

**Interviews of the Margaret MacVicar Memorial AMITA Oral History Project, MC 356**  
Massachusetts Institute of Technology, Institute Archives and Distinctive Collections

**Dr. Irene Pepperberg** – class of 1969

Interviewed by Kira Buttrey, class of 2023

July 2, 2020

## Margaret MacVicar Memorial AMITA Oral History Project

Irene Pepperberg (SB Chemistry 1969) was interviewed on July 2, 2020 by Kira Buttrey (SB Biological Engineering 2023) via a videoconferencing app during the early course of the COVID-19 pandemic. Dr. Pepperberg was at her home in Swampscott, Massachusetts and Ms. Buttrey was in Cambridge, Massachusetts.

Professor Pepperberg is a world-renowned innovator in the field of animal cognition.

After a childhood spent in New York, Professor Pepperberg earned her undergraduate degree in chemistry from MIT in 1969. Planning to become a chemistry professor and researcher, she then earned a PhD in chemical physics from Harvard University. But, while completing her PhD, she became interested in animal cognition and interspecies communication—which was then a brand-new field focusing on nonhuman primates and cetaceans—and began attending related Harvard classes and seminars.

Professor Pepperberg pivoted fully into the study of animal cognition after graduating from Harvard. Her first research subject, Alex (whose name is the acronym for “avian learning experiment”), was an African grey parrot bought at a pet store. Professor Pepperberg’s work with Alex spanned 30 years and involved research conducted at six universities and labs: Purdue, Northwestern, the University of Arizona, the MIT Media Lab, Brandeis and Harvard. The model/rival training technique she developed was used to teach Alex over 100 vocal labels and their meanings. These labels, which included concepts like “bigger” and “none” could then be used to test Alex’s cognitive and communicative abilities. Professor Pepperberg’s work, which showed that Alex had the intelligence of a five-year-old human (in certain respects), revolutionized the study of interspecies communication with animals.

Professor Pepperberg’s research on Alex captivated public interest and was featured in such media outlets as the *New York Times*, *National Geographic*, *BBC Nature*, and *Nova Science Now*. Her own books, *The Alex Studies* (1999) and *Alex & Me* (2008), further increased public admiration of and interest in Alex. Since Alex’s death in 2007, she has worked with other parrots and has contributed to research involving the possibility of aiding development of artificial intelligence via the study of avian cognition.

Professor Pepperberg is passionate about wildlife conservation and collaborates to adapt the model/rival training technique for teaching autistic children.

BUTTREY: It's great to meet you, Professor Pepperberg.

PEPPERBERG: You, too. You're currently a student at MIT?

BUTTREY: Yes, I'm a rising junior.

PEPPERBERG: Sorry about what COVID's done to you.

BUTTREY: You, too. It's a difficult time for everyone.

PEPPERBERG: Yes.

BUTTREY: Thank you again for the opportunity to interview you for MIT's MacVicar/AMITA oral history project. I know you've been interviewed before on many of the topics I'm going to ask about, but I hope we'll talk about a few things that will be new. We're excited to include this account in MIT's archives.

PEPPERBERG: One thing that you have to put into context is that I started at MIT in September of '65 [1965]. This was the era of women wearing spike heels and beehive hairdos. And I ended in '69, where it was earth shoes and love beads.

When you just think of the span of things that were happening in that period, I mean, all the uprisings about Vietnam, the horrible assassinations of Martin Luther King and Robert Kennedy—that was part of my time at MIT. So yes, there were a whole bunch of things about being a woman at MIT, but there were also all these other really incredible life-shaking events that were overshadowing everything on the whole campus at that time.

BUTTREY: I would love to hear more about that. Is it OK if we start with your childhood and work our way up there?

PEPPERBERG: Sure.

BUTTREY: I read that you grew up in Brooklyn and lived above a pet shop—a fact that possibly influenced the groundbreaking work you've gone on to do in animal cognition.

PEPPERBERG: Not a pet shop, no.

BUTTREY: Oh--

PEPPERBERG: It was in Brooklyn, but just above a store.

BUTTREY: I'm glad we've corrected that story, which is in print somewhere!

PEPPERBERG: My father was working full-time as a school teacher, going to school to get his master's, and taking care of his mother who was quite ill. My mother would have been great in our generation. She always wanted to work. She wanted a job.

But I was born in 1949. When you got pregnant, you were fired from your job; you were forced to stay home.

So we were living above the store. There were no other people around. It wasn't like she could take me for play dates or anything. My mother was stuck with me in this very large apartment, but it was still an apartment above the store. She took care of all my physical needs, but none of my emotional ones, because she was very unhappy.

Anyway, my father was working, and my mom was not very helpful. My dad felt I needed some kind of pet, and he bought me this little green budgie. I was about four years old at the time. I kind of joked that I imprinted on this bird, because that was the only thing that communicated with me all day.

My father had best intentions, but he'd get up, he'd kiss me good morning, and then I might not see him till the next morning, because he'd go from his school to his classes, and to see his mother, and then by the time he came home, I was asleep.

When I was about six, we moved to Queens, and then I had a much more normal childhood. We lived in a suburban house. There were plenty of children around to play with, so it was much better.

But I always still had the budgies. They were all my pets. They didn't last very long, because we didn't know how to take care of them in those times. But they talked, so that's how I kind of got interested in the kind of work I've been doing [on the cognitive fundamentals of language and communication, and on language learning in animals other than human species].

BUTTREY: What was your dad studying?

PEPPERBERG: He was teaching, so he was getting his M.A. in education.

He was a frustrated biochemist. That's what he wanted to major in, but the war [WWII] and the Depression and all those kinds of things got in his way, so he was teaching school.

He always encouraged me in science. He was putting all his ideas and wishes and hopes on me. I was an only child, but I loved science and I did very well in it. But I was so frightened of chemistry that the summer before I took the course, I borrowed the textbook from a student in high school ahead me and started reading it. I started

realizing this was kind of cool stuff, so I was very good in it, and I was very much encouraged to pursue that as a career.

I took a summer course at Queens College [in New York City] in chemistry. I was accepted at MIT to major in chemistry. So that was that part of my life. I even snuck a parakeet into the dorm.

BUTTREY: When you talk about being encouraged in chemistry, was that mostly your dad? Was that your mom as well? Any particular teachers?

PEPPERBERG: My teachers, yes. My dad, yes, and [junior year in high school] I had Mr. Schwarzenbach, who was an amazing chemistry teacher. He was so encouraging. He just felt that I really could do the work. He'd kind of joke to me about 'Marie and Irene Curie'—that I had a namesake. Things like that. So yes, he was very, very encouraging.

The next year I had to take physics. That was sort of a nightmare, because the teacher who was teaching physics didn't even know the course. I mean, he was one chapter ahead of us. When I ended up at MIT, I had to take remedial physics, because I had so little understanding of physics.

BUTTREY: Interesting. But there was no problem with chemistry?

PEPPERBERG: No. I did understand my chemistry.

BUTTREY: So your preparation for MIT was a little spotty.

PEPPERBERG: Very much so. Very much so.

BUTTREY: What was the attitude toward young women who did well in science and math then?

PEPPERBERG: It was weird. I mean, we were odd. I think the good thing for me was going to MIT, because in a sense everybody at MIT was a little bit on the oddball spectrum at that point. You were there because you were good in science. If I had actually gotten into Radcliffe, which for crazy reasons had been my first choice, I would have been a real oddball, because there would have been so few women in science. I'm not sure what would have happened.

But being in science and a woman, it wasn't that odd; we were all expected to be good in science. I mean, that's why we were at MIT. It was later on that things would get weird.

I remember that I was in my sophomore year, and I was dating a graduate student. We went to a party, and, of course, there were much older people. (Also, I was 16 when I went to MIT.) I had basically just turned 18, and I was at this party. And some

guy said something like, "What are you doing in science? You're taking away a position from a man." I got very huffy, and said, "Well, I can do just as well as a man. I can do all this work. And I'm acing all my courses. And what have you got to say?" And he said something like, "You're just going to get married, stay home, get pregnant, and your whole education is going to be useless." I just looked at him like I hadn't even thought about that. I mean, to me, I was going to go get my degree and I was going to do good things.

My freshman chemistry teacher, Professor Irvine, he was amazing. He also was very encouraging and very supportive of my interest in chemistry. [John Withers Irvine Jr., PhD Chemistry '39; MIT Professor of Chemistry and Executive Officer of the Department of Chemistry; conducted classified research as a radiochemist at the Radioactivity Center during WWII.]

There were other weird things, too. I think junior year our class was something like 45 women out of our whole MIT class of 1,200. They had a dinner for the women at McCormick [McCormick Hall, the all-women's dorm]. There were the classes below me that had more women students and the ones above me that had fewer, so maybe there were somewhat under 200 of us at this dinner. They asked Millie Dresselhaus to give us a lecture about women in science. [Mildred Dresselhaus, a pioneer for women in science and engineering who focused on carbon science and carbon nanostructures, was associated with MIT for 57 years. She held professorships in two departments, Electrical Engineering and Physics. Among numerous other distinctions, she was awarded the Presidential Medal of Freedom in 2014.]

I don't know if you know anything about Millie. She was a very, very famous physicist. She won every honor imaginable. She was the first woman to do this, and the first woman to do that. The first woman to do almost everything. I mean, she was supposed to be a role model.

Again, this is 1967 probably, maybe '68. We're still big hair, lots of makeup, miniskirts, the whole '60s kind of routine at the dinner. We were dressed nicely, of course, but we were current. And Millie comes in looking like she'd walked out of a photograph from the '40s. She had this long hair that was in a braid tied tightly around her head, a skirt that was probably half-calf length, extremely dowdy, and telling us how we should be just like her. She's "made it."

She was telling us how she did things. Like when she got married and she got pregnant, she made sure that the babies would be born right after the end of classes. This was so she wouldn't miss any classes and could bring the baby into the lab with

her—she could put the bassinet in the lab while she was doing her experiments and calculations.

We all just sat there in absolute horror, thinking, “What? What kind of a life is this? Let's think about secretarial school.” I mean, we were really horrified. This was supposed to be inspirational to us. And for us, this was the worst thing you could do, to show us a person like this, all the sacrifices she had had to make.

So there were these oddball things that would come up. Because I was dating a graduate student, I was outside of the whole sorority, fraternity, party environment. He had been a fraternity person, but we were going out to dinners and to people's homes for dinners, with his fraternity brothers, but not to fraternity parties.

Also, there were some times where the male students were horrid. I remember trying to get into an aisle in a big lecture hall. I wanted to sit in the middle of the aisle so I could see the board better, and some guy wouldn't move. He just said, “Damn curve breaker,” and things like that.

BUTTREY: Sorry, what was that?

PEPPERBERG: Curve breaker—because the women were basically acing all the courses and doing better than the men. We had a much higher standard applied to us to get in, because there were so few slots. That was another thing, that we were all doing really well.

We also kind of had a little bit of a pact. It started with my class trying to really, really avoid the ‘Sally Slide Rule’ mentality, which was the woman who didn't look any different from the guys, in jeans, an old sweatshirt, stringy hair and no makeup. We all would go to classes dressed in skirts, and hose and heels. When we had labs, we looked kind of grungy, because we didn't want to mess our clothes up. But for all of our lectures, we always came in looking as fashion plate as we could, because we wanted to show people that we could be women and we could also be scientists.

It was just such an odd time to be in college, let alone being a woman in this area [chemistry, while at MIT]. The other thing that was really important for me for that time period was that there were so few of us, and at that point we were all living in McCormick. It was almost like being in a sorority, instead of being in a dorm. We were so close. I was at my 50-year reunion last year, and saw some of these friends. We're still really, really close after all these years. We'd made very close friendships.

BUTTREY: That's great. So it was good community, especially in comparison to what you said about Radcliffe. Actually, to get back to Radcliffe, why was that your first choice? And then why did you also apply to MIT?

PEPPERBERG: Well, there's always some guy involved! I wanted to be in the Boston area because there was some guy involved, and I was encouraged because Radcliffe was an all-girls' school, but you could take all your courses at Harvard. So if I were at Radcliffe, I would be in the 'acceptable arena,' but I could take all the science I wanted at Harvard.

I remember that in high school, I said to my advisor that I wanted to apply to Radcliffe. He was really happy with that, but he said, "What are your other schools?" I said, "Well, Cornell." He said, "OK.' Because Cornell had what's called the ag [Agriculture] school, and as a New York resident, it was a state part of the private school. You could still go to Cornell and go to the state part, so it would be very cheap. My parents didn't have a whole lot of money. Then he said he wanted me to apply to Vassar. And I went, "What? You know that would be totally ridiculous." I wanted to be a scientist. Vassar's not the place for that.

Then it was really weird. The next week there was a woman who had come back to the high school to visit the teachers there over Christmas, and she was at MIT. Her name was Mary Rose. [Likely Mary Rose Kornreich, SM '67 and PhD '70 Nutrition & Food Science & Technology.] She was talking to the high school counselor while I was waiting for him. After she had, he comes over, and he takes the MIT catalog and he throws it at me. And he says, "Well, go apply to MIT if that's what you want." And I said, "OK. Do women go there?" And this woman was saying, "Yes, I go there. It's fine. You can do this."

BUTTREY: Wow. Amazing that it's the one person, Mary Rose, who just--

PEPPERBERG: Happened to be there at the right time. I don't know what happened to her. I think she had graduated by the time I got there.

BUTTREY: You mentioned that you brought a parakeet with you to MIT and snuck it into McCormick.

PEPPERBERG: Yes, yes.

BUTTREY: Were you already interested in birds academically, or was the parakeet just fun to have around?

PEPPERBERG: This was a pet. Again, I was just 16 when I went to MIT, so I was 17 when I got my own room, a single, and I was a little bit homesick. It was the first time I'd ever been away from home at all, and to have this little creature there was really important to me. To be able to sit there while I was studying, and have him on my shoulder, or on the desk and chewing my pens, and things like that. It was companionship.



Because it was a parakeet and it was small, it didn't make much noise. And it wasn't like a cat with cat litter, or a dog that needed walking, or something like that. Nobody really bothered me about it.

It was only later on, when I was [a graduate student] at Harvard—that was when things really went sideways in terms of my sex. Not overt sexual discrimination in the sense of anything super ugly, but a lot of sexual discrimination in terms of—Well, for example, we were supposed to go to evening seminars. This was exactly the time of the Boston Strangler, and I was afraid to be walking home at night after dark. My advisor said, “You're supposed to be doing this. You're supposed to be a student.” Or I was doing mathematical modeling and had to use the computers. Then, the size of the computers was huge, in big rooms, with punch cards. Probably things that you might have seen in movies or something.

The point was you didn't just sit at your desk. You had to walk over to the Computer Center [several blocks away] and type out all these cards. You had to run the programs, and it was so expensive that you had to run them at discount times, which was midnight to 6:00 AM. I couldn't even physically carry big boxes of cards over there. There was so much guff about my having to have other people do this stuff for me. “Why was I here if I couldn't do all the work?” Things like that.

BUTTREY: Why did you decide to go to Harvard to get your PhD in chemical physics?

PEPPERBERG: Because at that point I was really interested in molecular orbital theory. I was fascinated by sort of the Woodward-Hoffmann type rules. It started when I was in organic chemistry at MIT. My first semester in organic, I was absolutely going crazy. We had a professor that semester who said, “We'll just write equations on the board. Spend the entire hour writing equations on the board.” And then you would be tested on 10 of them every Friday. I was going nuts until all of a sudden it occurred to me that if I used the molecular orbital stuff that I had learned as a freshman, I could predict what was going to happen. I didn't have to memorize this stuff; I could just look at and go, “Wait a minute. Here's a hydrogen. And this is going to come in here and attack here. And it's going to go do that.” It was like, wow. It was basically the Woodward-Hoffmann rules and things like that that interested me. Once I realized that, I was so excited about this predictive ability.

Then, at Harvard, there was a fellow who was working on boron hydrides—trying to come up with something like this for boron hydrides.

BUTTREY: Do you remember the person's name?

PEPPERBERG: Who I was working with at Harvard?

BUTTREY: Yes.

PEPPERBERG: William Lipscomb [Harvard University chemistry professor from 1959-1990; best known for his work on boron chemistry, enzyme structure, nuclear magnetic resonance and theoretical chemistry]. He won the Nobel Prize in '76.

But Harvard was really hard. I was told at one point in graduate school that I didn't need a fellowship because I had a husband to support me. [David R. Pepperberg, SB physics '66, PhD biology '73; vision neuroscientist; Professor of Ophthalmology and Visual Sciences at the University of Illinois at Chicago at his death in 2018] This was at the same time that the guys in my lab who were married had wives who were working as schoolteachers and jobs like that and making much more money than my husband, who was a graduate student at MIT at the time. I mean, they were making twice his salary, yet I didn't need support!

BUTTREY: Did you ever compare your experiences with your then-husband's, given that you were a grad student at Harvard and he was at MIT?

PEPPERBERG: Yes. At one point, when I was trying to finish my doctorate and we were doing complicated calculations, I had gone over them, but my advisor said they were wrong. My husband actually went in to talk to him to present the data to him because he wouldn't talk to me about it. And it turns out the advisor was wrong: he had mistaken a half-life for a rate constant. He had made the mistake, but he would never admit to it—so it was very crazy.

BUTTREY: I see.

PEPPERBERG: As for MIT, I joked that people there were a little bit on the spectrum. They sort of like looked at you from the neck up, and if there was something good going on from the neck up, not a whole lot else mattered at that point.

I have friends whom I knew from MIT who would tell you horror stories. Horror stories. One of my best friends at MIT was math/electrical engineering, and she had to drop out of the electrical engineering part because the professor basically told all the boys in the class—all the boys—that anybody who worked with her as a lab partner, he would fail.

This was the kind of stuff that some of my friends were dealing with. I was really fortunate that I didn't have that [sort of thing happen to me], but it went on.

There was another gal who was two years below me. I can't remember her name, but I saw her at one of the reunions years ago. She had to switch majors, again, because basically she was told that nobody was going to take her on as a student. Nobody was going to let her do a senior thesis.

As I said, I was really fortunate [in terms of gender discrimination], but things did happen. For example, during my senior year I had a really good GPA. I don't think it was a total 4.0, but it was very close to a 4.0. I found out that a guy in my class had been accepted to the American Chemical Society Honorary Society, and I went, "Well, wait a minute. Why? My grades are just as good as his." I didn't do a senior thesis, because it turned out I had a medical problem and had to spend some time at home my senior year, but I did a senior project. They said to me, "Oh, well, it's a fraternity. It's an honorary fraternity. We can't even nominate you." And I'm going like, "What the...?"

BUTTREY: Right.

PEPPERBERG: So there were things that were going on, but I never had a professor at MIT tell me, "No, you can't do this." Other women in the dorm did have that experience and were told things like that.

BUTTREY: When you talk about the difference in your experience between MIT and Harvard, do you think that they were attributable to the particular groups of people you were around? Or, was it more a difference between schools or the difference in being an undergrad versus a graduate student?

PEPPERBERG: I think part of it was the difference in being an undergraduate versus a graduate student. Because as a graduate student, you are aiming for faculty positions. You're aiming for academia.

When I was at Harvard, there were no women role models—there were no women faculty almost anywhere at all in the sciences. Even at MIT, there were very few. That's why Dresselhaus was put forward, because she was one of the few female faculty. I had one female teacher the whole four years I was at MIT, and she was instructor in humanities. I never had a female TA. So I had no role models.

When I got to Harvard, it was much clearer that there were issues. It was much weirder, too, because my year at Harvard, there were a ton of women in my class and we were really excited. We thought, "Wow, this is super." It turned out that was the year that all the male graduate students lost their deferment for the Vietnam War. They needed people to be TAs, so they admitted all these women because they were the only people who would come to Harvard and be a TA. All the men had lost their deferments. They all did something else. They turned down their admission to go work in hospitals or do other things so they wouldn't be drafted.

At one point, when I was at Harvard, it was just the beginning of women's liberation: 1972, Bread and Roses, and all that. We started a women's group, because we all thought that all these things that were happening to us were personal. We got there

and heard from the others, “You also were told you didn't need a fellowship?” We started comparing what we were experiencing.

One of my colleagues who was in my year, but was in organic [chemistry], was finishing a little bit earlier. This would've been 1974. She was interviewing for jobs, and they were asking her things like, “Well, what kind of birth control are you using? Because we want to make sure that if we hire you, you're not going to get pregnant and leave.” There was no law against asking things like this.

Also, as graduate students we were told, “Don't you dare get pregnant, because there's no way of dealing with this. There's no way of giving you any time off. There's no way of coping with this. Just don't get pregnant.”

I don't know what was going on for the graduate women at MIT at this point, but this is what I was dealing with at Harvard.

BUTTREY: I see. How many women were in your class at Harvard?

PEPPERBERG: I'm thinking it was something like six of us.

BUTTREY: In chemistry?

PEPPERBERG: Yes. And it was not a big class; each class in the graduate department is quite small. I think we might have even been half of it at that point.

BUTTREY: Something I find like really compelling is your transition from chemistry into animal cognition, which occurred, if I'm not mistaken, after you saw a Nova documentary on PBS.

PEPPERBERG: Yes. Yes. This was around 1974. I was completely disheartened. The other thing at Harvard was that there were no women faculty. And we were told, “Well, why aren't there? Well, there aren't any women good enough to be hired.” And we were saying, “You're graduating people like us. Why aren't your graduates good enough to be hired?” And they wouldn't answer us.

The other thing is that we actually liberated a first-floor bathroom, because there was only one bathroom for us. We actually liberated a men's bathroom! And we took big tubs of chrysanthemums and we put them in the urinals.

We were pretty angry at that point, again, in '74. I was at the point of just realizing, even if I got a postdoc, how would I get a faculty position? There were no women. Or maybe there was one somewhere, but I wasn't going to get a faculty position at a really good university to do research. I might get one somewhere teaching, to be a teacher at a university, but research wasn't going to happen.

There were a whole bunch of other craziness going on, things like being told that I had made a mistake in my calculations when I hadn't [see above]. My advisor had made a mistake. I had lost a lot of confidence in my ability at that point in chemistry.

And then there was this Nova program. Actually, there were two Nova programs. One was on the signing chimps and the dolphin research, and the second one was on, why do birds sing? And it all of a sudden hit me: if you wanted animal communication, I had a talking budgie. Why not use a parrot that actually talked in English?

I was really excited about this, and I went over to the folks in the [Harvard] Museum of Comparative Zoology. I said I wanted to switch fields, and they said, "No, no, no, no. You're ABD [all but dissertation]. You're close. You've had a bunch of publications in chemistry already. You're really close." It was still two years away, but they said, "You're really close. Just finish the degree. But if you want to sit in on our courses, just don't make us grade your papers. Sit in on our courses. You can use our library. You've got a Harvard ID. Do what you want, but just don't make us grade your papers." It was the same thing in psychology.

So I could sit in on their seminars. I could sit in on the courses. Jill de Villiers [Assistant Professor of Psychology, Harvard University, 1974-1979; Professor of Psychology and Philosophy, Smith College, 1979 to present; researches language acquisition and theory of mind] had this amazing course on child language. Again, this was the very beginning of the animal language studies, and the very beginning of the scientific exploration of how children learn language. Until that time, it was either Chomsky [Noam Chomsky, Professor Emeritus of Linguistics at MIT; theoretical linguist and one of the founders of the field of cognitive science; often referred to as "the father of modern linguistics"; a major figure in analytic philosophy] where there was a little language acquisition device in your head that went 'bing'! And you had language. Or it was Skinner [B. F. Skinner, professor of psychology at Harvard University, 1958-1974; a key figure in the development of the philosophy of behaviorism; best known for developing the Skinner Box used to conduct conditioning experiments with animals], and everything was conditioning and stimulus response; the kid learned everything from stimulus response.

Now there were a bunch of people saying, "No, no, no. Neither of those make any sense if you look at the data. We're starting to collect data. None of this makes sense."

Roger Brown [Professor of Social Psychology at Harvard University, 1962 to 1994; taught at MIT from 1957 to 1962; studied language acquisition] was at Harvard at the time. He had just published his book on first language. People like Jerry Bruner [co-founded and co-directed the Center for Cognitive Studies at Harvard University;

leader of the cognitive revolution, emphasizing cognition over behaviorism in psychological research] and Jerome Kagan [Professor Emeritus of Psychology at Harvard University; studied developmental psychology, with a focus on temperament] were there. And in the Boston area, there were all these other people who were at BU.

Jean Berko Gleason [Professor Emerita of Psychology and Brain Science at Boston University; helped found the field of psycholinguistics], who's become a really dear friend of mine, was the first person to study pluralization in children—"This is a wug. Here's another wug. What do you call these two?"—to see how children learn pluralization and other concepts. [The wug test was created by Jean Gleason to study linguistic morphology in children. In the test, a child is shown pictures with nonsense names, such as "wug" and asked to complete statements about them]. People were first learning about so many new things. Everything was happening at once. There were all these incredible courses to be taken. And this animal "language" stuff, it was a new brand-new field. People just started publishing in that area in '69, so you could enter the field because there wasn't 100 years' worth of papers you had to read. There were six or seven years of papers you had to read.

And, of course, all these people were coming through Boston and Harvard to give lectures, so you went wherever you could. You could listen to all these people give talks about their work.

That's when I finished the degree in theoretical chemistry. Then, literally about six months after that, my then-husband got a job at Purdue, so we moved to Purdue. That was another horror story in terms of discriminatory behavior. Basically, we moved there, and I was told, "You're a faculty wife. You're supposed to stay home and bake cookies and make babies. What do you mean you want some kind of position somewhere, you want to submit a grant, you want to do research?" That was a whole 'nother nightmare!

BUTTREY: You've said before that one of your first research proposals came back with the question: What were you smoking?

PEPPERBERG: Yes.

BUTTREY: That you weren't taken seriously.

PEPPERBERG: Right.

BUTTREY: Did you yourself ever question the validity of doing this work and working with Alex, your first parrot research subject, the parrot that became internationally famous because of the studies you undertook with him? [As noted in Professor Pepperberg's

bio above, Alex, a grey parrot, was a key subject of Professor Pepperberg's animal psychology research for thirty years.]

PEPPERBERG: No. I mean, when I look back on it, it's really hard to think about how completely, absolutely completely convinced I was that I was right, because there was so much scientific background that suggested I was right. There was no proof, because, obviously, I was the first person trying to do it. But if you looked at all the stuff on birdsong research, if you looked at all the stuff on the ape studies-- One fellow had tried to do something a little bit like this with grey parrots in Germany. He developed a prototype of the technique that I started to use, which worked amazingly well. Also, within a month of my getting Alex, he was starting to talk.

BUTTREY: What were your first experiments?

PEPPERBERG: We were just trying to tame him. I'd figured out which of the toys he liked the best, which things he liked. It was paper and key. And, of course, paper—I didn't know at the time that a "puh" without lips was going to be the hardest thing. So he'd try "a-er", "a-er." That's what he used.

I just knew this was going to work. Even getting permission to let me submit the grant proposal, that was a whole nightmare in itself because I didn't have any formal position. I came there [Purdue] without any position. I finally got to see the department head of biology, where my husband was working. I don't know if he was serious, but he jokingly said, "Well, if you could get the dean to sign off on this grant, I'll sign off on it, too." So I'm figuring, "OK, how the hell do I do this?" I had become friends with a woman who had been in the department forever. She was a brilliant scientist, but she was only a research associate in her husband's lab, because they wouldn't give her a faculty position. She said, "I don't want this to happen to you. I've been here for 20 years at this point. I've been treated horribly."

So she called the dean's office, without saying it specifically, but saying that she was calling on behalf of Dr. Pepperberg, which was true. That made it sound like she was my husband's secretary. I mean, she didn't ever say that. It wasn't a lie, but she called him. She wanted an appointment with the dean for Dr. Pepperberg to talk to him about something. So I walked in, and the dean looked at me and went, "Who are you?" And I said, "I'm Dr. Pepperberg." He said, "No, you're not." And I said, "Yes, I am. I have a doctorate from Harvard. I can't show you my diploma here, but I have one." He was furious. He said, "Well, what do you want?" And I said, "Well, I want to do some research in the biology building. I borrowed some space from one of the other professors, and I need to submit a grant proposal." And he said, "Well, how can you do that?" And I said, "Well, I need your signature, and then I can do that." He said, "What did your department head say?" And I said, "Well, my department

said that if you signed it, he'd sign it." And he said, "Struther said that?" It turns out that this was one person whose word was his bond, and everybody knew it. And if he had said that to me, he was going to do it. So the dean signed it, and I submitted it. That's the grant that came back asking me what I was smoking.

But once I had set a precedent, I was able to revise the grant. And the interesting thing is, fast forward maybe 20 years. I'm giving a talk at a conference, and this is part of my introduction when I say that this field is new. That when I first started it, people asked me what I was smoking. I get to the end. I get a question. And I said, "Yes?" And the fellow says, "Well, this isn't a question. It's a comment and an apology, because it was my review. And I'm really sorry. You have made some great strides in the field."

BUTTREY: Oh, wow.

PEPPERBERG: That was really cool.

BUTTREY: When did people start taking you more seriously?

PEPPERBERG: It was slow, but some people took me seriously from the get-go. There was one, Donald Griffin [Professor of zoology, e.g., at Harvard University, Rockefeller University; argued for animal consciousness and discovered echolocation through the study of bats; pioneer in the field of cognitive ethology] He was a professor at Rockefeller. He had written this book just around 1976, "The Question of Animal Awareness," not just about animal cognition, but animal consciousness. We met at a conference, and he was fascinated. He became as close to a mentor as I could ever have. We became close friends over the years. At that point, he was in his 60's. He was retiring from Rockefeller at the time, but he was very, very helpful over the years.

But acceptance was slow. I'd be invited to give talks, and then the hands would come up and people would say, "But there's no cerebral cortex. How can the bird do this?" And I'd look at them and I'd say, "You're the neurobiologists. You go find it, because these are my data." It 'only' took till 2005, but in 2005, *Nature Reviews Neuroscience*, Erich Jarvis [Professor at the Rockefeller University leading a team studying the neurobiology of vocal learning using animal models that include parrots, hummingbirds and songbirds] et al.— where et al. is 20 other people—they found a chunk of parrot brain that works functionally like a cerebral cortex. The relative size is humongous compared to the rest of the brain.

I think it was 10 years later when they found that the neural densities are so great in these birds' brains, the parrots and the corvids, that it's the equivalent of non-human primates of much larger size. They tested it against monkeys, but they were thinking



it was close to that of chimpanzees in terms of neural densities. So these birds can have the abilities, and it's really exciting.

But at the time, I couldn't get a faculty job. I got my degree in '76, and my first faculty job was in 1990 at the University of Arizona. In December of 1990, I moved to the University of Arizona, technically starting January 1, '91.

But while we were at Purdue, David didn't get tenure. We moved to Chicago, and I had a visiting assistant professorship at Northwestern for seven years. Then that got kiboshed because they couldn't keep me beyond seven years in a non-tenured position—and nobody would tenure me. Then I was able to get the job at Arizona.

And the same time, the marriage fell apart, so I just up and left.

BUTTREY: What were you doing for those seven years? Were you teaching or doing research?

PEPPERBERG: Both.

BUTTREY: What were you teaching?

PEPPERBERG: It was really cool. I was teaching animal cognition and animal-human communication. Then I taught a basic animal behavior course at Northwestern. It was in a quarter system, so I taught one quarter animal behavior, one quarter animal-human communication, one quarter animal cognition.

I had so many colleagues there who really believed in me, who really thought this was amazing work. Intellectually, I was really happy there, but they could never see themselves formalizing my position. I said, "I just got a grant. It's \$250,000 for three years." This is 1986 or something, so you'd have to check back. I don't know how much it would be in today's money, but maybe add another zero or something. But for animal behavior, that was huge. And the dean there, or the provost, says to me, "Well, I can't afford you. My neuro people bring that in every year." So it was like, "Oh, this is a business. You're only acceptable as to how much overhead you bring in, and what percent of the overhead." I don't think that was against me as a woman, that was just against the field. They actually wiped out their ecology and evolutionary biology program department at Northwestern because it wasn't bringing in enough money.

BUTTREY: That's very unfortunate.

PEPPERBERG: Yes.

BUTTREY: After the University of Arizona, how did you end up back at MIT, this time at the Media Lab?

PEPPERBERG: They were interested in animal-human interfaces, and using animals as models for intelligent learning systems. Sort of an animal model for AI.

BUTTREY: Is that what you ended up working on, and not just what brought you there?

PEPPERBERG: Yes, well, I did it to some extent. We were actually looking more at animal-human computer interfaces. We were just trying to design things where the birds would interact and learn from computer systems, or we'd use basically computer systems to test them on cognitive tasks and things like that. It was really fun.

I was a visitor there for two years, and then when they hired me as a research scientist, I started September 1, 2001. And 11 days later, 9/11 hit, and everything went to, excuse me, hell in a handbasket. They had a financial meltdown. They fired the most recent hires, which was me. But I had a contract. We went into discussions for a long time. They basically kept me for a few years in a weird position until I won a Radcliffe Institute fellowship.

BUTTREY: At this time, what was it like to have the focus of your scientific studies, Alex, become a kind of celebrity?

PEPPERBERG: Well, at first, in the 1980s, it was really crazymaking. I remember when the first time it hit, I hid. I literally hid from the phones because I couldn't handle it. And then I started understanding how important it was to make it clear to people that this was not a joke, that it was real science, that it was based on a lot of work.

I was extremely careful how I dealt with the media; the media wanted to hype it like crazy. I would always try to say, "No, it's not yet counting. He has numerical competence, but that's not counting. They say, "Well, what's the difference?" I would try to explain to them, and they didn't want to hear it. But at least I made the effort.

I think it was part of what blew my marriage apart. My husband was a neuroscientist. He felt he was doing real science, and here I was talking to a parrot, and I'm the one on the face of *Chicago* magazine and getting calls from NPR and things like that. Nobody's interviewing him. So there was some craziness. And there were also things that I had to be really careful about—we called it the 'Carl Sagan effect.' I don't know if you aware of that at all.

BUTTREY: I know who Carl Sagan is, but I don't know about the 'Carl Sagan effect.'

PEPPERBERG: He was a brilliant scientist out of Cornell. He had hosted the television series *Cosmos*. And because he was a public figure, he was denied admission to the National Academy of Sciences. They claimed that he wasn't a real scientist because he was publicizing his research.

BUTTREY: Did you feel the effects of that?

PEPPERBERG: I don't know. I don't know if that's what made it harder for me to get that first faculty job or not. I know that there was a little bit of squawking about my being an affirmative action hire at the time. Half the department led a delegation to the dean to protest the hiring in Arizona [the University of Arizona], because they wanted a field ornithologist, and not somebody doing cognitive behavior. "My department head said, "Look, she's going to be a connection to psych and to neuro. That's what we want. We just don't want somebody in the sort of old-fashioned tramping through the woods stuff." Not that it's bad, but I mean, this is where the world is heading.

And the department-- When half the department leads a delegation to the dean-- If I didn't need the job so badly, I wouldn't have taken it. It never got better. There was so much antagonism to me constantly in that department. It was so petty. There weren't a whole lot of places you could take people out for dinner in Arizona, so when you had a visiting speaker, you had a party at your house and you invited the department. Nobody in my department, other than one friend and his wife, would come—and I had a huge lab. I had some friends in psychology who would come, so the house was full. The visiting professor never probably figured out exactly who was there and why they were there, but it was full of graduate students, and undergraduates, and their significant others, and a couple of random faculty people. But my department-- How petty can you be that you wouldn't come to my house for a beer? That was the kind of thing that I had to deal with there.

BUTTREY: That's unfortunate.

I remember reading about Alex when I was around 11, and I loved his story. It was compelling to me. I was an animal lover, and I had pets.

PEPPERBERG: Oh, cool.

BUTTREY: I felt like it was backing up what I already knew—that my pets *have* to be intelligent, and here is scientific proof that they are. That's how I took it as a kid. Do you think that this contributed to Alex's popularity, and why so many people connected with him and the work you were doing?

PEPPERBERG: Yes. When he died, I had thousands—and I mean thousands—of emails, thousands of letters from people saying exactly what you're saying. They weren't from scientists; they were from the average person. I got letters from children—the 11-year-olds from schools where the teacher would send me a packet. "This is what my class wrote about Alex." I hadn't realized what an effect he had on people until that. It was overwhelming. It completely blew me away.

What I find sad is that now, a lot of people have sort of forgotten. Griffin [another African grey parrot who became a subject in the Pepperberg lab in 1995] is just as smart, and he's doing really cool stuff. But when we publish a paper on Griffin, nobody puts it out in the news anymore. [Griffin recently matched or outperformed Harvard undergraduates in 12 of 14 trials of a Shell Game working memory test; that paper did garner some publicity.]

BUTTREY: How did you adjust your work after Alex died? Was Griffin the next bird you worked with?

PEPPERBERG: Yes, and he's really, really smart. He doesn't talk as much as Alex did, but we've been doing so many incredible studies where the communication skills are sometimes needed, but sometimes they're not.

The communication skills allow us to work with him, even on the tasks where he doesn't have to talk. They allow us to question him efficiently. And I think because he's used to thinking abstractly in the communication system, he does these things that other animals won't. I have a younger bird, Athena. She's also smart, but she doesn't like to talk. We've been trying to train her, but, for a lot of reasons, she hasn't had the kind of training that Alex and Griffin had. She doesn't do the same stuff. She's smart, because she shows us in other ways, like very little deceptive things that she does, and succeeding on some non-vocal tasks. As for Griffin, he's done several Piagetian tests at the level of six- to eight-year-old children.

BUTTREY: That's amazing.

PEPPERBERG: Yes, it is. What's really bizarre is, last week, my department head in psychology said he's not renewing my contract, so I'm desperately looking for some place to move my lab by August 31.

BUTTREY: Oh, wow.

PEPPERBERG: Right.

BUTTREY: That means moving the lab to a different university, or somewhere else at Harvard?

PEPPERBERG: Well, there are several other departments at Harvard that were interested, but because of the hiring freeze [due to the ongoing COVID-19 pandemic], they can't get any kind of FTE for me. Everybody's trying to de-intensify their staff, too. I would need some kind of appointment so I can run my grant through there.

We got permission to work off campus for the COVID panic, but I don't know what's next. Everybody's nervous about doing anything. I would rather stay at Harvard in

another department, and there were two departments that were eager, that were interested. They just couldn't make it work.

But yes, I'm looking at something else in the Boston area, because three years from now, one of my former students will be able to get a job. She's starting a postdoc now, and eventually she'll be able to get a job and take over the lab, but the lab has to be kept alive for the next three years.

BUTTREY: I'm really sorry to hear that. Best of luck.

PEPPERBERG: Thank you. It's just incredibly scary that this whole thing is going to collapse.

BUTTREY: Is it possible to summarize other projects you're working on right now?

PEPPERBERG: Oh, yes.

BUTTREY: AI?

PEPPERBERG: Yes. Well, in AI, I'm collaborating with some folks in India. They're trying to build a robotic parrot that would work as a model for autistic children, because years ago we did some studies showing that this modeling technique that we use to train the parrots works amazingly well to train autistic children in language studies.

The problem is that it needs two adults and one child, so it's incredibly labor intensive. People don't want that, because it's very expensive to hire two full-time trainers to work with one child, so we couldn't get any traction on it. But now they're thinking, maybe if you got a robotic parrot, you can have a robotic parrot and one person working with the child. So I'm doing that as far as AI is concerned.

We just published study on Piagetian liquid conservation. That's where you show a young child two half-filled glasses of juice, and you say, "Which one do you want?" And they giggle, and they say, "Well, they're the same." And then you pour one into a tall, thin glass, and one into a short, fat one, and you say, "Which one do you want?" And if the child is under about five years old, or sometimes six years old or under, they'll go, "I want the tall, thin one." And you say, "Why?" "Because there's more." "But you just told me they were the same." They say, "No, now there's more." If you ask a six- or seven-year-old child which one they want, they may say, "Oh, I want the tall, thin one because it looks like it's more fun to drink out of." They say, "We know it's the same, but that one looks like it's more fun."

We gave these tests to my two grey parrots, and two grey parrots that we often work with because they're owned by people who used to work in my lab. These folks can do the studies, and we trust them. Also, the husband was a naval nuclear

submarine commander, so you give them a protocol, and it gets followed! Anyway, the birds passed it. So that's [like] six- or eight-year-old children.

We're just finishing up a study on contrafreeloading, which is when you give an animal a choice between working for food or getting free food, and a certain percentage of the time they choose to work for it. That goes against theory. Well, why wouldn't you just take freebies? I mean, why would you do this? Not according to foraging theory, or learning theory, or anything like that.

It turns out that Griffin will contrafreeload on a certain type of task that Athena won't. She goes for the freebies unless she can work for a better reward. But if you give them a whole almond in the shell, or a shelled almond, Griffin's just going to go for the shelled almond; he loves that. But you give it to Athena-- She can have an almond for free, and she spends five minutes tearing apart the shell. Why are they doing this? We don't know. But we can document that for some birds, it depends on what they think is fun.

So each individual person and each individual parrot have a different idea of what is fun, and again, we're replicating some of that with these other two birds. It's not male-female, because their female will take the freebie, and their male will choose an almond in the shell to tear it apart. So those are some of the kinds of things we're doing.

We've also published some papers that involve executive function, inference by exclusion, and Griffin is at the level of five- to six-year-old children—he outperforms the apes on these kinds of studies. We're working on some other things like that. Delayed gratification: Do you know the marshmallow test?

BUTTREY: No--

PEPPERBERG: OK. In 1970, Mischel did a study with four-year-old children. [Walter Mischel was a psychologist best known for his work on delayed gratification and willpower; among other honors, he served as president of the Association for Psychological Science] He sat them down in a room and he said, "Here's a marshmallow on a plate. You can have this now, but I have to go run an errand for a few minutes, for about 10, 15 minutes. If you wait to eat this until I come back, I'll bring a second marshmallow." A small percentage of the kids waited, and they got the second marshmallow. A fairly large number of four-year-olds could not wait. He has videos of all of them. The ones that waited were doing things like getting up and dancing around the room, and trying to fall asleep, and twiddling with their hair. They were just self-distracting behaviors. Then he checked back on these kids 30 years later, and it turned out that the kids that waited had done better on their college boards. They were in better universities. They'd done better at university. They had better jobs. Their marriages

lasted longer. Their whole lives were so much better because they had this executive function that allowed them to think about waiting for a better reward.

It turns out that if you look at low-SES children, they fail, and for really sad reasons. You ask them, "Why didn't you wait?" and they'll say, "Because I didn't trust you to come back." Or they'll say, "Well, I was afraid my brother would come in and steal the marshmallow."

But Griffin waited for 15 minutes for the better reward. We did it for a better, not more reward. We videotaped him, and he did the same behaviors as the kids. He squawked, and he sang to himself. He preened. He turned around. One time he picked up the cup holding the reward, and he threw it across the room so it wasn't in front of his face. He did the same things the kids would do, those who waited for 15 minutes.

So now we're doing it for more, but in a token economy, because when we started with Griffin, he wouldn't wait for more. And no bird, no animal, will really wait for more. The ones that they do wait for more, it's not set up exactly the way that children are. When you set it up exactly the way the children are, it's very hard to get the animals to wait for more. Crows, and all the corvids, will wait for better, but not for more. So we're trying to use a token. Griffin's learned that three little wooden hearts mean three nuts. Two hearts mean two nuts. Four hearts mean four nuts. And I've got him to sit there, and he sits in front of the cup holding the tokens. "You can have two, or you can wait for three." He sees two hearts, and he can wait for three hearts, and if he waits for three hearts, or he's given three and waits for four, he gets the same number of nuts. Most of the time, he waits. Sometimes he doesn't, which is kind of good, because it means that he's not just trained to wait. He sees the situation and knows he's supposed to sit there until I let him break. Sometimes he's going, "I don't want to wait. I'll get fewer nuts, but that'll be it for today." So we're doing that kind of study.

**BUTTREY:** It's great to hear you talk about this. It's really exciting, and it seems like you find it exciting as well, and that you're still passionate about it.

**PEPPERBERG:** Well, one of the reasons I want to keep the lab going is I want to provide the opportunity for students to work in the lab on these projects. I have had two students recently do undergraduate theses at Harvard. One student I taught at MIT a couple of years ago has been working on the DG, the delayed gratification, with me. She graduated this year, but she came over several times a week to work in the lab. This is the kind of thing that I'm desperately trying to keep going.

**BUTTREY:** How important is it for you to mentor other scientists at all the schools you've been affiliated with?

PEPPERBERG: It's so important, because this is the next generation of researchers. Let me start by saying there are so few jobs in this area. There's so little funding compared to other areas, that most of my students have gone into neurobiology, or gone to medical school or veterinary school. But that's important, too, because particularly as veterinarians they need to be able to explain to people how smart these animals are so that people will treat them appropriately. I feel this is just as important, mentoring these students.

In the last few years, I have had several students who have been interested in the work. There is the student who just finished her PhD at Tufts this year. Another student is finishing her PhD at Cambridge [University] across the ocean, and another is finishing her master's and she's been accepted to their doctoral program, so there will be some people carrying on this work.

One of my former students is actually old enough that he's retiring from his professorship in the field. A few other students are around the country doing related things, sometimes more in conservation issues than just straight cognition. But that's super important, too.

With one of my very best students, it was really heartbreaking. I was working with her, and we had just finished a co-authored paper. I said, "Hey, we need to start talking about graduate school." And she kind of looks at me and says, "Well, I didn't know how to tell you this, but I figured if I was going to put in the kind of hours you're putting in, I want to be paid. So I just took the LSAT and I'm going into law school." We've lost track over the years, but scuttlebutt has it that she's gone into environmental law.

BUTTREY: Oh, good.

PEPPERBERG: At least that's something!

BUTTREY: It sounds like your focus when mentoring is on encouraging students to develop the areas of biology and psychological science that you've helped to advance.

PEPPERBERG: Yes. As I said, you don't get anywhere unless you can mentor students and have them carry on. You don't want anything to die with you.

BUTTREY: Right.

As far as the struggles of being a woman in science, have you seen anything get significantly better since you were my age? Are there certain areas where there's still a long way to go?



PEPPERBERG: Well, yes and yes. When I was in Arizona—again, this was 1990 to 1999—they finally put in maternity leave. Finally. Hello! Finally, they had maternity leave, so you could take off a semester with pay with no problems. However, they didn't write in a request for money to pay for somebody to cover your courses. If you took maternity leave, your courses weren't going to be covered, or the department had to come up with some other money, or somebody had to teach an overload that semester to cover your courses. Well, gee, guess what? When it comes to then hiring new faculty members, even the women didn't want to hire more women, because they're thinking, "Great, I'm going to hire her. She's going to get pregnant, and I'm going to have to teach an overload to cover her courses." So on the one hand, it was really good. Maternity leave: yay. On the other hand, it's like it comes to bite you in the butt.

BUTTREY: Right.

PEPPERBERG: It's things like that that people haven't necessarily thought through. They're trying, but not every university has on-site daycare. I don't know how it works at Harvard because I never had any children. At some schools you can apply for fellowships for to help pay for your daycare and such, but your tenure track clock is going exactly when you are—when you should be having your kids. That's sort of the way it goes, and it's really hard. I don't know how it works for these women. I don't know. There was one woman who had taken maternity leave who pulled back before she went up for tenure because she felt it wasn't going to happen. I don't know if there was an issue there.

The point is that it's not true that everybody just looks at it as a normal thing still.

BUTTREY: Right.

PEPPERBERG: There's still the two-body problem: You get married, and either you go to a place like Boston, where there are lots of different schools, where one of you can work at one school and one of you can work at the other school, and you hope that this works. Or you pray that there's a university that will hire both of you. But it's really much harder than if you're just going there as yourself.

BUTTREY: Yes.

PEPPERBERG: I applaud the #MeToo movement. I think it's incredibly important. I have certainly been propositioned over the years by colleagues, but never been attacked. And I've never been in a situation where the proposition came from somebody who had total control over my career. It usually happened at conferences where some guy had a couple too many, and he was kind of obnoxious.

Then there can be hiring issues. I remember at Arizona, there was one point where we had this incredible woman who was applying for a job. She was married to a fellow considerably older than she was, and he never asked for anything. He was a professor at another university. This was going to be her first job, and it came up in the discussions. "Well, what if we hire her? What are we going to do about John? I mean, she's going to ask for a job for him, and we don't have a job for him, so we better not hire her. We should hire this other guy who is just coming on his own."

I just went ballistic. I said, "Can we vote to strike that comment from the minutes? I mean, this is a Title IX issue, admitting that she is our choice and then saying we can't hire her because we don't know what to do about her husband. She's never said anything about her husband. Maybe she wants to divorce her husband, and she wants the job to leave him. We don't know."

As it turned out, all he wanted was basically a half-time position so he could just run his grant. He didn't even want to necessarily be paid by the university. He had grant money. He just wanted some kind of situation, an office. He was doing field work.

BUTTREY: Did you end up hiring that woman?

PEPPERBERG: We did. Then, for other reasons, she didn't get tenure and left, and who knows what was going on there?

BUTTREY: It sounds like there is still a way to go.

PEPPERBERG: Yes. I mean, I think discrimination is still there, and there's so much also implicit bias. Those studies by my colleague Mahzarin [Mahzarin Banaji, Professor of Social Ethics at Harvard University; co-founded Project Implicit, which helped popularize the concept of implicit bias, a test requires a series of rapid judgements about two target groups, such as men and women, and is thought to reveal implicit associations] at Harvard, where she does this work where you take a little computer test. People say, "I'm not at all biased." And then you take this test, and you realize, "I really am." It's very scary to take it and find out. You might not be outrageously biased, but you might show up something on there.

Nevertheless, I do think things are getting better. We have come a long way. For example, you look at the psych department at Harvard, and there are tons of women there. It's really appealing in that sense. But I think there's still a lot of departments where that's not true, a lot of places, a lot of fields. I don't know, but I'm guessing that the physics department at Harvard does not look like the psych department at Harvard. I know Lisa Randall [MIT Professor of Physics 1991-2001, and current member of Harvard's physics faculty; studies theoretical particle physics and cosmology; the most cited theoretical physicist between 1999 and 2004] is there, but

I don't know how many other women are there, so we might have only a few women professors.

I remember at Arizona [the University of Arizona], there were just a few of us in the department. It was sort of like, 'Well, yeah, they need a token woman on every kind of possible—" That's the other thing: they need a token woman on every committee, because otherwise there's a gender problem. We need representation, so we end up doing all this extra committee work that the guys don't have to do, because there aren't enough women to treat us like everybody else. You find yourself working 75 hours a week in order to do everything you need to do to get tenure, because you've got all this extra committee work.

BUTTREY: Interesting.

PEPPERBERG: It's the same thing in terms of advising. I've had students come to me with personal problems that I doubt that they would come to their male professors with, because I'm approachable.

BUTTREY: I was just going to bring that up—that the women have to do so much more emotional work. And you're obviously very open to mentorship. And you go out of your way to do it, which is wonderful for the students. But that's additional work for you in an already busy week.

PEPPERBERG: Yes. All of this is just so hard!

The students of mine who have gone on into the field, they can tell you I don't abandon them; I still work with them. If they have questions and need help, I'm still there for them. Those who have left the field, I can't do much for. But it's still such a crazy situation. Again, it's better. It's more open. Men are being held accountable for their behaviors, which is incredibly important. But it's still hard.

Then we have awkward situations where men are scared to interact with women at all. They don't know what's going to be taken weirdly. If two guys go out for a drink at a conference, and they're talking science, nobody thinks about it. If two women go out for a drink and they're talking science, same. But if a man and a woman go out for a drink, even if they're talking science, even if there's no innuendo whatsoever, people are looking at them. "What's going on here?"

BUTTREY: It reminds me of what you said about hiring, about some people saying "Oh, we don't want to hire this woman. It might be a problem." Which is ironic, because it wouldn't be the woman being the problem.

PEPPERBERG: Right. Exactly. Exactly.

When I was applying for the job at Arizona in the late '80s, I had a really, really dear male colleague. He was just such an inspiration to me. I don't want to give his name, but he was so helpful. I'd just missed out on a job that I really, really wanted, and I was really upset. He said, "I don't know how to say this. But guys want to be able to go out and play basketball with their colleagues, and go out for a drink, and be able to talk science without getting a hard-on. And it's just-- It's not fair, but that's the way life is."

During the years in the late '80s when I was interviewing-- I will give the name of the university: it was at UCLA. I won't say which people who were involved, but it was at UCLA. The interview had been going very, very well. (You can tell when an interview is going well.) After the interview, they take me out for dinner. We're at a Moroccan restaurant, so we're sitting on the floor, grabbing the food with our hands. Very relaxed. We're having a couple of drinks, and they say to me, "We're really concerned about offering you this job, because it'll put you in a commuting marriage." And I said, "Oh." My first thought was that I wish I had mic'ed my bra. I said, "Well, honestly, I'm already in one. My husband goes to Germany one month in four. I travel. We both do a lot of traveling. This summer, we will literally see each other for two weeks, one in Edinburgh, where we both managed to get conferences at the same time, and one in Chicago, where we live. That's the only time we'll see each other this whole summer. So I'm already in one. What's the problem?" But I didn't get the job.

Again, this was said at a restaurant off campus. There was no way to make claims or anything. That was '87 or '88—a long time ago. But I'm guessing that those things are just not said out loud anymore. They're not allowed to be said, but they're thought.

BUTTREY: Right.

Do you think that there are steps that places like MIT and Harvard need to take in order to do a better job of welcoming women?

PEPPERBERG: Well, yes. Again, I don't know if either place has on-campus day care, but you desperately need free on-campus day care. That's the most critical thing. You need it to be set up so that there's also medical day care, so if a child gets sick, he or she can be put in a little infirmary area that their mom and dad can go back and forth to during the day, but where one parent is not stuck at home. Taking care of a sick kid, you need that kind of thing. And you need to convince the husbands that they take as much parental leave as the females, so it's not just the woman who takes off the semester but the male who has the baby who takes off the semester. Both tenure clocks get stopped.

BUTTREY: Yep.

PEPPERBERG: It's not fair that just one person takes the hit.

They're working really hard on openness, and Title IX, and being able to report things [that are allegedly illegal]. But the stuff that's come down from [Secretary of Education] Betsy DeVos about the new rules about sexual harassment are scary.

Yes, I think somebody who's accused of sexual harassment should have some ability to defend him or herself. I don't think it should be, "Only listen to one side." But you at least need to be able to listen to both. You don't have to actually have somebody confronting one another face to face. You can have an ombudsperson in between. "This is her side. This is his side." And having somebody try to sort through all of this and find out what the answer is. But you can't just say, "Oh, you just have to believe her, or you just have to believe him." It's not fair either way.

: One of the things that some schools are doing that I think is really important is having summer sessions before freshman year for disadvantaged students. They give students the opportunity to take courses so that they don't come in with as many disadvantages as they might have otherwise. I think that's true for both women and racial minorities. If you're a woman, you might be really interested in science, but you might have been for some reason told you couldn't take the physics class in your high school, or been told that coding is "not for everybody."

There was just a piece in *Science* magazine, "Understanding persistent gender gaps in STEM", by Joseph Cimpian et al. It was saying that women who go into physics and engineering are at the top of their class. A lot of men who were not at the top of their class go into physics and engineering, and they do OK. But women have it in their heads that unless they are at the top of their class, they can't even try.

BUTTREY: Right. I had the same conversation with a friend about two days ago.

PEPPERBERG: So somebody else read that article!

BUTTREY: We hadn't read it. We were just talking about observations from our lives!

PEPPERBERG: Yes. As I said, when I got into MIT, I had to take remedial physics, because I had basically almost no physics background compared with what most other people had. I took a class. I passed whatever physics I had to pass to get my degree. But I needed so much more work. If there had been like a summer session beforehand that I could have been in rather than using one of my valuable courses at MIT to take that course...

BUTTREY: MIT does now have a pre-freshman year full-summer session.

PEPPERBERG: Oh, cool.

BUTTREY: I hope that it's successful in addressing some of the situations you've mentioned.

PEPPERBERG: Right.

BUTTREY: In terms of your MIT experience in general, how do you think that's shaped, if at all, your life and career?

PEPPERBERG: Well, I wasn't particularly happy there. We joked about it, and you still probably do, too: It's like drinking out of a fire hose.

BUTTREY: Yes.

PEPPERBERG: It is. It's the most intense experience that you have. Again, this has nothing to do with gender issues, but I remember being given a problem set in one of my courses, and it was like, "There was no way we can figure this out." We did the best we could. It turns out this was part of some professor's research. Twenty years later, he won the Nobel Prize for figuring this out. But he thought, "No, this is something my kids could do." It was great that he thought we were that smart, but it was those kinds of challenges, of walking out of my first-semester organic chemistry final in tears because I could only answer half the questions, literally. And I got an A, because the class average was 38!

There were some things at MIT that were just egregious in terms of, "Am I learning anything? Seriously?" But in contrast, it was once you got through it, you realized, "I got through this. People thought I was smart enough to do this kind of stuff." It gives you a certain rigor, and a certain backbone, that I don't think I would have had if I had gone to another school.

So it might have not been fun at the time, but when you graduate, you have a certain knowledge of your abilities, and your competence, and rigor, and how to scientifically think. You've done lots of critical thinking.

Even in my courses now in psychology, I tell my students—because almost none of them are going to major in animal cognition; they're taking the course because they need a distribution course—I say, "Ten years from now you're not going to remember a fact in this lab, but you're going to be able to read a paper in whatever field you're in, and be able to make sure that this is rigorous science."

BUTTREY: Yes.

PEPPERBERG: "Because I'm trying to teach you critical thinking." And that's what MIT really gave me.

BUTTREY: Would you say that what was able to transfer from your undergraduate experience in chemistry to your later work in animal cognition—that type of skill set of critical thinking?

PEPPERBERG: Yes. Yes. Because there's so much. I was an associate editor on a journal [the Journal of Comparative Psychology] for six years. So much of what I saw in the papers that were rejected was just sloppy science. They were people not thinking through the experimental design appropriately. They were supposedly thinking as scientists, but they weren't. They weren't thinking of alternative explanations. They weren't thinking about how to make sure that that you've designed the experiment in a way to eliminate alternative explanations. You can't eliminate every single alternative explanation, but you can eliminate the major important ones, and that's how you have to think.

It's true in any field of science. It's true in medicine. It's true in everything that you go into: you have to have critical thinking.

BUTTREY: Agreed. Is there anything else you'd like to add, whether about your early life, your time at MIT, your personal life, your current work—even something about mentors you might have had?

PEPPERBERG: Well, again, a lot of people really didn't appreciate what I did. But I had some really amazing mentors who really, really cared. At Harvard, I had Ken Nakayama [Professor of Psychology at Harvard University; studies vision science and helped found the Vision Sciences Society], who helped me establish this kind of weird little position I had at Harvard. We co-authored a paper together. Susan Carey [MIT Associate and Assistant Professor in Psychology, 1972-1984; MIT Professor of Brain and Cognitive Sciences, 1984-1996; Harvard Professor of Psychology 1996-present; studies language acquisition and how cultural concepts change over time] in the psych department is also someone who has been incredibly helpful. We're also collaborators.

It's almost not about mentorship per se, but having collaborators who trusted my work and were willing to work with me, and helped me with this work. There are people in the scientific community who really care about one another, and care about the work being done. And then there are other people who are just phoning it in. That's probably what's true in all different areas.

So again, I say that I might not have been happy [as an undergraduate] at MIT, but I certainly appreciate it, looking back on it. It made me realize how much I could rely on myself, and learn how to get some trust in my ideas and my abilities.

It may not get easier for you in the time you have left in your undergraduate years at the Institute, but when you get through it, you will come out and realize how important it was, whatever annealing experience you've gone through was really worth it.

BUTTREY: Thank you.

PEPPERBERG: You're welcome.

BUTTREY: That's my hope.

PEPPERBERG: Feel free to write to me if you need some mentoring.

BUTTREY: Thank you so much. I really appreciate having had a chance to talk with you, even if it's had to be over Zoom.

PEPPERBERG: Yes. This has been cool.

BUTTREY: Yes. Best of luck with your lab.

PEPPERBERG: Thank you. It would be nice to be able to continue doing the work.

BUTTREY: There must be a lot of people who appreciate your work and who feel the same way.

Once again, thank you so much for being willing to talk with me about so many aspects of your life and career.

PEPPERBERG: Sure. And as I was saying, good luck. You're halfway through!