TRANSCRIPT

Key Conversations with Phi Beta Kappa

How We Actively Shape a "Well-Grounded Brain" with Kelly Lambert

How much control do we truly have over our brain health? In this episode, Professor Kelly Lambert, a pioneer in the field of behaviorceuticals, discusses how environmental enrichment and positive anticipation physically reshape the brain. Drawing on her celebrated research—including the world-famous "rat driving" studies—Professor Lambert discusses what we can learn about brain health from wild animals, the dangers of living in what she calls "brain bubbles," and examines the critical role of authentic experience in building emotional resilience. She also offers a unique perspective on how small behavioral shifts can serve as powerful alternatives to traditional pharmaceuticals for improving mood and cognitive function.

Fred Lawrence: This podcast episode was generously funded by two anonymous donors. If you would like to support the podcast in similar ways, please contact Hadley Kelly at hkelly@pbk.org. Thanks for listening.

Hello and welcome to Key Conversations with Phi Beta Kappa. I'm Fred Lawrence, Secretary and CEO of the Phi Beta Kappa Society. Since 2018, we have welcomed leading thinkers, visionaries, and artists to our podcast. These individuals have shaped our collective understanding of some of today's most pressing and consequential matters, in addition to sharing stories with us about their scholarly and personal journeys. Many of our guests are Phi Beta Kappa Visiting Scholars who travel the

country to our Phi Beta Kappa chapters where they spend two days on campus and present free public lectures. We invite you to attend. For more information about Visiting Scholars' lectures, please visit pbk.org.

Today, I'm delighted to welcome Professor Kelly Lambert. Professor Lambert is the Trawick Professor of Behavioral Neuroscience at the University of Richmond, where she investigates experience-based neuroplasticity and teaches multiple neuroscience courses. She has authored approximately 80 scholarly publications and has written neuroscience textbooks and several mainstream books, including Lifting Depression, The Lab Rat Chronicles, and Well-Grounded. Her research targeting connections between physical effort and emotional resilience was featured on CBS Sunday Morning, and her celebrated rat driving research has been featured in over 1,500 news stories across the world, including the Netflix series, *The Hidden Lives of Pets*, and the Canadian Broadcasting Corporation's *Rat City*. Professor Lambert is a leading researcher on behaviorceuticals, the way in which small behavioral changes can improve brain health, mood, and overall day-to-day functioning. In 2023, she received the Society of Neuroscience's Science Educator Award for her scientific outreach endeavors. Welcome, Professor.

Kelly Lambert: Great. Thanks, Fred. It's great to be here with you today.

Fred Lawrence: It's a pleasure to have you with us, Kelly. Gosh, neuroscience, the study of the brain. What could be more fascinating, but at the same time, what could be more intimidating? I know from my time at Brandeis, my neurobiologist used to tell me that the study of neuroscience was the study of pushing back the bounds of our knowledge about the way the brain functioned, and at each step, seeing that it's even more complicated than we knew. So I understand you're a first-generation college student. Have I got that right?

Kelly Lambert: That's correct, from Alabama.

Fred Lawrence: So here's the thing, if I had asked little girl Kelly Lambert, "What do you think of the possibility that someday you're going to be a leading neuroscientist or brain scientist doing research, and also being a public intellectual on these issues?" Would that little girl have said, "That's not possible"? Would that little girl have said, "Yes, that checks out, that's what I'd like to be able to do"?

Kelly Lambert: That little girl would've said, "What does any of that mean?" I didn't have any exposure to brains. I didn't have many role models of women doing anything other than teaching, being a nurse, or an airline attendant. So the animals, nature led the way for me, and I'm so thankful to have had just the childhood experiences that allowed me to explore nature, and for that to take me forward. But I would've been curious and intrigued by what any of that meant. But it's been a great journey.

Fred Lawrence: So, tell us a little bit about that experience with nature. What kind of a town did you grow up in? And when you look back on it now, how would you describe your childhood?

Kelly Lambert: Yes. Part of my childhood, I say, was in LA, Lower Alabama, around Mobile, Alabama, and Gulf Shores, around there, so we were close to the beach and nature and woods. And I grew up at a time where maybe you could describe childhood or parenting as benign neglect, where it was just, "Get out of the house, kids," and we had time to-

Fred Lawrence: "Be home for supper and don't get hurt," right?

Kelly Lambert: Yes, Yes. "Show up for dinner, I don't need to know where you are," and I know things have changed. I just was an animal lover, so anything I found, bird eggs, lizards, crabs on the beach, I would always try to bring them back home to nurture. And interesting, that is very relevant for what I'm doing now, because that did not end well, because I didn't replicate the correct and nurturing environment for these little critters I was bringing home. And now, a lot of my work is with this neuroplasticity and the importance of engaging environments and environments that have elements of nature, environments that our ancestors developed and evolved. So I was getting the environments wrong, but I was kind of assessing the research questions: what would happen if I nurtured this egg, or will this egg hatch, or will this lizard live when its tail is no longer on it? And then, of course, pets as well. Just exploring, just exploring, that was great for me.

Fred Lawrence: You found your way to Samford University, a Christian university in Homewood, Alabama. Tell us about your experience at Samford. And also, at what point did you find yourself drawn in your studies towards the work you were going to wind up pursuing?

Kelly Lambert: Yes. It was interesting; I did seem to have an affinity for science, going through high school. Actually, I guess I'm a high school dropout. I just skipped the senior year; they let me do that and just started early there, so I was kind of young, and the only kind of model I knew about science was pre-med, so along with everyone else, I started off thinking pre-med. But I was interested in something I'd learned in high school about psychiatry and the way that brains function in some way, but very naive about what that meant.

And so, I started off as a biology major, but because I was interested in this thing called psychiatry and the brain, I started taking psychology classes. So I double majored in psychology and biology. But there was one course, and we called it physiological psychology. I wrote a textbook for it, and I've taught it for like 38 years, behavioral neuroscience or biological psychology, and in that course. I learned, I hope that I can be a professor to tell a story that may transform some students, but there was a story in that course about enriched environments, about these studies at UC Berkeley in the

1960s when scientists put little rats into not a bare, stripped-down cage, but kind of a Disneyland cage, we called it an enriched environment, and their brains changed. Their brains changed in positive ways in a month or two months.

And for me, that was like pulling a rabbit out of a hat, that you could change your brains through the environment, different environmental exposures, for good or bad. But I wanted to learn everything I could about how that could happen, and I realized that you could do research with animals, and we could all learn from each other. So I started to shift toward thinking I wanted to go to graduate school and something related to this course, physiological psychology, or behavioral neuroscience.

Fred Lawrence: So, where it did take you was University of Georgia, a major research university. Did you go there with this set of research interests already in mind, or was it a little more open-ended than that when you first entered Georgia?

Kelly Lambert: So that professor who told me that wonderful story, she had gone to the University of Georgia, so I checked that out, visited. I got into that biological psychology doctoral program, and I knew I was going to be studying brain and behavior, and that was good enough. And for my master's thesis, I started off with humans, studying stress, and I'm still studying stress, to some extent. But you know what? Those humans don't always show up when you need data. So we were calling the research participants, and we were looking at different electrophysiological measures, heart rate, and such. And at that point, I thought, you know, I think I'm more interested in looking at the animal models so I can get down to more basic biological functions.

Fred Lawrence: And the rats are a lot more compliant.

Kelly Lambert: The rats are easier to work with. They show up.

Fred Lawrence: They show up.

Kelly Lambert: And they didn't have a cover story or an excuse.

Fred Lawrence: They don't complain, and they weren't out late the night before.

Kelly Lambert: That's right, that's right. But we have a lot of respect for the animals. I know that that's an interesting topic in itself. But I have learned so much, writing a whole book, *The Lab Rat Chronicles*, on what I've learned from these animals is quite humbling.

Fred Lawrence: So actually, let's talk about that a little bit. You have a remarkable piece in T*he Washington Post*, in addition to your scholarly pieces, about your experiments with rats driving cars. And I do want to come back to you and rats driving cars, because that's the sound bite that's going to follow you around for the rest of your life.

Kelly Lambert: I know.

Fred Lawrence: And how could we not talk about that? But you also talked about what you learned, not just learned about the rats, but learned from the rats. Talk about that a little bit.

Kelly Lambert: Right. So, this whole crazy research area of rat driving, I'll just give you a little bit of background with that. When I was at another institution, Randolph-Macon College, for 28 years, and I came to the University of Richmond about nine years ago, one of my colleagues, who I did research with, Craig Kinsley, great friend, great colleague, and tragically he passed away, and I'm here in his office, not filling his shoes, but continuing the legacy that we did looking at parenting experience in the brain. But anyway, I digress. When I got here, Beth Crawford, who was the chair of the psychology department and interested in cognitive science, she had been to a science museum exhibit where the goldfish were kind of driving an aquarium based on training about where food was.

And I remember getting an email one night saying, "Kelly, do you think you could teach a rat to drive a car?" Because I was the only person on campus working with rodents. And my first instinct was absolutely not. I'm trying to be a serious scientist, even with this Southern accent and such, a female, I am not a circus trainer, why would I want to do that? And then, I thought, I need to be a team player. And once you start thinking about, okay, how would I design the car? What would the response be? What would the incentives be? What could they do? Could they use the vehicle, the car, as a tool? I couldn't stop thinking about it. So I said, "Okay, let's do this, it's just an aside." And so, we worked together to develop this program. And so, that's a whole story in itself we could talk about.

But during the pandemic, we were continuing to train these animals, mostly for science outreach, because as you said, there's nothing else that I've done in the lab that anyone, this many people, have been interested in. So I wanted to be opportunistic, like the raccoons I study are opportunistic, and the rats, to take advantage of that. So we continued the driving training, and during the pandemic, of course, the students weren't here, so my trainees and I, we took turns coming in to take care of the rats. And at least I was in a pretty low mood, it was, I was separated from students and family during this time, so I remember walking into the lab, and there were three trained rats, our drivers, and they kind of, they jumped up, they went to the front of the cage, they were reaching out, they were doing these, it looks like jumping for joy, like when I ask my dog if he wants to take a walk and he's just jumping.

We don't usually talk about joy in animals, and we don't talk enough about positive emotions in non-human animals, and a lot of my research and my colleagues' research focuses on the negative emotions, stress, trauma, depression, anxiety, and we need to know a lot about that. But at that point, I was just at my tipping point; I couldn't stand the negative anymore, and I said, "Whatever you're doing when you're jumping up and down like that, I want to study that, I just want to know more about what this is." And

so, we started a new research program, exposing rats to positive things, unpredictable positive event responses, UPERs, our version of UPERs with our behaviorceuticals theme.

So we're learning that this may be, anticipation for positive events may be just as critical for developing brains as avoiding and coping with the negative things that happen in our lives. But the rats are continuing, we're onto our sixth study now, looking at this positive anticipation, and actually, with little rat tests of optimism and their vocalizations, they have ultrasonic vocalizations that, with a microphone like I have here, we can hear, and they're more on the positive angle. And they are telling me, even in their laboratory worlds, which they have a pretty good life, they're in an enriched environment, they do driving every other day or so, they seem to be telling me that this anticipation for positive events is critical and important for the brain, and that may build emotional resilience. So they have my attention, and I'm listening to them.

Fred Lawrence: When you talk about developing the brain, and I do want to talk about behaviorceuticals a little bit here, you're actually talking about physiological changes in the brain, aren't you?

Kelly Lambert: Right. I mean that lecture that Dr. Janice Teal delivered at Samford University was about this: enriched environments, the brain changed. So if the brain changes, that's neuroplasticity. And I always tell my students, if you're alive, your brain's changing. It changes from the womb to the tomb; it never stops changing. If it did, then we couldn't adapt to anything that happened, changed in the world around us.

Fred Lawrence: So I can see why, as a species, we'd be selected to have the attribute, if I can call it that, of neuroplasticity, but how about the meta question, can I improve my neuroplasticity? Now, you gave a TED Talk in Bermuda, of all places, on improving our neuroplasticity. So that sounds not just like it's a selected-for trait, that sounds like there are actual things we can do that improve our neuroplasticity. How does that work?

Kelly Lambert: Yes. That's what's so exciting about it and about this endeavor, and is at the heart of this term, behaviorceuticals. The more we understand about our brain, and when it's healthy, and learning and neuroplasticity is where it should be, maybe there are some evolutionary or bio or brain hacks that we can engage in. For example, learning about the environment itself is going to increase novelty, increase neuroplasticity, and connections. So we don't have to have new neurons, our existing neurons, and we have... I don't know how many I have, Fred, but we're supposed to have about 86 billion. I question that. And that's a lot, and then trillions of connections. So we may not want to reinvent; it takes a lot of energy to create a new neuron, but new connections, new pathways, new circuits. So nurturing that curiosity, learning new things, learning about how stress, chronic stress responses may suppress neuroplasticity, and in many ways, it does, so learning about coping more effectively.

We're looking at this positive anticipation and things like hope, which is an interesting term; does that activate some of these circuits?

So yes, I think the more we understand, and it goes back to my roots in psychology, a lot of it is basic learning, but what is underlying that learning process that will keep our brains strong. We have age-related diseases, such as Alzheimer's, we're not automatically going to fall into a lot of impairment. But there's a little bit of impairment that goes on with aging, and we want to create a buffer, a reserve, a neurophysiological reserve, a cognitive reserve, an experiential reserve, that may protect us going forward. So we think of medicine in our culture as pills and surgery, and that is one way of intervening, but this is a kind of meta-therapeutic approach, where we are driving the intervention itself. So it's complex, but I think it's certainly worth pursuing, and may have fewer side effects and be cheaper, and things like that.

Fred Lawrence: Well, let me ask you about one of your mainstream projects, the book *Well-Grounded: The Neurobiology of Rational Decisions*. So what do you mean by a well-grounded brain, and what are some of the strategies you've found that focus on protecting and enhancing the brain's ability to navigate decisions and navigate uncertainties?

Kelly Lambert: Yes. So I think it's becoming more relevant now. A brain, we could argue, not argue, but could have a conversation about what a brain does, what the function of a brain is. At one level, it's keeping us alive, so the basic parts of keeping us breathing and our glandular secretions and light/dark cycles, sleep/wake, and such. But then, we've got, especially humans, all of these accessories in our cortex. We have more cells in our cortex, this outer covering of our brain, than any other animal on the planet, even those with larger brains, such as an elephant or a dolphin.

And so, what I argue or think about with well-grounded is the importance of this brain in filtering information about our environment, about our experiences, so we can make informed decisions as they come up. And from one perspective, our brain is just helping us make the next decision. It may be as mundane as what type of ice cream to order or coffee, to do I marry this person, or is this the career I want? But the degree of how informed these decisions are is based on how well our brain is filtering and processing this information, so we need to be grounded.

If you're doing something that isn't acceptable, so if we're growing up, I use the analogy of brain bubbles. So if we're in a bubble, where everyone loves us, and they tell us how smart we are, how beautiful we are, we can't make any mistakes, that brain is on life support. It's not going to be able to survive once it gets out of that bubble, because it's lost its ability to gauge the environment and to make these decisions. So we need real, authentic experiences and information for our brain to be able to do what it evolved to do, so we need to try to keep those experiences authentic.

Fred Lawrence: Your most recent book, *Wild Brains: Translating Adaptive Mental Health Strategies From the Bush to the Bedside*. Wow, having come up with a title, how could you not write the rest of the book?

Kelly Lambert: I know. I had to start with a fun title; it keeps me going.

Fred Lawrence: Well, absolutely. I always come up with my titles at the very end, but I like starting with the title and finding your way into the book. So tell us what that's going to take us through and what that's going to teach us.

Kelly Lambert: Going back to my animal days, when I was that little girl bringing back lizards and bird eggs and such to my pillow and bedroom, I realized that the habitat, the environment, was incredibly important for brains. And all of our sophisticated neuroscience research, most of it's done with rodent models, rats, and now increasingly mice, more than rats, and that's been great for consistency, for practical reasons. We can order everything, cages, food, related to these animals. They're selectively bred to be easy to handle, so they're not going to bite you. So it keeps us in this research world. But I think that maybe those brains are distorted. We've learned a lot from laboratory research. I do it, I'm pointing the finger at myself. But we need to look at animals in more natural habitats, we need to look at other animals.

I've been crazy about raccoons because they have that curiosity we were talking about; their brains look like primate brains. And I've published a study using their brains, but I didn't put them down that USDA was doing research with them, so I was able to look at their brains as well. But I'm feeling my way around in the dark. There are no tools for looking at a raccoon brain, but I have all the tools for rats and mice. So what can we learn about other brains out there, from mostly mammals, but insects, octopus, and vertebrates, that can teach us about our own brains and what brains can do, change, and age? There's a naked mole rat that lives 38 years. What secrets does it have, compared to my lab rats that live two years on a good day?

So there are so many unique abilities and characteristics of animals out there, we've just limited our scope and our view, and I think that we should expand it, and I think that we should redefine the way that we're doing some of this research, which is hard to do because we have habits. But at this stage of my career, I want to be uncomfortable and suggest other ways of doing things. So it's a celebration of the diversity of animal brains out there and what we can learn from them.

Fred Lawrence: And your own neuroplasticity, apparently, new patterns, new grooves that you're developing-

Kelly Lambert: Yes, and it's hard, it's hard.

Fred Lawrence: ... in your own line of thinking. One of the things we do on Key Conversations is help our listeners build their book lists and their bookshelves. So I wonder if you could give

us a couple of recommendations, both for people for whom this is interesting, but somewhat new, and for people with some background in neurobiology who would want to take their level of knowledge to a new level?

Kelly Lambert: Yes. My favorite neuroscientist, so anything he has written is great, Robert Sapolsky. And I think any of these books that I would mention, anyone can read. He is a great storyteller. So his book, *Why Zebras Don't Get Ulcers* or *A Primate's Memoir,* are two favorites with my students, so I'd recommend any of them. Thinking about translational neuroscience and the importance of public policy, a book by a professor, Thomas Pearson, and it's entitled *An Ordinary Future: Margaret Mead, the Problem of Disability, and A Child Born Different*, and he talks about both his professional experiences as a sociologist and how society responds to individuals who are born different, and then his daughter, who was born with Down syndrome, and it's a beautiful story reminding us about how impactful policy can be. But this, I think, is about respecting and letting these individuals, providing an engaging, enriched environment, and it's just so wonderful.

And then, this summer, I was just really blown away, being a little bit different, a different read, Alexei Navalny's book, *Patriot*. It even mentions, one day, I hope neuroscience will help us understand connections and relationships that were important in his journey, and it's just quite a compelling life journey. Brains are all about humans and their different life experiences, and I learned so much from reading about those experiences. So those are a few that I've been thinking about.

Fred Lawrence: Those are great additions. Thank you. Thank you for those. Thank you for what you did as a Visiting Scholar for Phi Beta Kappa. I know your lectures at colleges, universities all over the country were extremely well-received, and not surprisingly so. It's not just your knowledge base, but your enthusiasm for the field and your willingness to ask questions that are new and that keep challenging you. They're interesting questions, but the inspiration of just being willing to push yourself that way. Thanks for what you continue to do as a researcher, as a scholar, as a public intellectual, and thank you for joining me today on *Key Conversations with Phi Beta Kappa*.

Kelly Lambert: Thanks, Fred.

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