so, it starts out something something "bacteria," something something, rhymes with bacteria, I can't think of what it is. But then at the very end it concludes by saying that they have nothing inside their "interia." And so, that's one that actually relates to biochemistry. I've got quite a few that relate to chemistry, some math, a little bit of biology and things like that. But I don't really use the limericks as a teaching tool. I put the limericks out there mostly to amuse people. And again, this sort of getting people relaxed and comfortable I think is really, really important. That was the reason that I persisted in doing the songs, because I think if you see your professor in a light other than "I'm the authority, I'm the god of this subject," if you see the professor in a way that is a human way, a more vulnerable way, whether that's singing badly or whatever that is, that I think that you're going to feel different about that professor, and probably different about that subject than you would otherwise.

So, I'm quite comfortable using the limericks for the sort of humor portion of things. The songs are more based in "here's something that you can learn" and that humor portion, as well. But the limericks are mostly just to amuse people, and they—the limericks, they have now taken on a life of their own as well. They're very, very, popular. I have a mailing list that I send things out to everyday and I get a lot of feedback from those. It's really interesting, I can, you know, sometimes you write a limerick and then you get "that's a really, really good one," and it'll generate no feedback, you know.

MD: And you think "what's wrong with that?"

KA: "What's wrong with that? It's one of the best limericks I've written." Then I'll put something out, you know, "this is kind of an average limerick," and then "oh my god, that's just great," and it's like you know, I don't understand what—you never understand what people like, I guess.

[1:00:02]

MD: Well, and this kind of ties in with social media, the internet, and you know, you've—you were internet savvy back when internet savvy wasn't a thing.

KA: Yeah, yeah.

MD: And now you have a huge presence online.

KA: Yeah.

MD: I've searched you. But one of the things that I always like to ask people that are in the profession, that are professors; how have students changed over the years? Are they more prepared, are they more savvy, especially with computer literate? Do they have their face in their phone all the time?

KA: That's a very good question, Mike. There's some truth to, I think, a lot of the stereotypes that you have of a modern student. They are very phone-driven; they are very social media aware. I won't say that they're more computer-aware, but I would say that certainly social media, absolutely. And what social media has done is it's allowed people to be able to connect and use computers without being computer literate. And that's true, that's why Grandma's on Facebook and whatever. It's that that really got people over that barrier. And because that's happened, I actually think students are a little bit less tech-savvy than a few years ago, where it took more knowledge to actually do that.

What I've seen has happened with students over the years, and I've been teaching now for close to twenty years, what I've been seeing with students over the years has been—really the most significant things I've seen have not actually been technological, although I use technology a lot in what I do. But the changes that I've seen have been the real strong presence of helicopter moms. Helicopter moms, the soccer mom who's been taking the kid to organized activities for all of their life and the kid is used to mom taking them through and doing all these things. The students that I'm seeing today are used to that, and so they're still at the point in their lives where they're needing to step out and do that, but they're much more anxious about it. And I see this more in the advising capacity than I do in the teaching, although it's certainly present in both. And that's unfortunate. I really think that's unfortunate. The students who don't have that mom who's been doing this with them all the time, who had to do things on their own, are outstanding. I mean, they—and that's always been the case, I think, that they're absolutely outstanding and they're absolutely knowledgeable, willing to do what they need to do to be successful at that.

And if you think about this, what's been happening in the span of our lifetimes has been the amount of knowledge that we've generated has grown enormously. So, when I look at what I expect my students to know in my class and I compare what it was that I was expected to know when I took biochemistry, it's a world of difference. Now yes, the focus has changed. You can't expect that you're going to quadruple the knowledge and people are going to quadruple the amount of things that they're going to learn, because they're not. So, that's something to keep in mind. But the abilities and interests of students to get on top of and do some of these things are just incredible. I am awed, I will tell you, by many of the students that I have, many, many students that I have. I talk to colleagues and they get depressed and upset and unhappy with the low performers. And I think it's easy to do that in this profession, but if you focus on the people who are (A) doing incredible things—and I'm not talking about just incredible things in terms of academically, but incredible things in their lives—you look at people who are doing incredible things academically, you look at the people who are balancing the things that they're pulling off and making a difference. It's, I mean it's inspiring.

We talked earlier about getting to tears in one of these things, and I've had interactions with students where when I hear their story or I see the result of something that they've done, I've been brought to tears with that. I know that feeling. And there's nothing in the world like being a part of helping people to be successful. There's nothing like that, Mike. So, and that's been universally true from Day One as a teacher day-to-day. And in fact, maybe it's even better today, because when

I look at the obstacles that students have to overcome to get a college degree and the expense and the loans that we didn't have to deal with when we were students, it's inspiring. And you want to do what you can to help people to be successful, and then when you see those things happen, it's outstanding.

[1:05:34]

So, my perspectives of these things have come about largely from my combined roles as an advisor and as an instructor. Putting those two together really helps me, because if I had just been teaching I would not have seen as much of that human side of stuff as if I had been an advisor. But being an advisor helped me to much better understand at, a very intimate level with students, what their experiences have been and what they're needs are. And I really think it made me a much better instructor.

MD: Being able to be that and, yeah.

KA: Being empathetic, you know. I mean I've had students, I won't go into them here, but students whose parents are drug-addicted; perfectly normal, you'd look at them and you'd think a happy-go-lucky kid, et cetera, et cetera, and they've got a parent who's addicted to crack cocaine. And how do they go and be successful doing that? It just—you think it's just, it's more than you would expect anybody to do, but people do it. I've got one in medical school right now and I had one who graduated from medical school recently who had exactly the experience I'm talking about. And it's like how—it's amazing. So, we've got to do something for those students.

MD: Well, and that's one of the reasons why you were awarded the Dar Reese Advising Award in 2005. I mean, being an advisor in the sciences must be challenging, because the curriculum and guiding these people into where they want to end up in.

KA: You know, actually I don't think it is. I think that being a good advisor, Mike, is really a function of listening to people. There's nothing—anything more technically difficult about advising in the sciences than there is advising in the humanities. And it may be more challenging in the humanities than it is in the sciences, because sciences tend to have a fairly programmed pathway to do things. What I try to do with students is a couple of things when I sit down with them. One is I will—the first thing I'll ask them is what do you hope to do in your life, what do you want to do? And when you're eighteen years old, the really honest ones say "I don't know." And they feel bad about saying that and you say "no, that's the right answer," or (B) they think they want to know, but they really don't know.

And so, what I try to do is get them thinking and making a plan for something. So, I want—you think okay, you don't have to know that you're going to go be a dentist, but if you think you might want to be a dentist, let's put you on a path that's going to get you here so that you get as much experience and you get as much exposure to it, so you can decide if you really like being a dentist or you hate it. And if they go and do that, then they're much better prepared for that world that's out there for them. And I say that because, as I said when I was an undergrad, I was a goofy kid. And I know what being a goofy kid gets you. I was very lucky. I mean, I shouldn't have luck be something that leads me to where I am. It should be something that I work towards, that I plan, that I do. And that's what I try to get students to do. So, I expose them to as many things as I can.

That's how I got involved with undergraduate research, because as an advisor I was continually pushing students, getting them involved in research laboratories, because I knew that they would have a development that would happen as a result of that; developing confidence, developing knowledge, developing experience, developing context, all of those things would happen if they were exposed to that. So, that was one of the things. The other thing that I do with students is I really, as I get to know them—and of course I use humor in advising as well—but as I get to know them, is really question them, because people tend not to question themselves. You know; am I sure I really know what I want to do? That might be as deep as that questioning goes, but if I'm sitting there and asking them "well, you say you want to be a doctor, but you haven't got any experience so far. Doesn't that say something about whether you want to be a doctor or not?"

[1:10:12]

And they'll argue, and that's fine, but my job is to make them think about it and then address that. And so, what commonly happens as a result of that is that students will get this—I should write a book about this sometime—is students will get

to their senior year and they will come into my office and they look as white as a ghost, and I'll say "what's wrong?" and they'll say "I don't think I want to be a doctor. I don't think I want to do research. I don't think I want to do xyz." And I say "that's good." And of course, that's not the way they look at it. They look at it like "oh my god," you know, "I've gone to college for four years and now I come out, I don't know anything."

And so, I talk to them and guide them and try to get them thinking about that next step, but I just point out to them that college is basic training. College doesn't—college is not the end-all. And when you come to realize that, that the most likely thing you're going to do in the sciences is what you do after college, not what you did in college—other areas of engineering and so forth, that's a different matter—but in the sciences that's not the case. If I can get them asking themselves that question and then coming to realize, you know, many of them will say "oh yeah, this is what I want to do." Great, because if you've asked that question and you've really thought hard about that question and you still feel like that's what you want to do, then most likely that's what you want to do. But if you haven't asked that question of yourself or somebody else hasn't asked that question of you, you, in my opinion, are preparing yourself for something that you may be very unhappy doing at some at some point. And so, I think that's something that an advisor should be doing. We always like to say we do holistic advising in Biochem, because we want to help them as a person, not just help them which classes you're going to get to your degree.

[1:12:08]

And I think unfortunately, given time constraints—and I don't think any evil intentions on anybody's part—but I think given time constraints that many advisors have is that they end up spending more time working with the classes than they do with the person that's there. Again, I'm not blaming advisors or anything for that, but I've had the luxury of doing this in addition to teaching, where I could give it as much time as I wanted to do with that. And I had a relatively small major. It's grown quite a bit now, but I had a relatively small major where I could really spend that time with the students and do that. And so, that I think made a big difference for the advising component.

MD: Well, you are the director of undergraduate research. Now, you said that this wasn't something available to you at Oklahoma State.

KA: Yeah, yeah.

MD: Now, is this fairly ground-breaking that we have undergraduate research? Or is this a trend?

KA: It's a trend, it's definitely a trend. So, what's happened the past twenty years, especially, is as the techniques in the biological sciences, in particular, have become more addressable, more accessible to people to do, there's been a real explosion of interest in getting students experience doing those. So, this is not something that's unique to Oregon State, but it is something that's happened, really, across the country. And it's been a wonderful thing. When I look at the, again, the bills that students are paying for tuition, and you think bang for the buck; you want to get as much bang for the buck as you can. And so, getting those internship experiences, the research, the service learning, all the various components of that extracurricular learning that people can do, you want those to be as strong and as meaningful as they possibly can be.

And what's happened for me, my original involvement, of course, was as Biological Sciences. I was the director for the Howard Hughes Medical Institute Summer Research Program for fourteen years, and so that was all biological sciences. I had some good successes with that, and so when they created this position for director of undergraduate research, Susie Brubaker-Cole, wonderful, wonderful woman who had the vision to recognize that OSU needed to have that done, I applied for the position and got it. And so, what I moved from doing was helping students get involved in research in the biological sciences to really helping it happen across the campus. And that's been very rewarding.

[1:15:01]

And what I've learned in the process of that is the breadth and scope of scholarly activity on the OSU campus, as a byproduct of that. I mean I don't know, or I didn't know, people in the College of Liberal Arts, for example, before this. But I've had interactions with people, for example, in history that have been—and I know you're interested in history—that have been remarkable. I have said this before, and it's true, that the undergraduate research that goes on in history is as good and impressive as any undergraduate research that goes on anywhere on the campus. And it's almost invisible.

It was invisible to me until I got involved in doing this, and I always think wow, I mean, these kids are doing incredible things. I don't know if you've ever been to the presentations that they do at the end of the year—

MD: I gave one here.

KA: Yeah, I went to one of those, it was like oh my god, I mean I just—and I was just blown away. So, I've been able to have those kinds of interactions as a result of that, but also, more importantly, to help students to connect with professors. So, I look at my role as that connector. I tell students "you know, I don't have a problem with calling up the professor and say 'hey, I've got a student here really interested in your work, you want to talk to them, or not?'" instead of a student having to go knock on a door and go "oh my god, what's it going to be like," et cetera, et cetera. So, that gets over—there's an energy barrier right there. I mean, it's a different kind than the class barrier I talked about, but it's an energy barrier that's a limit for a lot of students. So, if I can make that barrier go away, then we can get undergraduate research much more widespread.

MD: Yeah, because I mean it's, you know, it just fascinated me that we do undergraduate research. You just never think about that. I'd like to shift gears a little bit.

KA: Sure.

MD: You have a publications list that is far too large to mention here, but actually you and Indira have authored a lot of books together.

KA: We have, yeah.

MD: Tell us about that process.

KA: Sure, sure. So, I like to write and I like to write things besides goofy funny things, so I had a—the first book that Indira and I wrote together was I had a publisher—we get these publishers coming through your office periodically; "oh, are you interested in doing such and such, are you interested in doing such and such," and so forth, and usually it's "well yeah, but I'm busy," et cetera, et cetera. And I had a little tiny publisher representative—the representative wasn't, the publisher himself was tiny. Anyway, a representative from a little tiny publishing company who came to me and says "we're really interested in writing, making a book available to students in Biochemistry that would not be a textbook, but it would be showing students the essential parts of biochemistry; how to understand, what's the important things to learn to understand, how to learn them and how to do that." And I was kind of intrigued by this idea, because I had been an author of that previous book in 2000.

So, we talked for a little bit and so forth and I liked the idea and I talked to Indira about it and I said "you know, I think we could actually put together a little book like these for these—to address this—that it will be aimed at so many students. It wouldn't be used for teaching purposes, it would just be aimed solely at students, and it would tell them how biochemistry works, how taking a complicated subject, put it in simple matters, perfect for education, right?" And so, she agreed with me, she thought this was a good idea, so we said okay, so we signed an agreement with this little tiny publishing company.

And we sat down and wrote our first book, and we spent the better part of several months of the summer and some other time in addition to that putting this stuff together. And the more we interacted with the publisher the more it was clear that (A) they were so tiny that they weren't going to be able to do what we had envisioned. In fact, they said "maybe we could do the figures in black and white," and I said, "I don't think the figures are going to go on black and white." And then when they started talking about the prices that they wanted to charge for the book, we said "well, we wanted this to be accessible to students," you know, I didn't want to have this little bitty book for way too many dollars. And the guy that I'd interacted with was exceedingly nice, and I think this could only happen with a small company like that, and he said "well," he says, "I just don't think that we're going to match on this. Would you like me to let you out of your contract?" Now, a big publishing company would never had said that.

MD: Oh, yeah.

KA: And there was nothing in it for him. I mean, he had nothing to gain by letting me out of the contract. He could just keep me in the contract and say "the book is mine, we'll do with it what we want to do with it, we'll sell it to somebody else." And I said "well yes, I think I would, thank you." And so, he gave me the rights back to what Indira and I had written. Well, we sat and looked at what we wrote and I thought "well, what in the hell are we going to do with this now?" because we don't know what to do with it. And so, we added a little bit to it thinking well, we'll do something with it ourselves and so forth, and we made it into more of a form that would be amenable to textbook, although it's not a traditional textbook.

[1:20:12]

And about—not too long after that time happened, Apple came out with a product called iBooks Author. And iBooks Author, I took one look at it, and of course I'm a Mac junkie, I've been a Mac junkie since Day One, and I realized that I could take the thing that we had written and we could make an electronic book out of it very easily, and not only that, but that Apple would distribute the book for us for free if we gave it away for free. And we thought "hmm," because now it's going to get in people's hands, now it's going to go out there and do its thing. And so, we sat down and spent probably a couple months, pretty intense work, getting the book formatted in the way that we wanted.

I got one of these little L.L. Stewart grants to hire a student to make figures, because we had no figures at that point, to make figures for the book. And the thing came together in the matter of a few months and we were able to use the really cool electronic tools of iBooks Author, I don't know if you've ever messed with it or not, but you can do video, you can do audio, you can do 3D; we have 3D molecules and stuff like that. We have—you could do learning modules and things like that in it. And so, we put this together and uploaded it to Apple's iBooks store, and it took a little finagling, but I put the songs in there too. I had recordings of the songs, put the songs in there, and it's got forty or fifty songs in it, I think. Anyway, so we did that and we were on—we were at a meeting in Oxford and we got word from Apple that it had been approved. It took a long time to get the approval; it had been approved and we got it set. And we went "oh my god, it's wonderful."

Well, it was wonderful because people started downloading and downloading and downloading and downloading the book. And we thought that was really cool. And we made a version for people who—because the version of iBooks goes on an iPad only and we started hearing from people: "oh, do you have a version for something besides an iPad?" And so, we made a PDF version for personal computers. I don't have a—I'm not an Android person, so I didn't have tools for Android to do that, but we made a PDF version of it, so we currently have a PDF version, an iBooks Author version on iBooks, and then Kindle came to us and said "would you like to do this on a Kindle?" and we said "well, yeah," and they said "you only got"—but the Kindle said it was different, they charge you per byte downloaded. And I said "well, the book's going to be free. If the book's free, how am I going to pay for per byte downloaded?" "well..." back and forth and back and forth and back and forth. The upshot was they finally came around; they said they wouldn't charge us for that, so they would give the book away for free. So, it's been on Kindle now for several months, maybe close to a year, and it's doing great there.

And over the time, we've had a hundred—I checked this morning—had a hundred and twenty-eight thousand downloads of the book, which I think for a non-*New York Times* type of book is a pretty good thing. So we have—all over the world we hear from students all the time now about it, and "oh my god, thank you so much," et cetera, et cetera.

MD: Well, that's the thing, because you're doing it for the student. It seems like that is a recurring theme that I've picked up here, that it's for the students, that to help them.

KA: Well, it's true. I think that when you're in the business of education, you should be doing as much for education as you possibly can, right? And I had a colleague who said "well, you should charge one dollar for it. If you charged one dollar for it you'd have a hundred and twenty-eight thousand dollars right now," or whatever the number was last time I talked to him. And I said "you know, if I charged a dollar for it, there's a lot of people, (A), that wouldn't do it, and there are people in the world for whom a dollar is a lot of money."

The most amazing, the most amazing stories I had from the book was from three students in Africa. And I had three students in Africa who sent me an email that just, I mean it makes me tingle as I tell you the story, but they lived in a remote village in Africa and they wanted to do something in the field of medicine, and they had connected with a

university there, but the university had no biochemistry department, they had no resources to help the students, to do anything that—but they did give a test. So, it was up to the student to go find a book, learn the book, take the test, do all the stuff themselves. A very different kind of model than what we have here.

MD: Yeah.

KA: And they had found the book and they had found the YouTube videos, and of course all those were free, and because they were free, they could afford to do them. And they all took the test and they all passed the test and it was because that was there. If that book costs a dollar, those three are still looking for something, right?

MD: Yeah.

[1:25:03]

KA: And so yeah, I very, very much believe in that. And so, as a consequence of that, Indira and I now have become very involved in the Open Educational Resource Movement, which of course is to provide educational materials like open software available for people to use, to modify, to do as they wish and so forth. And so, we're actually writing a new book right now that's going to be a bigger, better version of the book that we have. The book that we have is called *Biochemistry Free & Easy*, and the new book will be called *Biochemistry Free for All*. We've also got a book on how to get into medical school.

MD: Yeah, I saw that title, I thought that's interesting.

KA: Yeah, you know that one is interesting. I'm a pre-med advisor and I've had some pretty good successes of helping students to get into medical school. And so, we decided to sort of write that down, the advice that we gave to students, and help them with that. And again, the original idea was we'll charge for it, and then it was going why are we doing this, you know? It doesn't make sense. And so, we put it out there as an open educational source now, as well. So, it's been free for quite a while. But it's not nearly as popular as the biochem book. The biochem book, about ten times the number as the pre-med, which is a little surprising to me, I have to say, but I guess there's not quite as many pre-meds as there probably are biochemistry students.

MD: Well see, and it's something that you never think about, that these kids in Africa have access to this, and it makes a difference.

KA: Oh, it makes a difference, yeah.

MD: And being able to be a teacher, an author and make that kind of difference on a global, on a global basis just through the internet.

KA: It's one of the empowering things of technology. There are many awful, god-awful things about technology that are out there, but when we think about the way that technology can be used to really change the world and do things better in the world, this is a—and there's many examples, but this is a prime example about how that can be done for that purpose. I really see my role as a professor—and I became a professor last year, I had been an instructor prior to that point, but I had—I see my role as a professor or as an instructor, whatever that is, as that I really should be thinking about the education component.

I really should—I don't do research. When I had the experience in San Diego and I came back to OSU, I stopped doing research right there. I had stopped doing research when I got the patent. I wasn't doing research at all and I had a patent. So, I'm not contributing in terms of the knowledge that I generate with respect to the research that I do, but I do want to contribute with respect to the education of people with the work that I do there. And I see those as not that different. I think that they're both very important to do. And so, if you were asking me "well, why do the research that you do?" I would say "because the research is important." So, I don't think it's that different of an answer to a question why do you make these things available to students; because the education is important. I think it's the same thing. And I think that's really what a land grant is and should be about. So this, I mean I just feel absolutely exhilarated to think that we're contributing to what really land grants were supposed to do.

MD: Yes.

KA: And what land grants—not that they don't do it, because they do, but we're contributing to what land grants do, and I just think that's wonderful.

MD: Well, now one of the things that you're heavily into is these online classes, and then Ecampus. And this is—well, my daughter has been taking e-classes, which to me, I mean you have to be responsible and an adult to be able to do those things, and I'm neither, so I haven't taken online classes. But were you kind of a pioneer, did you get into that whole Ecampus thing early?

KA: You know, I didn't get in probably as early as I could have. My Ecampus thing came about in a sort of a roundabout way. I had, starting in I think 2001, started videotaping my lectures, because it was in 2001 that it first seemed like it was going to be possible to make a video available in a reasonable fashion for people to watch and do things. And I had been recording audio, I think I said, prior to that time, and so making the audios available; so videos seemed a logical extension to go and do. So, I started videotaping my lectures in about—it was in 2001—and they were very popular, but they were hosted, at that time, on the OSU campus. And I never envisioned that I'd have these in a big, broad audience. I just—they were going to be for my students and that was what it was going to be.

[1:30:02]

And OSU actually inadvertently contributed to making this happen. OSU decided, with good reason, that they wanted to stop hosting video; that they wanted to take the videos that they had and put them onto a company's server where the company would provide them and so forth. And I was very unhappy when that happened, foolishly perhaps. I was very unhappy when that happened because the company that they had worked with to do this, in my opinion, at least, was very clunky. The interface was terrible. Whereas I could put things on the OSU site and in five minutes I'd have it the way I wanted it, at this company I had to jump through all these hoops and it just—and they couldn't—if you were looking for things, you couldn't find them.

And so, YouTube was really getting going around this time, and so I futz with this thing with this company for a little while, bitching and complaining and everything with OSU about this, and I, as a lark one day, thought oh, why don't I put a few videos on YouTube, how difficult is that to do? Because I had these videos sitting around. And so, I put some videos up on YouTube and I thought oh, that wasn't very hard at all. And I'll be damned, I got on YouTube the next day and I saw that twenty people had watched the videos, and I thought who's watching these stupid videos? I mean, I haven't told anybody they're there, and they've watched these videos. And I would go in everyday and I'd start looking; they're watching the videos and they're watching the videos, and I thought this is kind of weird. So, I put up a whole class worth of videos and I started hearing from students "god, I love your videos," et cetera, et cetera. It's like [makes confused/surprised face] huh, there's an audience, there's a—and it didn't take too long, the wheels started turning and you think well, we can do something with this.

Well, I figured OSU's going to raise hell because I'm not using their server over here; I put my things out there on YouTube, god knows what they're going to do with those things on YouTube, et cetera, et cetera. Well, I was 100% wrong. OSU couldn't have been more supportive. OSU has been wonderful in terms of that. So, then I started—every time I did a video I'd put it on YouTube, I'd do a video, you know, it just became the natural thing to do. The YouTube quality kept getting better and better, and now it's outstanding. And so, I ended up, now I think I have about five hundred plus videos, I don't know exactly how many, but five hundred videos there. And it's been a very natural thing. So, the videos became the sort of evolution to make the Ecampus.

So, I'm getting to telling you, making a short story long. The videos started taking hold and I just kept getting these things from Ecampus saying you know, "why don't you do an Ecampus class, why don't you do an Ecampus class?" And "I don't want to do an Ecampus class, I don't want to do any"—I should listen to people more often, is what I should do, Mike. But I said "well, what would it take to do an Ecampus class?" and they said "well, you've got the videos, it doesn't take much more than what you've already got, we'll set up"—and I was more worried about the testing than I was about anything else, which, for which it's still not a perfect solution, I'll be honest, but it's pretty good. And anyway, so I did a test of that thinking who's going to take the class, right? And the very first class, with no publicity, in two weeks got like ten students. And of course those initial students, what I later learned, are mostly local students. Most of the students that

take Ecampus actually, for the most part, I'm probably an exception there, but most of the students who take Ecampus are actually students who are already OSU students, who are either finishing something by staying home with mom, or they're out of state students who are paying a lower Ecampus rate than out of state tuition. Very attractive there.

So, that worked really well. Well, what happened for me was I started advertising my Ecampus classes on my YouTube videos. I'd say "you want to take this for credit, here's how you go sign up for it," et cetera, et cetera. Now, and I don't know the percentages, but now the biggest percentage of students I have are actually away from OSU who've never had a connection to OSU, but they've seen the YouTube videos and they've gotten into a professional program that says "you've got to have a biochemistry class, and you've never had a biochemistry class." Bingo, you know. And so, I get a heck of a lot of students that way, and it's because YouTube gives me free advertising.

MD: Yeah.

KA: And so, I tell OSU, I say look at this, I mean we put all—I shouldn't say we put all, but we'll put a lot of our stuff in this little hidden server with this company that nobody can find, that is not getting you any advertising whatsoever. If they do a Google search they don't find anything that's in this little company that's there. Should we be thinking about putting as much as we possibly can on YouTube? Because it does generate traffic, and it generates people's knowledge of your stuff. So, I think OSU is moving in that direction. And as they point out to me, there are reasons to have things on this protected server, so you don't—everything that's out there. And I agree with that.

[1:35:24]

MD: Yeah, we have MediaSpace.

KA: Right. That's actually the thing, yeah. So, but I think it's important, wherever possible, that that should be out there in a very visible place like YouTube. I mean, I just don't see why not.

MD: Oh yeah. I mean, it's—

KA: I hope this will be on YouTube [laughs].

MD: Yeah, really, we'll put this on YouTube, today.

KA: I don't mean today, but yeah, but seriously—

MD: But you know, that's one of the things, that you're a teacher's teacher. I mean, that's the thing that I really have picked up with all of what I've learned about you; that you're the type of professor that these young bio students need, because some of them may end up being a history major because they couldn't get through bio, which I work with one of those. And so, it is really, you know, this information and these philosophies that we've talked about today, they're so important.

KA: Oh, I agree Mike, I absolutely agree. I also think that people are able to do anything they want to do. They've got to want to do it. So, you said a person can't become a biochemist, they become a history—they major in history, and that would sort of say "well, history is lower on the scheme than biochem is," but I don't believe that.

MD: Yeah.

KA: I absolutely don't believe that, number one. I think that the scholarly efforts in any discipline that you see at the university are all equal, and I think they all take the equal amount of time and effort to be successful at those, as I'm sure you're finding in your graduate work. But what it takes is your own internal fire to make that happen. And if your internal fire burns for one thing and not for something else, then why should you go do this one thing that you don't like when you can go do it for something—that's getting back to the advising question; you should do it for something that you really do like over here. And I think that's the most important thing. But yeah, I would say that, to I guess take credit here, that I do feel that my approach to approachability is an important one to think about in teaching. I think that's really important, yeah.

MD: Well, one of the things that I've found is there's this awards and accolades that many professors, many people that I've spoken with have kind of amassed, and we talked about the Dar Reese Advising Award, and then a Mentor Award in 2007, which was with the Medical Research Foundation, and you're a recipient of the Beaver Award in 2008—

KA: [laughs] a Beaver Champion.

MD: --which is kind of an important award around here, and in 2011 another award for academic advising; Olaf Boedtker Award. And then of course you've been inducted into the OSU Libraries and Press Open Access Hall of Fame, which is significant, because you're all about making you available.

KA: Well, that was an incredibly important award. Incredibly generous, I guess is what I wanted to say. That came out of the blue; I literally got a call one day from a lady in the library who I had interacted with who told me about it, and I was blown away by that, I have to say. That's a very precious award, no question of that.

MD: Well, one of the things that we like to round our stories, we have talked a lot about your life and everything, but kind of fill us in on family life. I mean, you live here in Corvallis. Children, or?

KA: No. So, I like to say I'm the only child in my wife and I's family. No, we don't have any kids. We're both advisors and we both get pretty involved with our students, so our students, in a lot of ways, are very much our surrogate children. We have, oh I would say about a dozen students that we've interacted with over the years that we literally look at as our own children. We always do something with them, we always, you know, when they're around, we interact with them, they stay with us and things like that. So, that's a very, very important part. And I think what's happened with that was I—neither one of us were ever interested in having children but both of us, as we got older, came to realize that Indira had maternal instincts and I had paternal instincts that neither one of us had really been in touch with, and that being able to act on those with our students really, I think, helped us to fill what some people would see as a void. I don't see it as a void, because we filled that. But I think without that, there definitely would have been a void.

[1:40:24]

MD: So, you live here in Corvallis now.

KA: We live in Corvallis, yeah. We live on Harrison, we walk to work every day, and I love Corvallis for that, that you can be close enough to campus to work—we haven't bought a parking permit since 2001, which is really nice, and we feel very—

MD: Especially now.

KA: Yeah, especially now. Very fortunate to be able to do that. Let's see, what else can I tell you. Indira's a—she's also a senior instructor in biochemistry, as I am—or I was; as I say, I'm a professor now. We both advise students, we both advise students for just general academics and also for medical school. We are pretty much both, I think, boring in the sense that we are addicted to our work. So, we spend a lot of time at OSU doing OSU events, because we love it; I mean, no complaint at all. But we do a lot of that. We don't do a lot of other outside things, because we—

MD: Yeah, I was wondering what you do for fun.

KA: Yeah, yeah. We have some friends, Neal Gladstone; do you know who Neal Gladstone is?

MD: Yes I do, yeah.

KA: He's a good friend of mine. Neal and Barbara are good friends of ours. We owned a cabin with them on the coast for quite a period of time, and we recently sold our share in it back to them, but they're very dear friends. We've known them for many years. And there's a genius for you.

MD: Yeah.

KA: Neal is an incredible genius. I mean, his ability to find something about the human condition and make it funny is—or make it beautiful, I mean he writes beautiful stuff as well, as I'm sure you've heard—is a gift that I very much envy. If I had—in fact, when I retire one of my goals is actually to learn something about music. And Neal keeps promising me, he says you've got to take piano lessons, you've got to do this, you've got to do that," it's "you know, time Neal, time, time." But that's a goal of retirement, because—

MD: Yeah, right, you don't have any musical instruments or anything like musical ability.

KA: I have no musical ability. I mean, I've demonstrated that on many occasions. But no, I love, and I told Neal, if I could write the music and the lyrics for one song, I would be delighted. If I did that before I died, I would be delighted. And Neal says "writing a melody, there's nothing to that," and I said "you know, I mean there's only what, how many musical notes, right? And people say there's only twenty-six letters in the alphabet, but how many bestsellers have any of us written? It's not the same thing." And so, I think that there are people who, for whatever reason, have what we call an innate musical ability. They hear things and they translate that into music and they can hear music in their head and they can play that music. And Neal's one of those people. And there are many people out there, Neal's not alone in that respect, but that ability is very different, and maybe it's been beaten out of my head or whatever, but I don't hear that, I don't—I can listen to somebody's else's song and say "this, I like that and this cadence goes with these words over here, and that works," but I don't know how to create it. I'd love to know how to create it, and I don't know how to do it. So, that's a goal at the time.

MD: Well, you're fascinating.

KA: That's overrated, but thank you [laughs].

MD: Now, one of the things I always like to provide in this venue here is do you have any real final thoughts that you would like to share with Beaver Nation and the people that are going to be watching this, which'll probably be many?

KA: Yeah. I guess—well first of all, thank you for the platform to be able to do that, thank you also, Mike, for the wonderful leading me through this and for inviting me. I think that I just was extraordinarily flattered when you contacted me originally about this project. So, I'm very, very honored by that.

I guess the final thoughts that I would have would be to remind people that you can do anything that you want to do, and for almost anybody—and that's not true of everybody, but for almost anybody, the biggest limitations that you'll ever find will be yourself. And if you tell yourself you can't do something, you make it all the harder for you to actually do something. It's really, really important that—I tell this to students all the time—it's really important to have a positive attitude, and a positive attitude is deeper than "I can do that."

[1:45:17]

I mean, attitude is different than words. And when you—and this is what Indira taught me, actually, that when you internalize that attitude and you internalize that approach to the way that you live your life, you can change your life. You really can do that. And whether that change in your life means the change in the circumstances of your life, change in the education that you're getting in your life, or changing just the way that you interact with people, you can make that difference. And so, that's I think what really is at the root of education. I think that's the very deepest root of education. It isn't the knowledge, it isn't the other things, but it's the empowering yourself that you get from the confidence of it and the ability to address and deal with things yourself, and recognizing that hey, I can do that. And I think if you can put yourself in that mindset to start, you are infinitely ahead of those that don't do that. So, that's pretty much my own thoughts.

MD: Well, on behalf of the OSU Sesquicentennial Oral History Project, Kevin, we thank you so very, very much.

KA: Thank you Mike, I'm extremely honored.

[1:46:34]