Dr. Slusser: Hello, my name is Dr. Wendy. And here, at the Semel Healthy Campus Center at UCLA, we're on a mission to change the culture of health and make the healthy choice the easy choice. Starting in our own backyard, we're implementing evidence-based changes right here on campus. Welcome to our center's podcast, Live Well. Join us as we interview leading experts and discover new perspectives on health and well being. Each episode, we will bring to you scientists and world class operators who will share with you the never before broadcasted tips to live a more healthful and wholesome life. For yourself, community, and ultimately, our planet.

Dr. Slusser: What are the origins of hearing, or what is the evolutionary benefit of music? And why do we get chills when we listen to certain songs? Today, we will talk to UCLA neuropsychologist expert Dr. Bob Bilder about the neuroscience behind music, and its benefit for our health and wellness. Bob is the Chief of Neuropsychology at UCLA's Semel Institute for Neuroscience and Human Behavior, and Director of the Tennenbaum Center for the Biology of Creativity. Do we have your interest now? You might even be interested in his research, which is focused on the links between brain and behavior, using tools spanning genetics, neuroimaging, cognitive, and other assessments of human behavior. I think my brain just did a little gymnastics.

Dr. Slusser: Bob has been studying the brain basis of creativity across species, and identifying brain and behavioral traits associated with exceptional or big C creativity in humans, which we will discuss today. He's particularly interested in studying dimensions of brain function to help eliminate artificial boundaries between mental illness, between health and disease, and between the brain mechanisms involved in exceptional and everyday creativity. He also directs the MindWell Pod within the Health Campus Initiative Center at UCLA, to concentrate on how we can support resilience, well being, and creative achievement at UCLA and beyond. Please join us in today's conversation. Dr. Bilder will discuss the relationships between music and the brain. What is happening in our brain when we listen to music? Can music help with addiction? What are the differences in our brains between highly creative individuals, proteges, and the regular person? And what does Herbie Hancock have to do with all this?

Dr. Slusser: Thank you so much for being here, Bob. I mean, I'm so excited to hear your answers for these questions I've been putting together with the UCLA students, staff, and faculty. And this is our UCLA Semel Healthy Campus Initiative podcast series, and we're focusing on healthy mind and healthy body. And who's better to talk about that but you, Dr. Bob Bilder? You're a neuroscientist, you're a musician, you research creativity, and I think Herbie Hancock's going to be entering into this conversation as well.

Dr. Bilder: If Herbie's doing anything, you've got to listen to it.

Dr. Slusser: Yeah.

Dr. Bilder: If he's involved, it's going to be good.

Dr. Slusser: Right on. Well, let's get to Herbie, then, right away. He was a guest lecturer at this presentation at the music school here at UCLA, and the professor fainted, or nearly fainted on stage. And I was called into action with, had to put my physician hat on and I rushed up and took care of him. And as the ambulance left, Herbie and I had a conversation and he learned a little bit about the Healthy Campus Initiative. And so a little while later, he approached me and asked me if I knew anybody that could speak to the neuroscience of music and its relationship to health and well being, as well. And so of course you came immediately to my mind. And the reason I didn't realize was even more apparent once you explained to me that not only do you study creativity in your day job, you also, in your weekends, you have a dad band. Tell me what a dad band is. It's the first time I've heard that phrase coined.

Dr. Bilder: Yeah. So there are a bunch of guys, we got together, we're all dads at the UCLA Lab School. We were lucky enough to have our kids go to the UCLA Lab School, which is a fantastic place. And sitting around at some school event, we started talking about music. And we realized that at least three of us all shared an interest in one particular kind of music, which was music from pretty much the '70s and has been referred to as progressive jazz, or sophisto-funk. And among the artists that each one of us had followed, Herbie Hancock was the main main. Some of his albums from that period, including the Headhunters album and Thrust, I mean, this was our standard go-to stuff.

Dr. Bilder: So we, as dads, got together and tried to play some of these songs, which were way over our head. Another friend of mine who used to be a drummer in our band in high school, I sent him our playlist, and he said, "No sane musician would attempt to play that playlist." And so, we're not sane musicians, we're just dads. So it's fine, we have a good time doing it.

Dr. Slusser: That's why you keep the title dad's band.

Dr. Bilder: That's right.

Dr. Slusser: Just to bring everyone down to reality.

Dr. Bilder: That's right. But Herbie, if you ever hear this, we need a keyboard player.

Dr. Slusser: First of all, you must have cleared the decks from your schedule, because it's so packed.

Dr. Bilder: Well, I'm so excited. How many times has somebody called me up and said, "Can you come and give a lecture to Herbie Hancock's class?" This is crazy.

Dr. Slusser: And not only was it for Herbie, it was for his elite musicians who were recruited from all over the world, studying the Monk Jazz Program in jazz, right? It's only one of two in the whole country.

Dr. Bilder: It's really an amazing thing, to try to talk to that group about music was also very intimidating. And you mentioned another professor who was giving a lecture fainted. Well, I think I was probably close to fainting a couple times, because, oh my God. To talk about music to these musicians is very difficult. And my familiarity with it is only in passing, in trying to understand how the brain could produce music, come to enjoy music, and all that kind of good stuff.

Dr. Slusser: Could you tell the listeners what you taught me, which was so sort of revealing about the neuroscience of music and the origins of music in the brain? The relationship to that?

Dr. Bilder: Well, one of the really fascinating things that I learned in trying to understand the neuroscience of music is how hearing came to be in the first place. If you think back through evolutionary time and back to single-celled organisms, well, they don't have any ears, obviously. But those, even those simplest of animals, ones that really had just one cell and maybe a tail that could help them wiggle and move in the water to where the light was so they could get more food and nutrition, even those animals had some sort of sensory function so they would sense what's on the outside of the cell, and it would help to drive their little tail.

Dr. Slusser: They could sense vibration? Or ...

Dr. Bilder: Well, they were more sensitive to light, and chemical environments.

Dr. Slusser: Oh.

Dr. Bilder: But over time, and as we developed into multi-cellular organisms, then sensitivity to vibrations became important. Now, first, that was just embedded in the body of the animal. And right now, all of us can experience sound, if you take a tuning fork.

Dr. Slusser: Right.

Dr. Bilder: And hit it, and then put it against your skin, you can feel the vibrations.

Dr. Slusser: That's right. Well, that's what doctors do. We learn to do that on your head, to see if you can sense the vibration on either side. Yeah.

Dr. Bilder: That's right. I guess you guys call that bone conduction.

Dr. Slusser: Exactly.

Dr. Bilder: Versus conduction through the air.

Dr. Slusser: Yeah.

Dr. Bilder: But then over time what happened is, animals began to develop these very sensitive membranes in parts of their skin surface or their body surface that were much more sensitive to vibrations that are conducted through the air. These sound vibrations. And then those ultimately evolved from being just little thin membranes on the, usually the sides of the head, into real ears that help to amplify the volume and then, in humans, there's a special apparatus that helps to segregate the high frequency sounds from the low frequency sounds. And a lot of brain has been dedicated to unpacking the auditory signals and the vibrations that come into our ears. And interpreting that in the brain, and classifying different vibrations as different notes, different frequencies. Picking words out and identifying meaning, all these functions the brain has evolved to enable us to process.

Dr. Bilder: Then there are some other really interesting things that have to do with the possible impact of music and other rhythmic sounds on group cohesion. And social functioning. So, really fascinating theories have evolved that are very hard to test, because we can't go back in history. But it's been hypothesized that there might be something about having shared rhythms that enabled people in early times in human evolution to work together to hunt, synchronizing their steps in ways that didn't alert other animals in the environment that they were coming. So they could successfully hunt.

Dr. Slusser: They were quieter.

Dr. Bilder: They were quieter, and coordinated. And there may be other aspects of shared experience that helped to bond social units. So one of the things about humans, and certain other species, is that they tend to hang together in social structures.

Dr. Slusser: And that's what you're describing as the evolutionary basis of music, is that it was a connector.

Dr. Bilder: That's right. That's one of the ideas, is that it helped us to share experiences and bond together. Because when you are listening to music, you are sharing a common experience.

Dr. Slusser: Yeah.

Dr. Bilder: And are brought together by the rhythmic and melodic structures.

Dr. Slusser: Yeah. So you, I know in that talk you gave, you talked about the four Fs in the limbic system.

Dr. Bilder: Right.

Dr. Slusser: And, can you elaborate on that?

Dr. Bilder: Sure. It comes right back to what we were talking about in terms of evolutionary significance. As the brain evolved from its most primitive levels up to the fancy brain that we have now as humans, but this limbic system has been described as mediating and supporting the four Fs functioning humans. Which we can identify as feeding, fighting, fleeing, and reproductive behavior. So, those are the Fs that we need to identify.

Dr. Slusser: That gets a big laugh, usually, when I see you speaking to the students, undergrads.

Dr. Bilder: That's one way people remember this stuff, right?

Dr. Slusser: I know. Actually, I remember the four Fs more than anything else about the brain.

Dr. Bilder: Well, there you go. There you go. It's clear how each one of those directly relates to our ability to survive as a species. If you're missing any one of those, then you're likely not going to survive as well as the other animals.

Dr. Slusser: I remember you, this limbic system and the four Fs, getting back to sort of the more primitive area, was also an area that lights up with music. Are there other sort of feedback loops that go on that are in that primitive area?

Dr. Bilder: Yes. I think that first we want to recognize that when we experience music, it's hitting all parts of our brain. Some aspects of musical expression could only be interpreted by the highest levels of our brain, where they carry certain nuanced meanings. In the same way that language communicates certain meanings, music can also carry certain meanings. And indeed, some of the regions of the brain that are language processing zones also can be engaged by music, and some music, of course, is very representational or has very sophisticated layers of meaning that go beyond its emotional impact. But, all that being said, I think that one of the things that we love about music is that it does hit, also, these more core and limbic brain functions. And it connects, in some ways, more directly with some of these emotional centers. And I think that's a fascinating aspect of music appreciation. I mean, a great example is the experience of chills.

Dr. Slusser: Right.

Dr. Bilder: When we're hearing certain musical expression. And it seems like that kind of experience, which has been referred to by some people as a skin orgasm, but seems to be found when there's a certain surprisal to the music following a period of expectation. So I think that if you can think to those elements of music that may have given you chills, often it's the result of you following the thread of the music through some kind of expectancy, and then, suddenly, the expectation is either satisfied or there's a complete surprise. Just an example would be a

chord progression that deviates from what you expect but then it resolves to a harmony or a melodic element that you already had implanted in your expectations. And it's this kind of a resolution seems to result in this big shift in this experience of chills.

Dr. Slusser: And that's considered to be more in the primitive brain, probably, that response?

Dr. Bilder: Yes. Yeah. So I mean, while a lot of the setup for that and how you expect things comes from higher brain centers, the bottom line of many of these kinds of experiences probably extend from our reward system, which is baked in at a pretty primitive level in our brain, in the brain stem and limbic levels. So when we experience something that's better than what we expected, we get a positive surge of dopamine in the nucleus accumbens. And then if something is not as good as what we expected, then there's actually a decrease in that same signal. So this has been referred to as prediction error.

Dr. Bilder: Ourselves, our brains, are constantly predicting. What is going to happen next? We have expectations all the time. So if what actually happens is better than what we expected, then we get this positive prediction error. This surge of dopamine in the nucleus accumbens. And then through a whole bunch of other connections, that increases the likelihood that you're going to do again whatever it was you were doing when you had that surge. In contrast, let's imagine that you're expecting something good to happen, and nothing good happens, or something bad happens. Then, the brain stem is going to quiet down, not send any dopamine up to the accumbens. And then you're going to become less likely to repeat the same actions that led to that problem.

Dr. Bilder: So this is how learning actually takes place. How we develop habits, is usually by having ...

Dr. Slusser: Through that process.

Dr. Bilder: Some reinforcement.

Dr. Slusser: Right.

Dr. Bilder: Through reward.

Dr. Slusser: That leads me to this question. The four Fs, we don't have to be really aspiring to meet any of those to any major extent these days. At least in our current setting. Would it be too much of a reach to say that we could make a list of what you're describing as the positive reinforcement, like music would be one, I would imagine? And could there be other things that you could say, "Okay, if I'm conscious of these habits that do give me that positive feeling, that are positive for my life," that you could then enhance that and then look at the areas that are negative and sort of remove those? Is that a methodology that people can utilize, based on your neuroscience description of the brain and its functioning?

Dr. Bilder: I think it is. I think that's one of the real bases of modern psychotherapy, is to do pretty much exactly this. To help people identify, what are the things that are important and valuable to them, and then helping them align their actions with those high level values and goals. And in that way, if people can begin to select their actions based on what is valuable to them, then they're going to find that, oh, it's going to be more satisfying, because it's actually connected to the things that are very valuable.

Dr. Slusser: And very physical.

Dr. Bilder: And potentially very physical. That can help to overcome distractions, or overcome bad habits. Things that we don't want to do that might be suggested to us, like eating that extra bowl of ice cream.

Dr. Slusser: So it could act as a deterrent for that, because you could replace that extra bowl of ice cream, if you're bored or something, with listening to music. Is that where you're suggesting?

Dr. Bilder: Exactly, yeah. And in fact that replacement is a critical thing. Punishment doesn't work.

Dr. Slusser: Right.

Dr. Bilder: Punishment only leads to the delay in the behavior occurring again.

Dr. Slusser: Or feeling like you're deprived.

Dr. Bilder: That's right. I think the one thing that is important that just struck me while we were talking is that we don't want to ignore our limbic systems. We could use our frontal lobes, the highest levels of development in the neocortex, to try to dampen and shut down that limbic system. But I think that would lead to all kinds of problems. So I think what we want to do is have a good balance, and have our ...

Dr. Slusser: Wait. What's the problem, if you ignore your limbic system?

Dr. Bilder: Oh. Because then it will express itself in one way or another. It will end up controlling the rest of the body in unusual ways, or it'll bleed out into the other parts of the brain and mess up the higher level functions. So I think that in any ...

Dr. Slusser: So you mean that if you don't satisfy the fighting, fleeing, feeding, and reproduction.

Dr. Bilder: That's right. That's right. The dynamic balance has to be maintained, so that the limbic system is still functioning.

Dr. Slusser: Or music. Music is also ... yeah. What else lights up there?

Dr. Bilder: If various forms of expression can connect to the limbic system and enable it to be expressed. If the experiences of lust are converted into and expressed through love ...

Dr. Slusser: Of love, right.

Dr. Bilder: Then that may provide a good avenue for expression.

Dr. Slusser: Right.

Dr. Bilder: But if there aren't love options and lust is repressed, then it could lead to explosions of lusty behavior in inappropriate contexts.

Dr. Slusser: Yeah. Which you see sometimes, when people are completely deprived of anything, right?

Dr. Bilder: That's right. That's right.

Dr. Slusser: Yeah.

Dr. Bilder: So I just worry if someone is-

Dr. Slusser: Well, feeding, you have to feed.

Dr. Bilder: That's right, and you have to feed. But some people control their feeding too much.

Dr. Slusser: Right.

Dr. Bilder: You're familiar, one of the deadliest diseases is anorexia nervosa.

Dr. Slusser: That's right.

Dr. Bilder: That leads some people to over control those limbic centers.

Dr. Slusser: Right.

Dr. Bilder: In ways that are dangerous.

Dr. Slusser: Well, fighting and fleeing. How can you satisfy those?

Dr. Bilder: Yeah. Play. That's an interesting thing, that some people would suggest that play is something that has evolved in connection to fighting and fleeing. You ever see dogs play?

Dr. Slusser: Oh sure, yeah. Sometimes it scares me.

Dr. Bilder: Yeah.

Dr. Slusser: But you're right, it's not really fighting. It's playing.

Dr. Bilder: It's mock fighting.

Dr. Slusser: But it looks like it, yeah.

Dr. Bilder: And a lot of chasing.

Dr. Slusser: Yeah.

Dr. Bilder: And, who's chasing whom?

Dr. Slusser: So tag's a great ...

Dr. Bilder: Perfect example, that's right. Yeah. So I think that is a neat re-expression and highlights the value of play, because yeah, we don't have opportunities to fight and flee in exactly the ways we used to.

Dr. Slusser: What else lights up there, besides the four Fs, in the music?

Dr. Bilder: Whole lots of other centers in the brain that are specialized for what we call semantic processing, or extracting meanings out of these elements. So language is the perfect example. Language is a kind of music that involves sequentially organized in time changes in the frequency of sound. Now, our brains, human brains, have developed an incredible lot of brain territory dedicated to this processing of language so that we can detect the differences between very, very subtle sound differences. So, for example, if I say the words bin and pin, did that sound like the same word, repeated twice, or two different words?

Dr. Slusser: Two different words.

Dr. Bilder: Okay. Now, it's possible to distinguish those because you can tell the difference in what's really occurring just in the first 50 milliseconds of that utterance, buh versus puh. And the only difference is buh has a gentle closing of the lips, where puh has a plosive or a rapid separation of the lips with the sound, and letting the air escape in that way. But this is a very subtle difference, yet you can resolve it with 100% accuracy. And so that's a real tribute to how much the part of the brain, usually in the left temporal lobe, gets overdeveloped. And sometimes the territory there can be seven times larger than the comparable brain region on the right hemisphere. Dedicated to this processing of sounds for speech.

Dr. Bilder: Now, in music, we also extract meaning from the sequentially organized in time fluctuations in the frequencies of the sound. But, it follows different rules. So we

actually can see that as people get more training in music, they transfer some of the processing capacities from the right hemisphere to the left hemisphere as they learn rules that are associated with musical processing. So if you have novices attend to certain musical tasks, they will show this right hemisphere preference. And it will be more widespread in its brain activations. Whereas a skilled musician will analyze it immediately and classify it in those left hemisphere modules, [crosstalk] more like language.

Dr. Slusser: Which is so cool about the brain, isn't it? That we now are knowing that it's so elastic and you can do these connections. Even at a late age, by learning new languages, right? And different sports.

Dr. Bilder: And playing instruments, is something that's supposed to be good for your brain as well.

Dr. Slusser: And playing instruments. Yeah. Picking up a new instrument, or learning a new song on an instrument. And that really touches on what we were talking about earlier, about how the brain is much more complex than this description of all the different sort of anatomic areas that we've been spending a lot of time on, that there's a lot of connectivity between back and forth, up and down, sideways. And you talked about language, and I remember in the talk that you gave with Herbie, that music came before language. Can you elaborate on that?

Dr. Bilder: Yeah. So I think that there's not really enough information about exactly what the timeframes were for developing language and music. But it looks like there were certain shared rhythmic patterns that occurred in social groups before language even developed. Now, whether, is that really music? Certainly it's not like Watermelon Man. But it gives us a broad definition of music in that way.

Dr. Slusser: Right.

Dr. Bilder: But yeah, probably those shared soundscapes were important to humans even before formal language was developed. And, we can also identify that those are simpler than some aspects of language. However, there probably is other aspects of language that were developed very early. If I say, "Ah!" Then you know that I'm in distress, right?

Dr. Slusser: Yes. Even, no matter what word you say. Yeah.

Dr. Bilder: That's right. And other species are capable of these kinds of vocalizations. Another interesting vocalization that probably is also very primitive is the infant cry. And then there's a key part of the limbic system that's known as the cingulate gyrus that is particularly sensitive to these infant separation cries. And it's particularly well-developed in mothers.

Dr. Slusser: Oh yeah.

Dr. Bilder: And if that territory is damaged, then mothers will stop showing a sensitivity to infant cries and neglect their offspring. And that, of course, has bad evolutionary consequences.

Dr. Slusser: Outcomes. Oh yeah.

Dr. Bilder: But we see variations on that all the time.

Dr. Slusser: Yeah. In mostly developing countries, but now developed countries, a form of what's called kangaroo care. Where it was developed in Colombia, the country, where they didn't have enough incubators for preemies and newborns that needed to be in incubators. So they would put them skin to skin to the moms and wrap them around. And the moms would act like incubators. They would, if the child's temperature dropped, their temperature would rise and maintain the temperature of these preemies. Except for drug addicts. They didn't have that kind of communication, emotional communication, to be able to incubate their babies. So it might be explained through some of the potential damage or interruptions of this limbic system. It's possible. Anyway, they found that that was a key difference between mothers who were more in tune with their babies and mothers who were disconnected, mostly because of habits that were addicting. Bad habits.

Dr. Bilder: Yeah.

Dr. Slusser: Yeah. And I think that I want to get back one more time to this question, because I feel that these negative behaviors that are routinely cited as ways to feed the reward system, right? Like drugs, nicotine, but also gaming, the smartphone is now looking to be quite addicting, gambling. What do you think can be beneficial to make ... I mean, what other things besides music or other things that you might observe yourself that help feel positive for your reward system? What do you know that lights up in the limbic system that would be something to give people ideas about that they could try?

Dr. Bilder: Right, right. Well, so I think that when we see all of these kinds of problems emerging, it usually comes from some root cause. And some of the root causes that we know are relevant are anxiety, and lack of social connection and support. And that those two features can be worked on, usually in psychotherapy. And also through other positive psychology activities. And just focusing on relationship building and building the other tools that support resilience. So I think that's something that, as part of our work in the Healthy Campus Initiative, we've been trying to work on identifying first how to make sure that people don't feel a stigma associated with problems like anxiety that can lead to seeking out other ways to get reinforced, like drugs or alcohol. Alcohol was the first drug ever identified, and it does a great job of going and dampening certain aspects of this anxiety system in the brain.

Dr. Slusser: Which is where? Where is that anxiety system?

Dr. Bilder: Yeah. So, interestingly, there's, this is great additional cocktail party lingo, what's called the septohippocampal system. There's sort of a loop that's part of the limbic system that goes from the septal nuclei and projects to the human hippocampus. And in that hippocampus really seems to be some of the key brain systems that help to stop ongoing behavior in sort of freezing reaction, and help us be alert to things in the environment that might be threatening. So the cause of anxiety is often felt to be an increased sensitivity of that system, so that it may fire under relatively not threatening circumstances, and maybe hyper-tune. And thus we end up feeling threatened even when we're not really being threatened. And engage that circuitry.

Dr. Bilder: Now if you then experience that, it's experienced as being quite unpleasant, as anybody who's ever been anxious, which is everyone, can recognize.

Dr. Slusser: And sometimes a little anxiety is a good thing, too.

Dr. Bilder: That's right. There is the whole, what's called the Yerkes Dodson Law. We're getting all kinds of great stuff to bring up at cocktail parties. Now the Yerkes Dodson Law, that's the law that is the inverted U curve, so that it defines, you could put anxiety there. There's a certain peak level of anxiety at which our performance is the best. But if you get more anxious than that, then your performance deteriorates. But if you're not anxious at all, if you're too laid back, then you're not going to perform your best either.

Dr. Slusser: Yeah.

Dr. Bilder: And an interesting thing is that the more you practice something, the higher you can push up that anxiety function and still be performing better. So that's why world class musicians, world class athletes, will often turn in their best performances under situations where they are performing in front of thousands or millions of people. Because they can push it to that level.

Dr. Slusser: Need that, almost. Yeah.

Dr. Bilder: Yeah. They can get there, and without a deterioration in performance. Others, like me, if I'm asked to play a bass solo, I fall apart immediately. The pressure is on.

Dr. Slusser: In front of your family.

Dr. Bilder: Oh my god, [inaudible 00:28:53], just the words. It makes me scared. So some of the people resort to alcohol or drugs in order to get out of that bad feeling. And so the question, how can we then treat that? More advanced forms of psychotherapy, we try to get at, what are the roots of that problem?

Dr. Slusser: Right.

Dr. Bilder: May go back to earlier trauma that one has experienced, et cetera. There are also behavioral ways to try to get past that, to desensitize people to the anxiety provoking stimuli.

Dr. Slusser: Right.

Dr. Bilder: And find other behaviors that aren't using alcohol or drugs that can be substituted.

Dr. Slusser: Like running, for me. I run every morning for that reason. Yeah.

Dr. Bilder: There you go. And you feel good?

Dr. Slusser: Oh yeah. It moderates my anxiety.

Dr. Bilder: It has a lot of other beneficial [crosstalk 00:29:35].

Dr. Slusser: Yeah. I get my best ideas when I run.

Dr. Bilder: Well there you go. It's good for your brain.

Dr. Slusser: That's right. That's what I hear. Am I right?

Dr. Bilder: Yep. It's, yeah. I mean, all the work we've been doing, trying to understand, what are the positive things you can do for your brain, among those positive things you can do for your brain, physical exercise is certainly one of the best.

Dr. Slusser: Even brisk walking, I'm assuming, right?

Dr. Bilder: Even brisk walking.

Dr. Slusser: I think that says a lot. You've explained getting to the root cause is critical, of what might cause you to lead you to poor behaviors. And then replacing it with healthier behaviors.

Dr. Bilder: One thing I didn't mention which just comes to mind is, when you're talking about the problematic use of mobile phones.

Dr. Slusser: Yes.

Dr. Bilder: Which is a project I'd love to work on here on our campus.

Dr. Slusser: Oh, me too. There's no question that we're going to see a social well-being, poor social well-being epidemic.

Dr. Bilder: This is also an evolutionary throwback, because before we developed all this frontal lobe, it was certainly wise to go for the bird in the hand.

Dr. Slusser: Right.

Dr. Bilder: In ancient times, if you let go of the bird in the hand, you're not going to get the bird in the bush. So immediate gratification is built into our brains. It's really baked in. It's only through having this extra cortex that we're able to delay gratification over longer periods of time and make more rational choices. When we do plot out these so called discounting functions to see how much is a reward now valued to a reward you could get at some later point in time, we discount the stuff that's further away in the future. So, from investments. Imagine I give you this alternative. I'll give you $100 now, or I'll give you $200 in six months. Which would you take?

Dr. Slusser: Well, I would take the $200.

Dr. Bilder: You see? Now, you've got a very strong frontal lobe.

Dr. Slusser: Well, and I don't need the $100 now. Right?

Dr. Bilder: That's right.

Dr. Slusser: You see, if I needed it, maybe I would take it.

Dr. Bilder: You see, now you've engaged in a very rational process that illustrates the power of your frontal lobe.

Dr. Slusser: Right.

Dr. Bilder: However, that exact example is just about at the average place where people think it's about the same. However, in reality, nobody has an option to double your money every six months.

Dr. Slusser: Six months. Yeah.

Dr. Bilder: But that's about the steepness of the typical human delay discounting curve. So we often make choices ... That's one of the reason cigarette smoking persisted for so long. Was you get the immediate reward. Most people knew that yeah, you've got a risk of cancer.

Dr. Slusser: Or emphysema.

Dr. Bilder: In 10 or 20 or 30 years.

Dr. Slusser: Yeah.

Dr. Bilder: But people didn't think about, well, that's in 10 or 20 or 30 years. And it's only a partial risk.

Dr. Slusser: Right.

Dr. Bilder: It's not a sure thing. So, in the face of those probabilities, people continued to do the thing that provided the immediate gratification. So it's a matter of connecting up the immediate actions with the longer term values and rewards that I think is the key to overcoming a lot of these problems.

Dr. Slusser: That's right. Or doing the opposite, where you can have the rewards in the primitive and the more cognitive areas. So using the, I keep going back to music. Playing music could satisfy everything.

Dr. Bilder: That's right, yeah. It can light up the whole system.

Dr. Slusser: Yeah.

Dr. Bilder: That's right. From brain stem up to neocortex.

Dr. Slusser: Exactly. And so just getting back to your time here, you've been here at the UCLA Semel Institute for 16 years. But before that, you've had a distinguished career in researching mental illness at Columbia, Albert Einstein, Hillside Hospital, and Nathan Kline Institute. Now, how did these previous roles prepare you for your role at Semel Institute, the leader of MindWell Pod and researcher of creative minds?

Dr. Bilder: Well, I've been super, super lucky in that those earlier experiences, I was able to do a lot of different things. I mean, I'm trained as a neuropsychologist. So typically neuropsychologists get into how to measure behavior to understand how the brain is functioning. But then in our research, back to the time of my dissertation, I started getting into neuro imaging. So at that time, we didn't have MRIs. We had CAT scans. I used to trace the size of different brain bits on the scans directly.

Dr. Slusser: Oh my goodness.

Dr. Bilder: Which is really difficult.

Dr. Slusser: Yeah.

Dr. Bilder: Because the little measuring thing would skip.

Dr. Slusser: Oh my gosh.

Dr. Bilder: Yeah, it was not fun. Had to do it again and again and again. Now, you've got computers that can do all that for you automatically, pretty much.

Dr. Slusser: Yeah. Yeah.

Dr. Bilder: So I learned to do brain imaging. Brain imaging, brain structure. And then, imaging of brain function, subsequently, when functional MRI came along I was able to get involved in doing that. I was lucky enough to be involved in a center where we did also what we call neurophysiology, basically gathering brain waves and studying the electrical activity of the brain. So that's another discipline called neurophysiology. And then I was able to start looking at genetics, as well. Because over the last 20 years we've developed these tools that let us look at the human genome in amazing ways.

Dr. Bilder: When we started, we sort of picked off certain candidate genetic markers that we thought would be useful, and then we realized, well, gee, that's not as informative as looking at all three billion base pairs. But that was prohibitively expensive. But now, we can do that. It probably will be done soon in every human, whole genome sequencing, as it's called. And it is going to happen that we're going to be able to connect the genetic risks all the way up through the proteins and the cells and the functioning of the brain to the expression of human behavior, and see how everything is connected together. One of our NIMH directors referred to it, the genetics, as providing the edge pieces to the puzzle of the human mind. So it's become sort of scientifically tractable problem to figure out how all of this biology works to produce this incredibly complex human experience.

Dr. Slusser: Yeah.

Dr. Bilder: So I've been lucky to be involved in a lot of different aspects of that. So I probably don't know anything in much depth, but a lot of breadth.

Dr. Slusser: Yeah.

Dr. Bilder: I've had the opportunity to do. And then after coming to UCLA, I've increasingly been thinking, "Well, what could I do that would be really good for people?" I had been studying schizophrenia for a long time, and I had a very sobering experience once giving a talk to a group of people, families of people with schizophrenia. And a person says, "Of all the things you've done, Dr. Bilder, you've published hundreds of papers and given hundreds of talks, what do you think has been of greatest benefit to people who have schizophrenia?" And as I searched the things I've done, I really thought, you know, not much. Most of the work that I had done was really related to more basic scientific issues, which may have a payoff in the very long term. But didn't have as much immediate impact. And so I really started thinking, well, what would be, just as we've been talking about, how to line up your high level values with your immediate actions.

Dr. Slusser: Yes.

Dr. Bilder: What could I do that would actually help people now? And that's where it was so great to have Jane Semel as the key benefactor of our institute for neuroscience and human behavior. And as you know, she changed the title of it from the Neuropsychiatric Institute to the Institute for Neuroscience and Human Behavior, specifically to help bridge the gap between those people who are identified as having mental illnesses and the rest of us. Which, I don't identify as being different from the people that have mental illness.

Dr. Slusser: That's right.

Dr. Bilder: So I've always been interesting in seeing, how can we overcome the stigma that's associated with mental illness?

Dr. Slusser: Yeah.

Dr. Bilder: How can we identify those things where we are all the same, we really share these dimensions of wellbeing and not wellbeing.

Dr. Slusser: Right. I mean, you've always told me it's just sort of a spectrum, or it's, you can move around it in terms of the definitions of wellbeing and emotional health, and challenges or whatever.

Dr. Bilder: Exactly.

Dr. Slusser: When you do your studies on creativity, I know people also do studies on creativity with people with schizophrenia, right? I would love to know, what have you found in terms of, who are these creative people, and what have you learned that distinguishes people that are creative? This is sort of the positive side of emotional wellbeing, because a lot of people who are considered diagnosed with mental illness are actually among the most creative.

Dr. Bilder: It's certainly true. But I think that there's a popular misconception that that's a good thing about mental illness.

Dr. Slusser: Right.

Dr. Bilder: And I think that what most of the research is pointing to now is that, yes, there are certain things about pushing oneself to the edge of certain dimensions that help creativity. But we developed an idea which we referred to as the edge of chaos. It's actually a model that comes from systems theory, and it can be used to talk about the origins of life, economic systems, and all kinds of complex systems. But what we think is probably the case in humans, for creativity, is that there's a certain envelope that you can push to the novel. If you go too far, it's not going to connect to the rest of the world, and it's not going to be perceived as being creative. So there's novelty up to a point.

Dr. Slusser: Right.

Dr. Bilder: Before it starts just being considered weird by everybody else.

Dr. Slusser: And what does-

Dr. Bilder: And that's what we call the edge of chaos.

Dr. Slusser: What defines weird?

Dr. Bilder: Yeah. It's defined by the community, unfortunately. So that means that something that is considered weird today might be considered perfectly normal tomorrow.

Dr. Slusser: Right.

Dr. Bilder: Yet, that is important for the survival of those ideas. They have to somehow make it past the current domain, the current culture, in order to be preserved. So, like Herbie Hancock was playing some pretty crazy stuff back in his hard bop era, into the funk era. But it really, more than much other jazz music, it really connected to people in a way that was unique. And so I think that's why some songs really stuck. It was new, totally new, different from what went before. But connected in certain ways to people that ended up preserving it. I think the same is true in the creative arts. We've been finding that, again, here, how lucky is this? We received support to study what we call big C, or exceptionally creative visual artists, exceptionally creative scientists, and then exceptionally creative musicians. And one of the things we've found is that in each of those groups, not so much the scientists, since they're a bunch of academics. Which tends to prune out certain problems that people have.

Dr. Slusser: Bummer.

Dr. Bilder: But, I know, I know. We need to support more of that. But it's interesting that when we look at measures of what we call psychopathology, things that have been referred to as schizotypy, which basically means entertaining really unusual ideas. Well, it's not that big of a surprise to know that the visual artists and the musicians actually were high on some of those scales. They weren't up in the range of people with diagnosable mental illnesses, but they were higher than the typical person is. So they were more likely to entertain unusual ideas.

Dr. Slusser: And what's unusual? What are unusual ideas?

Dr. Bilder: Oh, that other people can read your mind. Or that you could put your thoughts into somebody else's mind. That other things that are going on in the world are actually about you, or they have special meaning. So, you ask a scientist these questions, they go, "Nah," they say, "That's not really true." But you ask a visual artist, ask our friend Cathy Opie here at UCLA, a great photographer, or Doug Aitkin, another amazing artist here in LA, "Oh yeah, maybe. Yeah." They're very

open minded. And when we look at personality characteristics, that's one thing we find. That openness to new experience is very high in people who have creative temperaments and are high in creative achievement. Also, there's another fun finding that we observed in a group of healthy people. That the ones who had more creative achievement tended to also differ on another personality characteristic known as agreeableness. Some people are more agreeable than others. The ones who had higher creative achievement were less agreeable. They're more disagreeable. And so we think that that's reflecting their tendency to challenge the status quo. Some people just don't accept things because somebody else said it's true. An agreeable person might say, "Oh, yeah, fine." But the disagreeable person would go, "Well, I'm not so sure. What's the evidence that supports that?" And so I think that [inaudible] some meat in creative science and in other domains.

Dr. Slusser: That's a real juxtaposition. Open minded but not agreeable.

Dr. Bilder: That's right.

Dr. Slusser: It's interesting. But that sounds like something that people could adopt, if they were trying to build their creativity. They could work on being more open minded and also challenging, perhaps, the status quo.

Dr. Bilder: That's right. One of my favorite quotes about how to promote creative expression comes from Mihály Csíkszentmihályi, which I love to say, because I feel like I can pronounce it.

Dr. Slusser: You're so good at it. Yeah.

Dr. Bilder: It's the one thing I'm good at, is saying it. He lets people call him Mike.

Dr. Slusser: Oh, perfect. That's good for me.

Dr. Bilder: But he's the guy who has written literally the books about creativity that are some of the best in the world. And he also is the individual who brought to light the idea of flow, that state of effortless productivity and creativity that we all seek. One of the things he said, if you want to promote creative expression, he says, "You should surprise someone else every day." And he also said, "You should surprise yourself every day." And I think that this process of seeking surprise is one of the key activities that you could engage in to promote creative achievement.

Dr. Slusser: That's sort of like what you were describing with the music, if you got surprised by something at the end ...

Dr. Bilder: That's right.

Dr. Slusser: That was satisfying or exciting.

Dr. Bilder: That's right. That's right. And those people who love jazz, I think that whole process of being taken out very far from where you started and then suddenly having it come back to the head, or the key melodic line.

Dr. Slusser: Right.

Dr. Bilder: Or to have it all resolved. That is just an amazing thing.

Dr. Slusser: That makes you feel good. And also I remember you saying in your lecture about music that there's some relationship to health in terms of impacting people, for instance, in intensive care units or other settings. What do you attribute that to?

Dr. Bilder: That's right. I'm not sure. I mean, it's sad that there hasn't been more thorough scientific study of these kinds of processes. We know that there is a beneficial effect of music in medical settings. It's not known whether that's mediated pretty much all through relaxing effects, or whether there's more to it than that. There also could be more trivial explanations. So, for example, one of the key sources of problems in medical settings is the ICU environment, where there's lots of flashing lights and sounds. And ironically there you have people where they're there to rest, yet they're woken up every four hours in order to have vital signs.

Dr. Slusser: Right.

Dr. Bilder: How crazy is that?

Dr. Slusser: So crazy.

Dr. Bilder: Yeah. And rather than letting a person sleep and rest, which would probably have much greater ...

Dr. Slusser: Which will be another topic of our podcast.

Dr. Bilder: Oh, fantastic.

Dr. Slusser: We have to do sleep, yes.

Dr. Bilder: Oh, excellent, yeah. So the mechanisms through which the music helps peoples health remains unknown. Yet, one of the things that's interesting from a health perspective is true for music and probably true for other things as well, is the sense of being away. When people have looked at environmental factors that contribute to wellbeing, one of the things they've found is that the more you can help people feel that they're in a different place, that may be beneficial. That it inspires their sense of awe and provides a feeling of connection to something larger that may be beneficial. I think music can have that impact. People can be

immersed in it and be taken away from where they are right now. And have a real sense of being in a unique space.

Dr. Slusser: Getting back to creativity, then, is there anyone that inspires you that you could identify as someone that has been a creative force in your life?

Dr. Bilder: Yes. Well, I can't not mention Herbie Hancock.

Dr. Slusser: You're right.

Dr. Bilder: Every time I listen to those songs. I sort of focus on the bass lines, but then when I listen to what he does playing keyboard, it's just unbelievable how he ever came up with the ideas to play what he's playing, when he's playing it.

Dr. Slusser: Yeah.

Dr. Bilder: It's just, really, it gets me every time.

Dr. Slusser: That's why you wanted to study, you would like to image his brain.

Dr. Bilder: Oh yeah. That's right.

Dr. Slusser: So tell me about that, the imaging of brains. What's the difference? Are you seeing anything among those that you are imaging?

Dr. Bilder: We have. I mean, some of the things are interesting, but not very surprising. So, for example, visual artists we see have parts of their brain structured in visual cortical areas that are bigger than other people. Now, you could say, "Oh, well maybe they decided."

Dr. Slusser: They use it more.

Dr. Bilder: "I have, this part of my brain is bigger, I'll go and become an artist." But maybe it's easier for them, if they were born that way. But I think it's more likely that they exercise those aspects of their brains.

Dr. Slusser: Right.

Dr. Bilder: To such an extent that it grew. We know that there's, through what we call experience dependent plasticity, the capacity for the brain to grow a lot in response to exercise of certain cognitive functions. So, we know that doing cognitive exercise can grow these bits of brain. And it was surprising to me that we would actually see it in these visual areas, from people who are visual artists. They did that much exercise, perhaps. So that was interesting. But then there's another interesting thing that we see that links together different creative groups with the artists and the scientists, show a pattern of functional connectivity in their brains that's unique. And there, when we look at the

functional connectivity in the brain, it's sort of like looking at those maps of airline routes that you see on the seat back pocket.

Dr. Slusser: Oh sure, yeah.

Dr. Bilder: Right?

Dr. Slusser: All over.

Dr. Bilder: And you see that little ... But now, if you look at each airport as a node in a graph, and then, every airport's not connected to every other airport.

Dr. Slusser: That's right.

Dr. Bilder: LAX connects to New York, and then LAX connects to other regional centers in the southwest, but you don't see flights from LaGuardia to Burbank, right?

Dr. Slusser: Right.

Dr. Bilder: You don't see everything connected to everything else. That's a more random pattern. Instead, the airline pattern is very efficient in spanning long distances with a few routes and then having lots of local routes to get everybody where they need to go. That's called global efficiency, in fancy statistical terms. When we look at those kind of metrics of, how do the brain areas connect with each other, because we can map that, when people are at rest in the scanner, we can look at which patterns of brain activity are correlated with each other. So we can basically say, "Where are the planes flying in the brain," and make a map of that, kind of a route map of the human brain at work. And what we see is that these big C creatives are actually showing a pattern that's more random, with other stuff connected randomly to other stuff, so maybe you can go from LaGuardia to Burbank if you're a big C creative.

Dr. Slusser: If you're a creative person. Wow.

Dr. Bilder: And it's been, I was really impressed that we saw that across two different groups, scientists and artists, who couldn't be more different in some ways, yet share this spark of creativity.

Dr. Slusser: And again, is it the chicken or the egg, right? Did it, did they have it before, or is it something that they built up over time?

Dr. Bilder: That's right. This is something that we need to do more research to find out. But yeah. An amazing finding. And just published. It's hot off the press.

Dr. Slusser: Wow.

Dr. Bilder: Yeah. Yeah.

Dr. Slusser: That's ...

Dr. Bilder: Go pick up your copy of Neuropsychologia today.

Dr. Slusser: We'll definitely post it on the, as a link.

Dr. Bilder: Good [crosstalk 00:49:47].

Dr. Slusser: We have to. I mean, this is really, I think your description of the circuits in the brain and comparing it to the map of an airline is very understandable for people like me and my brain. Very helpful.

Dr. Bilder: Well, you have an amazing brain, as you've already proven.

Dr. Slusser: I hope so. I haven't been recruited for the big C though. That's going to be something I'll have to aspire to.

Dr. Bilder: Oh, boy.

Dr. Slusser: Can you explain what big C creativity is?

Dr. Bilder: Yeah. So when people have talked about creativity, they sometimes talk about everyday creativity, or little C creativity, as distinct from creative genius, transformative creativity, or big C creativity. Creativity with a capital C. So that's been called big C creativity. And a lot of studies looking at creative achievement will grab what I refer to sometimes as free range humans, not selected for creativity, and study a bunch of them. And you can rank them in terms of their creative achievements. Like in visual arts, I once painted something when I was in high school that I hope no one will ever see. But that was my greatest artistic achievement in the visual arts.

Dr. Slusser: And I wonder what your brain ...

Dr. Bilder: That gives me a one or a two on the scale that goes up to seven [inaudible 00:50:56]. But our artists that we recruited for the big C project had multiple international exhibitions. And so they're in a whole other stratosphere of artistic achievement.

Dr. Slusser: Sure.

Dr. Bilder: But the typical person doesn't get above a three. So the big C individuals are those who've made clearly landmark achievements within their respective domains. And people always wonder, when we do studies of little C creativity and find dimensions that are associated with creative achievement, "Well, what about the big C creativity? How does that explain Picasso, and Mozart?" In the

big C creativity studies we try to go out and find those people who are one day going to be seen as the Picassos and Mozarts of our era.

Dr. Slusser: And do you see a difference in their brains, the little C and the big C?

Dr. Bilder: Well, there, we haven't compared enough of little Cs who could be matched on creative achievement to the big Cs. That's sort of a definitional problem.

Dr. Slusser: Right. Yeah.

Dr. Bilder: So that study is sort of hard to do. What we've done is compared our big Cs to what we call smart control group. So one of the first things we realized when studying big C creativity is that we would face scientific criticism, because people would say, "Oh, those big C creatives. They're just smarter than everybody else. They just have higher IQs." Et cetera.

Dr. Slusser: Oh, oh.

Dr. Bilder: So especially when we're looking at big C scientists. They've all got doctoral degrees.

Dr. Slusser: Right.

Dr. Bilder: Some of them, several doctoral degrees.

Dr. Slusser: Sure.

Dr. Bilder: So they're hyper-educated. And even our visual artists were quite educated and very intelligent. So if we just studied an average group of people, then people would say, "Well, they differ in all of these other properties."

Dr. Slusser: Yeah.

Dr. Bilder: So we found a smart control group of people who were very high in intellectual ability, in fact not significantly different from our big C groups in estimated IQ, so in that way we looked at really smart people and the differences I talked about. There's more random pattern of connection, seems to be a big difference. And it also looks like, in that paper that's in Neuropsychologia, what we found is that the big C people didn't need to work their brains as hard to get the same results in tasks that required divergent thinking. If I ask you to say, "What are the unusual things that you could do with this water bottle?" And then you might think, "Well, I could use it to water the plants," but that's not a very unusual idea, right? But what if you said, "I could use it to practice my balance. I could put it on my head, and practice walking with it, as a posture." Now that's a little bit more creative, right? We have tasks like this where we ask people to produce as many unusual uses of things as they can. But it turns out that our big C people didn't have to exercise their brains as much. They didn't show as much activation

as the smart controls did when performing that kind of task. They got about the same amount of stuff, same amount of production in that task, but they didn't have to work as hard.

Dr. Slusser: Wow.

Dr. Bilder: Yeah.

Dr. Slusser: Because they were so probably revved up, perhaps.

Dr. Bilder: I think that maybe they're used to doing that sort of thing.

Dr. Slusser: That too. But maybe the connections, too.

Dr. Bilder: Well it could be that's-

Dr. Slusser: Going from LaGuardia to ...

Dr. Bilder: That's right. Going from LaGuardia to Burbank.

Dr. Slusser: Burbank.

Dr. Bilder: That maybe that's the easy, it's easier for them to make those remote connections.

Dr. Slusser: Yeah, right, yeah. I'd like to end this wonderful conversation with one question, especially since it's been mostly about music. I'd love to know who your favorite artist might be, and what's your favorite playlist that will make you feel nostalgic?

Dr. Bilder: I'm really tied to this whole 1970s sophisto-funk era. So, Herbie Hancock is front and center in that group. I also find to be very transporting, John McLaughlin was playing what they said is his last concert, and they're playing the music of Mahavishnu Orchestra, which I heard in 1972 in Keene, New Hampshire, when I was a high school student. Yeah. We escaped from the school and went up to Keene.

Dr. Slusser: You mean you played hookie?

Dr. Bilder: I played hookie, that's right.

Dr. Slusser: Oh, wow. During the day?

Dr. Bilder: Well, it was at night. But I think it was against the rules for us to ...

Dr. Slusser: Oh, it was a boarding school.

Dr. Bilder: It was a boarding school.

Dr. Slusser: Oh.

Dr. Bilder: I think we weren't supposed to leave campus.

Dr. Slusser: Oh.

Dr. Bilder: And I went with my buddies up to see John McLaughlin and the Mahavishnu Orchestra. And yeah, it's really quite-

Dr. Slusser: So you're quite creative, because you pushed the envelope there.

Dr. Bilder: Well, we did push the envelope a little bit there.

Dr. Slusser: So go for it.

Dr. Bilder: Quite an incredible musician. I mean, not only is he a legendary guitarist and guitar virtuoso, some people say without parallel, but the kind of music that he invented was really unique. Really playing with novel time signatures, totally unique melodies and harmonies that no one else would think about. I remember Miles Davis commented about John McLaughlin when he was playing on one of his albums.

Dr. Slusser: Whoa.

Dr. Bilder: He goes, "Man, that is right off. Yeah." [crosstalk]

Dr. Slusser: Oh, wow. If you get someone like Miles Davis, oh my gosh, commenting.

Dr. Bilder: Yeah. Yeah.

Dr. Slusser: And was he, did he meet your expectations, even this many years later?

Dr. Bilder: Unbelievable.

Dr. Slusser: Really?

Dr. Bilder: I can't imagine. Because yeah, he's, what's the word, not a spring chicken. He must be in his seventies, seventy-something, 79, or ... Anyhow.

Dr. Slusser: Isn't that fantastic?

Dr. Bilder: And to be able to play. I mean, it's very physically demanding music, too.

Dr. Slusser: Sure.

Dr. Bilder: It's unbelievable. He's known by many just as, for the rapidity with which he can play. And I just can't imagine how his brain and muscles can still move at that rate, with precision. But anyhow, he's just an incredible guy.

Dr. Slusser: And how do you feel, physically?

Dr. Bilder: Yeah. Well, we were talking before about frisson. So I had multiple experiences of frisson during the course of that.

Dr. Slusser: That's the goosebumps.

Dr. Bilder: That's right, yeah. Because these melodies are so ingrained in my psyche, over the last 50 years, that to then hear them live and to see John McLaughlin there, and to have it resonate with this entire experience of, "Wow, that was 50 years ago that I heard that same song by that same musician."

Dr. Slusser: Live.

Dr. Bilder: Live.

Dr. Slusser: Yeah. Which also has such significance.

Dr. Bilder: That's right. And with friends who really appreciated that music, as well.

Dr. Slusser: So you remembered your friends, too.

Dr. Bilder: Yeah, yeah.

Dr. Slusser: So that brought some nostalgic memories.

Dr. Bilder: Yeah, yeah.

Dr. Slusser: I mean, it shows that exposing your kids, even maybe even in utero to music could have this kind of imprinting that potentially could bring back these wonderful feelings of contentment or nostalgia, or ...

Dr. Bilder: Could do, could do. In theory. I like the idea, but yeah, so you have to show me the studies that people have done about the in utero.

Dr. Slusser: Yeah, I don't know. I think it's all theory, as you said. Yeah.

Dr. Bilder: Look it up, or do the study.

Dr. Slusser: I will. Yeah.

Dr. Bilder: We'll do some projects.

Dr. Slusser: Hey, that's a good idea.

Dr. Bilder: Yeah.

Dr. Slusser: Okay. This is where it happens.

Dr. Bilder: We can get together. Between the brain science and the ...

Dr. Slusser: And pediatrics.

Dr. Bilder: Pediatrics. I think we've got a new project.

Dr. Slusser: I like that a lot. Yes. Very positive, too. Creative.

Dr. Bilder: There you go.

Dr. Slusser: Maybe we just flew from LaGuardia to Burbank.

Dr. Bilder: That's it, that's it. All the way.

Dr. Slusser: We created a connection in our own brains.

Dr. Bilder: Fantastic.

Dr. Slusser: Yeah. Well, thank you so much, Bob. You're amazing. You're such a jewel for our campus, and I've learned so much from you over time about breaking down stigma around emotional wellbeing issues and music. Just laughing and knowing that you can pursue a lot of different areas of science and still be a scientist. Meet lots of famous people along the way.

Dr. Bilder: Well, so nice, and I'm so honored that you would speak to me about these things. And you're really a great force for the greater good here on our campus. It's really wonderful.

Dr. Slusser: Oh, thank you, Bob. That makes me feel good.

Dr. Bilder: Become part of our healthy campus initiative and leading the way.

Dr. Slusser: Right on.

Dr. Bilder: You always say, "Onwards and upwards."

Dr. Slusser: Onwards and upwards. It's a group effort. It takes a university. Thanks again.

Dr. Bilder: Sure. Thank you.

Dr. Slusser: All right. Bye bye.

Dr. Bilder: Bye.

Dr. Slusser: Thank you for tuning into Live Well Today. Today's podcast was brought to you by UCLA's Semel Healthy Campus Initiative Center. For more information on Bob's new study on brain circuits, please visit our website at healthy.ucla.edu\livewellpodcast. To stay up to date with our latest podcasts, make sure to follow our Twitter and Instagram, @livewellpodcast.