

# THE KNOWLEDGE PROJECT #92

**Lisa Feldman Barrett**



**Shane Parrish:**

**Lisa, I'm so happy to get a chance to talk to you today.**

Lisa Feldman Barrett:

Oh, it's my pleasure. I'm so thrilled that you're interested in our work.

**Can you tell me how you got interested in emotions? Where did that come from?**

Wow. Who's not interested in emotion since we all have them. When I was a graduate student, when I went to graduate school, I did not go to graduate school to study emotions, I went to study the self, your view of yourself and why that matters. I was using some measures of emotion that were not behaving themselves. They just weren't working the way they were supposed to work. So, I thought, all right, I'm going to use very objective measures of emotions. So I'm going to rather than asking people how they feel, which is what I was doing at the time, I thought, all right, I know that there are universal facial expressions, that's what every textbook says. So, I'll just learn how to measure emotion in people's faces. Then I went to the scientific literature and I read and I realized, even though people claim there's a lot of evidence for universal facial expressions of emotion, that everybody scowls when they're angry.

**Are those the micro expressions that people talk about?**

Well, these are actually not micro expressions. The idea that there are micro expressions and the idea that there are full blown facial expressions of emotion, scowling in anger, smiling in happiness, pouting in sadness, come from the same theoretical view. Although there's a lot of claims that everyone in the world scowls when they're angry and everyone in the world recognizes a scowl as anger, that's not actually what the data show. So I thought, okay, well, I guess I can't measure emotion in the face, I'll measure emotion in the body because everybody knows that there's one bodily pattern for anger and one for fear and one for sadness. So your blood pressure goes up and maybe you flush a bit in anger, but your heart races and fear and so on. So again, I went to the research literature and I read what the papers said, and then I read the data and they didn't match.

In fact, there is no universal physical signature for any emotion that's ever been studied. I thought, okay, well, I guess I better figure out how to image the brain because everyone knows that there's going to be one circuit for fear, one circuit for anger, one circuit for sadness, that everyone in the world has, these circuits are born with them and maybe even some animals have them too.

What I found for the body and for the face is also what seemed to be emerging from evidence from the brain. I thought, wow. Many people believe that there are these diagnostic signs, objective signs for emotion. But they don't exist. We feel emotions. I feel angry sometimes, I feel happy sometimes. These feelings they feel, emotions feel like they happen to you, like they hijack you and take you over and cause you to think and do and say sometimes things that you rather would not have. So I thought this is a real mystery and I just abandoned the work that I was working on and I completely switched my research program at that point because it was a real puzzle. Here I am almost 30 years later.

### **Let's start at the beginning. What are emotions?**

That's not starting at the beginning.

### **Where's the beginning?**

Well, here's the thing, the linguist, George Lakoff calls emotions essentially contested concepts, which means we all think we know what emotions are but no one can define them. No one can agree on their definition. For example, scientists the way they typically define emotion is a package of thoughts and feelings and facial movements and bodily changes that are all coordinated with each other. That's the way they define anger and sadness and fear. But the evidence from science tells us that those coordinated packages don't exist. There isn't one coordinated package for anger that when you're angry, you always feel the same way and your body is always doing the same thing and your face is always doing the same thing. All the pieces are coordinated but they look different every single time. Well, maybe not every single time, but they look different in different situations. It's not easy to scientifically define what emotions are. If I gave you a definition, I don't think it would be meaningful to you or your listeners.

The way I would define emotion is the way I would define thinking what is a thought or what is a belief, what is memory? Your brain is conjuring all of these events in exactly the same way. It's just using different information to make sense of what's going on in the immediate moment.

**So there are no telltale signs that you could see even, if you could see inside somebody, would you see that this is anger or is there something in our blood or physiology and it's not cultural either?**

It's not completely a big random mess. I think the way to think about it is this, first, I'll give it to you by analogy and then we'll say it by emotion. Before Charles Darwin wrote his book on the origin of species, people believed that a category of animal, like a species of animal, like say a dog, there was a particular perfect dog. It was kind of like the dog show view of dogs. There was a perfect Cocker Spaniel, there was a perfect Dalmatian, there was a perfect Siberian Husky. Every dog had some of the features of what made that breed perfect. But there was a perfect animal with the perfect tail length and the perfect coat thickness and the perfect eye color. All the individuals that you would see of that kind of dog varied from each other. But that was just error, it was just mistakes. That really there was this perfect dog out there. Philosophers would say there was an essence, an essence of cocker spanielness that was there. But what we saw in the world, all the cocker spaniels, they had varying features. So, there was a lot of errors in the mix. Charles Darwin came along and said, no, actually, what a species of an animal is, like a breed of cocker spaniel is a collection of highly variable individuals. That what's real and meaningful is that variation, and our idea that there's this ideal cocker spaniel is actually a myth, it's a fiction, that doesn't really exist in nature.

So, scientifically what Charles Darwin was saying was that there aren't fixed types of animals. Each category or class of animal is a population of highly variable individuals. And the variation is really important because some animals will do well in one context and some will do well in another context. And they'll differentially breed based on how well they're doing.

So you can look at any biological category that way, like anger or sadness or fear. There isn't a perfect example of anger with a perfect facial scowl and a perfect change in the body and a one particular circuit firing or pattern in the brain. Instead, what your brain is doing is it's making instances of anger that fit the situation that you're in. Sometimes when you're angry, you might shout, you might raise your voice, and sometimes when you're angry, you might laugh. Sometimes when you're angry, you might cry. Sometimes when you're angry, you might sit quietly and plot the demise of your enemy. Sometimes, when you cultivate anger, it feels pleasant, actually and sometimes it feels unpleasant.

### **Wait, say more about feeling pleasant.**

Well, you've never felt aggressive and felt it was really good to express that aggression, like when you're playing soccer or you're trying to beat somebody in cards. So there are some people who, for example, when they're about to debate someone or negotiate with someone or they're about to enter a competition with someone, they get themselves pretty worked up and angry. So it feels good to be angry and to express that anger. But at other times, it doesn't. That's not error in the system, that's not stuff happening randomly, that's not a bug, that's a feature of how your brain works. It's a feature of how brains work. There is no essence of anger. There's no essence of sadness. Your brain is creating instances, based on what you learned in the past, it's creating instances that will work in the present.

Same thing is true for fear, the same thing is true for happiness and so on. So sometimes when I say that, people say, really, when are you ever happy when you're afraid? And I'll be like, well, have you ever been on a roller coaster? Have you ever gone to a haunted house? For 13 years, we had a haunted house in my basement right before Halloween. We did it as a charity. All my graduate students and postdocs, we would get all dressed up. We orchestrated the whole thing because we're really good at scaring the crap out of people in a lab. So we thought, well, hey, we'll scare little kids for money and then give all the money away to the Boston Food Bank, which is what we did for many years. We would all get together and we would just scare the crap out of people, like little kids again and again and again.

They loved it and they were really enjoying themselves. One time, I talk about this in my book, I threw a birthday party for my daughter when she was 12. It was a disgust party. I made these kids like exuberantly disgusted. They were having the time of their lives and they were totally grossed out. So disgust is often unpleasant but sometimes it's really pleasant. Often when you're disgusted, you withdraw from something, but sometimes you approach it because it's more interesting or it's fun or it's a challenge. So I think the point is that when it comes to emotion, as with almost everything in biology, variation is the norm. There isn't one anger. You have a whole population of angers that you can feel and your brain doesn't conjure them randomly. It conjures them according to your brain's best guess of what's going to work in a particular situation.

### **Is there a difference between feelings and emotions or are those interchangeable?**

So again, I have to give you the wishy washy science answer, which is that some scientists want to define emotions as actions, behaviors, not as feelings because they would like to search for a common physical basis of those actions in humans and in non-human animals.

### **Because they want the pattern.**

They're looking for the one pattern of that emotion. So for example, oftentimes you'll hear about fear learning or fear. Then when you read the article in the newspaper or you hear it on a podcast or whatever, it turns out that the scientists have studied a fly, or they've studied a rat. What they're studying actually is freezing behavior. If you create a situation where an animal freezes because the animal is uncertain about whether or not a threat is present, they call that fear. The assumption is that the circuitry is very similar across all different species. Well, it turns out that the circuitry, it's more complicated than that. But it turns out that in mammals, for example, the circuitry for freezing behavior is somewhat similar across rats and monkeys and humans, but the only way you can say that's a fear circuit is if you define fear as freezing. What about all the other parts? What about when animals try to escape a situation or what about when they attack a predator, which happens often.

So rats, for example, if they can't escape the situation, they'll attack the predator, particularly if it's a mother and she has pups.

**And in humans, it can motivate us. Sometimes fear drives us to do, because it's a particular type of fear?**

Right. That would be the old way of doing things. You could say, okay, well, instead of saying, I have this category with highly variable instances, a population in the Darwinian sense, you say no, okay, really, I just have to find types of fear. I'm going to take the category fear and I'm just going to chop it up into smaller bits because of what you're trying to do is say, okay, all the instances in this kind of fear are the same. No matter how small you make those boxes, there's still variation in the boxes. You just can't get rid of the variation because it's inherent in the phenomenon. So, there are some scientists who define emotions as behaviors. There are other scientists who define emotions as feelings. In our culture, colloquially, as people, we tend to define emotions as feelings. In other cultures, emotions are the action that's predicted in a particular situation, and feelings don't really play into it at all. It's in fact seen as kind of disrespectful to presume that you know how someone feels by how they act.

In our culture, we very much think that we know how people feel and what they think by what they act. That's why words like microaggression or microexpression exist because we make an inference. Your brain is automatically making inferences about the internal thoughts and feelings of people based on their actions, but we are blinded to the fact that they're inferences, that they're guesses. We think we're reading people, when in fact, really all our brain is doing is guessing.

**Is there a way that we can check ourselves on that?**

Yeah, ask.

**But how do you remember to do that in the moment because you just instinctively, somebody is acting, do we learn that? Is that cultural? We're taught that?**

It's cultural. You're taught that. When I say this, well, yeah, we've learned it. We need to understand a little bit what it means to say that something is learned. So, they'll say, oh, so it's not hardwired, it's learned. But actually anything which is learned is wired into your brain. If it wasn't wired into your brain it wouldn't be learned. So the question is, were you born with it or was it bootstrapped into your wiring by experience? I have a book coming out in the fall, it's called *Seven and a Half Lessons about the brain*. It covers some of these ideas because I think they're really fascinating but also most people just don't know.

So most people don't know, for example, that an infant brain is not a miniature adult brain. It's a brain. When human infants are born, they're born with unfinished brains. Those brains are waiting for wiring instructions from the world. Little brains wire themselves to the world, to the physical world and to the social world. For example, the brain needs information from your eyes in order to finish wiring itself so you can see. If it doesn't receive that information after you're born, you will never see normally. It's learned something that's been wired into the brain. If you live in a culture like ours where there are rooms with corners and buildings and square things with corners and edges, you learn to see the physical world in one way. If you live in a culture where there's nothing square and there are no corners, you learn to see the world in a different way.

So much so that some things for us that are visual, we have these visual illusions. We see two lines that are exactly the same size, but if one line has arrowheads pointing inwards, and on the other line pointing outwards it's called Muller-Lyer Illusion. The one with the ones pointing outwards look like a longer line than the ones with the arrowheads pointing inwards, but actually they're the same. So that illusion doesn't happen for some people in the world because they weren't exposed to buildings and boxes and corners and things when their brain was finished wiring itself to be able to see. So similarly, everything you do, everything in infant experiences is fair game for it to learn about, and that shapes its wiring, including when you label things for the child or you speak to someone else in the child's presence with words. For example, in our culture, we do a lot of curating of objects for infants. We'll hold up a dog, a toy dog, and say "look a doggy" or "look a truck" or "look a train." We do that kind of labeling.

But then we also say to kids, “oh, you’re crying, don’t be sad.” Or when the kid throws his Cheerios on the floor, “oh, don’t be angry” or when he cries when someone takes his toy away. Those incidental things, the child’s brain is picking it all up and learning it. So, what the brain is doing is it’s learning patterns and then those patterns are available for the brain to use later to make sense of what’s happening.

### **That’s really interesting. Should we label emotions with kids?**

Absolutely. In this culture. I think that kids have to learn, they have to become culturally competent in the categories that are meaningful in their culture, otherwise, they can’t communicate with other people. So remember, what a word is referring to is a whole event that’s occurring, that is how the child feels, what’s happening in the world around the child in that moment, what’s going on in the child’s body in that moment and then what actions happen next and what the consequences are. For example, when you feel bad, do you know what to do next to make yourself not feel bad? Not really. It’s a kind of a crapshoot. But if you know that you’re sad or angry or afraid, well, there might not be one thing to do when you’re sad, but maybe there are two or three and your brain can kind of make a pretty good guess based on the situation which one of those you should try. So in a sense, emotions are ways of understanding what’s happening in your own body in relation to what’s happening in the world as a prediction for what to do next to make yourself feel better or worse or get yourself into a state that your brain thinks would be a good state to be in. I say it that way because people don’t consciously do it a lot of the time. That’s just business as usual for how brains work.

There’s research which shows really clearly that in western cultural contexts like ours, knowing a lot of emotion concepts and a lot of emotion words and being able to use those to create very nuanced precise emotional events actually is really helpful. It’s helpful socially, it’s helpful in school. Those kids do better, they perform better in school. It allows you to be resilient when bad things happen to you. It helps you cope. We call this emotional granularity, meaning your emotional life is very precise and granular. So one grain of sand is not the same as another grain of sand. So one instance of anger is not the same as the other instance of anger. Those kids tend to use alcohol less when they’re stressed. People even recover faster from physical illness when they’re more granular.

And that sounds like magic but it actually isn't magic. If you understand how the brain works and you understand what's going on under the hood, it makes complete sense that these things would be true.

**Do we unconsciously send the message that you shouldn't be feeling when we say don't be angry or don't be sad?**

Well, I think that's really complicated. So, I think often times, so here's the thing, you and I are not in the same physical space. I'm in my office at home and you're in your studio. Let's just say we were, let's say we were both in the same studio or maybe we were having a cup of coffee. Even though we don't know each other, if we like each other, if we're getting along pretty well, if we trust each other in the moment, our biological signals will start to synchronize. Our heart rates will synchronize, our breathing will synchronize. If we know each other really well, when I get a little worked up, you might get a little worked up. Actually, we don't even have to know each other that well. We just have to be around each other for a little bit of time. People call that emotional contagion but it's actually not emotional.

What's happening really is that human nervous systems regulate each other. We're social animals, we evolved that way. So, we have lots of ways that we affect the nervous system of another person. When I affect your nervous system in a way and you're not aware of it, your brain's just going to try to make sense of it. So it makes sense if it sometimes is emotion. So my point is that when someone else gets worked up, you're more likely to get worked up too. If you don't want to be worked up, you don't want that person to be worked up. A lot of times when people say don't be sad, don't be angry, really, what they're saying is, I don't want to deal with you being angry or sad, and I don't want to feel that way so I want you to calm down.

**That's fascinating. I've never heard it explained that way before.**

Yeah. I trained as a therapist a really long time ago in another life. One thing I learned is that it's really hard to sit with someone else's distress and just let them be distressed. It's like one of the hardest things to learn to do. Instead, almost your knee jerk reaction, is to help them regulate because really, what you're doing is you're helping yourself regulate.

You don't want them to be upset because you don't want to be upset. It's not a completely selfish act, it's just that part of the mechanism for you to have empathy is to feel what someone else feels and that can be a really challenging thing.

**And often, we don't even want to feel it in ourselves, let alone with somebody else. It seems like we suppress a lot of feelings. Talk to me about that. Does that come back to bite us? Does it make them linger? Does it cause other behaviors later on?**

The idea that suppressing feelings is really bad for you is part of a, is part of an old hydraulic model of emotion that an emotion triggers in your brain, you need to let off steam, have catharsis, kind of get it out and if you don't, something bad will happen. And that's not really true. Here's more the way it works. You can think about your brain as running a budget for your body. You have cells, those cells require energy. You're thinking, what the hell, I just asked her a question about is it bad not to express emotion, she's talking about cells. I'll get there. I think the problem is, if you really want to understand it, you have to start-

**Oh, yeah, let's go into the weeds.**

We're only going to briefly glimpse the weeds and then we'll get right back out. But my point is that, what's your brain's most important job? Why do you even have a brain? Why did a brain evolve? It didn't evolve for you to think or feel or see. It evolved to regulate your body. As brains get bigger, bodies get bigger. As bodies get bigger, brains get bigger. What is your brain doing? Your brain is regulating, it's running a budget for your body. It's not budgeting money, it's budgeting oxygen and salt and water, and sodium, and all these hormones. All this junk that your body needs to function. So, in a sense, you can think about your brain as kind of the financial office of a very large company that's like a multinational company. And so, it needs to try to get the resources where they need to be before they're needed. Just like if you're going to spend a lot, you want to go buy something really expensive, it's better to have the money in the bank and buy it than it is to buy it on your credit card and try to pay it back with interest. And so that's how you brain basically tries to work.

So what's bad is if you make an expenditure, so let's say you buy a bunch of stuff on your credit card and you pay the bill really fast, there's no tax, you haven't paid any interest. There's no additional tax. There's no interest, you just pay the bill and it's paid. That's your brain preparing you to do something, to yell, to talk, to breathe, to run on the treadmill, to get into an argument with a friend, to have sex, to do something, to eat. Your brain makes an expenditure, and it's preparing to get something in return, like to have the bill paid. But let's say that doesn't happen. Well, then your body starts to run a bit of a deficit, and then there's a little bit of interest. If that builds up over time, that's very bad for you. So the thing is that when your brain is about to make a big expenditure, those happen to be the moments that we call emotions.

When your brain is preparing your body to do something or even thinking about it, you have a big cortisol release in your bloodstream. People think, oh, that's the stress hormone. No, it's not. It's a hormone that is secreted in what we call stress. But basically what cortisol does is it gets glucose into your blood really fast so that cells can use it really fast. When you get up in the morning, you have a cortisol surge. When you're running on the treadmill, you have a cortisol surge. It basically means your brain is preparing to make a big expenditure. And when you do that and you don't, as a consequence, there are sensory changes in your body. Your heart is pounding, you're starting to sweat, whatever it is. And you feel that as emotion, you feel that as emotion. If the expenditure doesn't come and the reward doesn't come, you don't replenish. That's actually really bad.

So if you're continually getting stressed over and over and over, you're getting mad over and over and over or you're getting afraid over and over and over, and that expenditure isn't paid back, you're not sleeping enough, you don't eat healthfully, you're not getting hugs from your loved ones, you're not exercising sufficiently, you will start to run a deficit. What that translates into is illness. It translates into depression, anxiety, heart disease, diabetes. They're all metabolic illnesses that come from running a deficit in your body budget.

**What are the actions that we can take that might prevent us from, or build up some of that account balance or prevent the deficit from accumulating? You sort of said sleep, exercise, sex, what else?**

Usually what I say when I talk like this, I don't sound like a neuroscientist, I sound like someone's mother. And I am someone's mother. I think one of the really big changes in neuroscience in the last decade is the realization of just how important sleep is. So literally, if there was only one thing that you could do in your life, only one, it would be sleep a decent amount every day, whatever that means for you. It's usually somewhere between seven and eight hours for most adults, and it's longer for kids and adolescents. For example, one reason that the rate of adolescent depression is so high in this country is because adolescents go to bed late. They're on their computers and their devices, which has light at a particular frequency that stimulates their retinas to keep them awake. So it's disrupting their circadian rhythm, which is the rhythm that helps your sleep wake cycle. So they can't get to sleep and then they have to get up at a really early time in the morning to get to school.

Whereas an adolescent brain might need 10 hours a night, most kids are getting five, six hours. That's really bad. It's not just bad because they won't learn well, I mean, they won't learn well, it's not just bad because there'll be more impulsive. It's not just bad because they'll be a complete pain in the ass if you're their parent. It's also bad because there's this small metabolic tax that's being charged every single time. And those kids when they become adults, middle aged will be more likely to develop diabetes, heart disease, metabolic illnesses, which by the way, are also at record numbers in this country. Of course, it's not the only reason why, but it's one reason. I think the issue isn't whether you express your emotions or not. The issue is, don't get riled up with any emotion without paying the bill. Part of paying the bill means getting enough sleep.

**So are some people actually more emotional than other people? Is that a thing or do they just have a bigger deficit than other people?**

Yes. Both. So here's the thing. I sort of skipped over one piece because I'm already giving you all this complicated science stuff, but I'll just complicate things further and give you one other piece.

So, when your brain is regulating your body, your body is sending sense data back to your brain that your brain needs in order to keep that regulation going. You don't experience those sensations typically in a very precise way. So when your heart is beating and your lungs are expanding and everything else that's going on in that little internal drama. Right now, for example, you're sitting there, you look like you're sitting quietly, but you have a whole symphony of physical changes going on in your body, and your body is sending that sense data to your brain. Can you sense your liver functioning? Can you sense your heart beating?

**No.**

Even now? No, you can't. Exactly. We're not wired to be able to do that and there's a good reason why. And that is, if you could, you would never pay attention to anything outside your own skin ever again. It's a big drama going on right now. For example, if you've ever been in one of those deprivation tanks, like a soaking tank where they block out all the external sense data? So it's completely dark, you have earphones that you can't hear anything, you're floating in salted water, you can't feel any touch. It's like this symphony of internal sounds just emerges. You can hear all this stuff going on inside your own body but you can't feel it because we're not wired to feel it. So instead, what we feel is a simple physical feeling that scientists call affect or we call mood. So you feel good or bad or pleasant or unpleasant or worked up or calm. It's like a general barometer for how your body budget is doing.

We make sense of those sensations as emotions sometimes but only when they get really intense. But they're with us all the time because your brain is always regulating your body. Your body is always sending sense data to your brain. So you're always, affect is a property of consciousness, it's not emotion. It's an ingredient, it's a feature in emotion. But it's also there when you're having thoughts or perceptions. So you're driving on the highway, somebody cuts you off and you're like, your reaction is like that guy's an asshole. Well, that's a very affective perception. If you ask people they'll be like, well, no, I'm not mad. That guy's an asshole. Like assholiness is a property of that guy who just cut me off. And you might say, well, you're just angry, you don't know it. Well, how can you tell? There's no objective marker for anger? Who's right? The answer is that's a bad question.

You're perceiving anger and that person is experiencing assholiness in that driver. They're both actually valid perceptions.

So my point is that do people differ in emotionality? Sure. Why? Because first of all, some people just differ in mood, and they differ in mood because some people, their brains prepare them to expend energy just more frequently than other people. It's something that in babies we call temperament. It's called arousability in babies. Some babies are perturbed by every little thing, and others, not so much. So there are some people who sort of swim in a sea of drama. Every little thing is meaningful to them. Every little thing their brain is reacting to preparing the body for some expenditure. And for other people, that's one end of the continuum, and the other end of the continuum, people are kind of like floating in a calm sea of tranquility. Occasionally, they might get perturbed, but mostly, they're just sailing along. And then there's everybody in between. For example, my husband is one of these people who floats in a sea of tranquility. Mostly I admire it. Occasionally, it irritates the shit out of me, but mostly, I admire it. I don't react to every little thing but my nervous system is a little more on the other, somewhere on the other end, where I react to more things.

The thing is that you can take anybody, deprive them of sleep, maybe they get five or six hours a night instead of eight for a couple of nights, and they just become more reactive. It's just the nature of the system for that to be true. If you take a person and you add some testosterone to their bloodstream, they become more reactive. And here's a contentious thing, but I will say it, if you take a woman who's still fertile and you start to withdraw estrogen and add progesterone, she will also be more reactive. So it's not just women, men have it too. For men, it runs on a daily cycle. Your testosterone goes up and down on the daily cycle. It might not be extreme enough that you can tell but it is observable by careful scientific means. Do women have, do they get uncontrollably emotional right before they get their period? No, that's a myth. Are women unable to make good sound decisions right before they get their period? No, that's a myth. But is it the case that they are even in a minuscule way, their brains are more likely to prepare them to do something for a challenge for more things than when they're at some other point in their cycle. Yeah, on average, that is true. In my data at least it's true.

**I want to go back to something you said. Is the brain just constantly interpreting the outside world and that is the process of sort of like how we construct emotions?**

The brain is constantly interpreting the meaning of internal sensations, and external sensations.

**And it's making meaning, it's a meaning making machine.**

It's a meaning making machine. And sometimes it makes meaning as a thought, and sometimes it makes meaning as a perception, and sometimes it makes meaning as an emotion. I should say, that's our understanding in this culture because we have events that we experience as thoughts and feelings. But in other cultures, or as physical symptoms, like a stomach ache. But in other cultures, some cultures don't make a distinction between thoughts and feelings. It's all one thing to them. It's not that they're wrong and we're right. It's that their brains have learned a way to make sense of their sense data in relation to what's going on around them in their world in a fundamentally different way than we do.

**And neither way is right or wrong, they're just different.**

Right. And so, let me give you an example of one way that we make sense of things that's really not helpful for us. And that is the idea of there being mental and physical illness. You have a mental illness, you see a psychiatrist. You have a physical illness, you see an internist. There's actually no fundamental difference biologically between a mental illness and a physical illness. In depression, you have a metabolic problem, and you also feel bad. And those two things are related. In heart disease, you have a metabolic problem and you feel bad. And those two things are related. So sometimes you'll hear people say, well, the comorbidity of depression and heart disease is about 70%, meaning 70% of people who have heart disease also developed depression. They talk about depression causing heart disease or heart disease causing depression. Actually, there's probably a common metabolic problem that's causing both. Both a problem with your heart and a problem with your mood because they're related. Or Alzheimer's disease, for example. Alzheimer's disease also is the result of a pervasive persistent metabolic problem.

I made this conjecture probably, I don't know, 15 years ago, and now there's actually starting to be evidence for about what I'm about to say, which is, the most expensive organ you own is your brain. Your brain costs you 20% of your metabolic budget. There's no other organ that comes close to being that expensive. So, neurons are really expensive little cells to keep alive. There are certain cells in your brain, certain neurons that are much more expensive than others. When you are running a deficit in your budget, in your bank budget, what do you do? You stop spending. So what does a brain do when it's running a deficit? It's also stopped spending. So what does that mean? Well, it might mean you're too tired and you don't move as much. It might mean that you stop learning about what's going on around you in the world because it turns out learning is expensive, metabolically speaking. So let's say you do that, you slow the body down, you make the body tired, you stop moving so much, you stop really paying a lot of attention to what's going on around you in the world. You sort of just use your internal, what you've learned before to help you make sense of everything and that's not enough. What do you do? Well, you start getting rid of some of the really expensive parts. You start killing off neurons.

### **That's where these things start cropping up?**

So neurodegeneration that happens in Alzheimer's disease or even normal aging is really about trimming your metabolic budget basically.

### **That's super interesting. And so, just to recap, the things that we can do to make sure we have the money to spend is sleep is number one, sex, exercise. What are the other things that we can do to sort of recharge?**

Well, there are lots of things you can do. Having sex is good. Who doesn't like that? But even just a hug.

### **Physical connection.**

Physical connection is good. Any kind of social connection can help. It can also hurt. One thing we can do is, you can be kind to someone.

That actually helps your metabolic budget. It actually is helpful when you are kind to someone. It also thankfully increases the likelihood that that person will be kind to you. And that also diminishes the burden on your budget. The degree of animosity and casual brutality that we see in the media and so on, that's like a, people think of it as this sort of decrease in civility as a social problem, but it's actually a public health problem too. I'm not saying you become like milk toast and let people walk all over you. I am saying though that treating other people with a certain degree of human dignity and kindness and having them treat you in the same way is actually really helpful, physically, biologically helpful to you. And I'm not saying this because I'm a bleeding heart liberal academic, I'm saying it because I'm a neuroscientist. That's what the data show.

If you exercise and you expend a lot of energy, you have to recuperate. You have to drink enough water, you have to eat something, you have to rest, you have to let your muscles rest. You have to recuperate. A big argument with someone is sort of the same thing. Not even sort of the same thing. It's pretty much the same thing from a metabolic standpoint. Your heart rate will go up higher if you're running probably. The expenditure will last for longer. In principle, the dynamics are the same. So, you have to replenish yourself and if you don't and you're just sort of swimming in this sea of icky conflict all the time, it's actually not good for your physical health. One thing we can do is we can sleep, we can eat healthfully, we can make good social connections to other people, who we like and who we trust, and who we value and who value us. We can generally just be kinder to each other.

**What do we do when our partner or friends are feeling something?  
When they have anxiety or anger, what are the ways that we can be helpful in our response or what are the most helpful ways I guess to respond in those situations?**

So I think the first thing that you have to do, which is actually a really, really hard thing to do is to figure out what they want. So sometimes what someone wants is just empathy, and sometimes what they want is help. They want you to help them, instrumentally help them figure out how to solve a problem.

If you offer your advice for how to solve a problem to someone who in that moment really just wants a pat on the back or a hug, do you know what happens?

**Not good things.**

Not good things, right. Anyone who's ever been in a relationship or had a kid knows exactly what we're talking about here. So the first thing I do, the first thing that we do in my house is we say, do you want empathy or do you want a solution? What do you want?

**And how does that skew? Is it 50-50 between empathy and solution? Or is it mostly empathy?**

It depends on the person. If you ask my daughter who's 21 now, she will tell you almost 100% of the time, I want empathy. And if you asked her, she would say, and my mother is constantly trying to solve problems, and all I really want is just a little empathy. But if you ask my husband, he would almost always say I want a solution. I want you to help me find a solution to this. I want instrumental help is what we would call it as a scientist. I think I probably am more like him in that sense. I certainly want to feel understood, but usually what I want is help with a solution. That actually makes me feel better. I don't need someone to just give me a hug and pat me on the back. But occasionally, that's very welcome. I think it really varies from person to person, which is why it's really helpful to ask.

**What's the next step if that's the first step in your house? Walk me through that whole tree.**

I think it really depends. So for example, and it's a little hard in this culture at this particular moment in time to say walk up and give somebody a hug because that can land you in jail. But sometimes for someone who you're close to and you have permission to do it, what empathy can mean is really just giving someone a hug or patting their arm.

### **Just being there with them in that moment.**

Just being with them in the moment and sitting with it.

### **That's really hard. I agree with you.**

It's really hard, it's really hard. Sometimes it means letting them talk. But then you have to reflect back what they said and not add anything. Just really let them know they've been heard, and that they're understood. Again, that may sound like psychological mumbo jumbo but there's a real biological consequence to doing that. Sometimes, literally, it means in my house, it means doing some breathing exercises because breathing is really the only way that we know of, biologically speaking, that is the only way that you can kind of deliberately get a handle on your nervous system.

So, you've got this nervous system in your body called the autonomic nervous system. You have the sympathetic side and the parasympathetic side, and they work together in a complicated kind of dance. It's called the autonomic nervous system because it's automatic and you have no control over it. There is one way to get control, a little bit of control. And if you practice more than a little bit, or a little bit more I would say, is breathing. For some people, it's six second or seven second breaths, for some people it's eight seconds. But if you breathe regularly and deeply diaphragmatic breathing, after a couple of minutes, you can slow your heart rate. Basically it sort of calms your system down.

### **Let's do that right now. Walk me through how we try this.**

Okay, so first of all, a lot of people know how to do this, they just don't realize it. For example, you know how when you cry, you have a big cry and then there are times when you just take a big breath and you let it out. Crying feels cathartic because everything is calming down. It's those breaths actually that are calming you down. Or in yoga for example when you're doing a yoga class, even in something like hot yoga where you're just drenched in sweat, you're pacing your breathing. So I think people intuitively know how to do it. What I should say is, for some people doing this causes them to hyperventilate.

**You've been warned if you're listening to this or watching this.**

So, put your hand on your torso, on your tummy. So you're not going to be breathing from your chest, you're going to be breathing from your diaphragm. When you breathe in, you don't want your chest to expand. What you want is your stomach kind of to expand. So breathe in and have your stomach expand. So what's happening is you're actually taking in breath down to the bottom of your lungs, instead of just the top. So you breathe in on account of say three or four and out on account of three or four. So let's do that one breath. Okay, ready?

**Yeah.**

And you try to push all the air out.

**It feels different like to breathe that low. Is that how we're supposed to be breathing all the time? Why don't we breathe that way all the time? It's like we're lazy breathing almost.**

If I could answer that question, you know. I think there are lots of reasons. Here's one. I can't actually see how you're sitting right now because you have a black T-shirt on and I can only see you from here. Are you sitting straight up or are you slouched over?

**I'm pretty close to straight up. This is like fully straight.**

Okay, so for me, I'm sitting fully straight right now. This is how I normally sit. I'm pretty crunched up. If I try to expand my diaphragm right now, I wouldn't get very far because I'm kind of hunched over. I'm not supposed to sit like that, it's very bad for you to sit like that. A lot of us do a lot of the time. I actually really admire people who have great posture all the time.

**Yeah, me too. I also hate them in some way.**

I know. I do too. Right, exactly. So that's one reason. I think another reason to be able to breathe like that, for most of us, requires a lot of mind, we have to really pay attention. We can practice and practice and practice, but then eventually, we can breathe more like that.

But that's a really kind of a, for lack of a better word, mindful breathing. It really requires a lot of attention. Most of us have other things to do in the day. It turns out that there is research which shows that if you breathe that way say for five minutes in the morning and five minutes at night, so you take a period and you kind of do it a couple of times a day, over months, your resting heart rate will go down. You'll be able to calm yourself faster when you get really worked up. It's a really useful strategy.

So that's something we do in our house, we call it a yoga breath. Let's do some yoga breaths. When my daughter was a little girl, that's what I would call it when I wanted her just to calm down and breathe a bit. And that's actually really, it's a really, really helpful strategy.

**Yeah, breath is really interesting when it comes to emotion and feeling too, right? It helps you center, it helps you focus. And sort of like, not only that, there's the physiological response of just breathing in a deeper more connected way.**

It also though helps you learn better. Because if all of your brain's energy isn't tied up here, there's a lot more left over for learning stuff. So, taking some breaths actually affects even how you learn in the moment.

**What are the core emotions? Are there universal emotions? How many emotions are there? Are there millions, are there four, are there five?**

Some scientists will tell you that there are six and some will tell you that there are 22 or 24. I think if you look at the evidence, there's not really good evidence for either of those answers. In fact, there's evidence against both of those answers. I would say there are no core emotions and there is no set of universal emotions. What's universal is affect. Your brain regulate your body, your body sends sense data to your brain, and you feel it as affect because that's how you're wired, that's how everybody's wired. Affect is like this kind of general barometer that lets you know how your body budget's doing. And that's true for everybody.

As far as we can tell from all the cultures that have ever been studied, that's universal.

But more than that, how you make sense of, for example, there's one culture where the prescription for what you're supposed to do when you're afraid is go to sleep.

**Interesting. Yeah, that's way different than what we do.**

Right. If we were to translate that into a Western meaning making, the analogy would be play dead so the threat doesn't take any interest in you. Go to sleep. That's not typically what we think of as the modal response to fear, the stereotypical response to fear in our culture. If you don't understand that, that just means that you don't have that kind of mind that was pickled in that kind of culture. You have a different kind of mind that was pickled in a different kind of culture. In a neurotypical brain, everyone is equipped to run. But when you run, how you run, that's not universal.

**Is love an emotion?**

Here's the thing, to people who believe that there are different mechanisms for emotion and for cognition, for thinking, and for perceptions, for seeing and for thinking and whatever, that's a really meaningful question. To me ...

**Not meaningful at all.**

Not meaningful. Mechanisms are all the same. It doesn't matter whether you're thinking or feeling or seeing or hearing or whatever, it's all the same mechanisms. Your brain is taking in sense data from the body and from the world and it's using past experiences to make sense of what that means. Is love an emotion?

**We're labeling it that through our brain almost.**

Sometimes when people ask that question, they're asking because they're looking for evidence of something. So for example, sometimes people ask that question I'm guessing because there's this belief that we are less in control of our emotions than we are of our thoughts, which is really false, actually. So this is something I talk about in how emotions are made.

My book that is in print now and my new book, this is something I talk about in both books, although in a bit of a different way.

The idea that you're not in control of your emotions, the moments of emotion, and therefore you're less responsible for them. And you're less culpable for them. So, if we say that love is an emotion, then it means that you're sort of less responsible for what you do.

**Well, no. Can't love be an emotion but you're still responsible for what you do?**

You can but I'm saying when people ask that question, that's usually why they're asking. It's like, you can't help who you love. Well, okay, sure, but you can help who you put yourself in proximity to. If I don't want to eat potato chips, I don't put potato chips in my cupboard and then try really hard not to eat them. I just don't have them in my cupboard. You can't help who you love, you can't help who you become attached to is sort of not true. But what it means to be in control is different than what people usually think. They think about overcoming something in the moment as opposed to making good decisions to architect your environment in such a way as to not let certain things happen.

**I like the architecting environment angle. How do we work to overcome or, we still have to function. How do we make good decisions when we're feeling emotional? How do we architect an environment? Those are sort of like three separate questions.**

Well I think the first thing I would say is that, when you're in an emotional episode, people often do make really good decisions. The idea that emotions are foibles that they kind of trip you up is a really old view that is not supported by the evidence. It's not supported by the evidence. Do emotion sometimes trip you up? Yeah. Does thinking sometimes trip you up? Absolutely. So there are just times when you're making good decisions and times when you're not. But it's not really aligned with whether or not you're emotional or whether or not you're being rational or thinking. Even the whole idea that your brain is a battleground between emotion and reason battling it out for control of your behavior is a very old story, but it's a myth. That's not how your brain works.

You brain didn't evolve that way, doesn't work that way, it's not structured that way.

**Talk to me about that because we tend to think there's this continuum when we're making decisions between emotional brain and rational brain. And you sort of want to know where you are on that continuum. And society sort of seems to nudge us towards more rational and less emotional as if they're sort of less valuable in some way.**

You have one brain. You don't have two brains or three brains. You don't have an emotional brain, you don't have a rational brain. There's no part of your brain that's devoted to emotion that isn't used when also in moments when you are being rational. That's the first thing to understand. Certainly there are times when you feel more in control of your behavior and times when you feel less in control of your behavior. Meaning there are times when your behavior feels more automatic and there are times when it feels more effortful. Your actions feel more effortful. There are times when affect is very, you're feeling it very strongly. Those are moments where we would typically, the brain would typically be making emotions. That can trip you up, it can also lead to great moments of heroism and great moments of valor.

We tend to think about emotional moments as hot and intense and rational moments as cool and not intense. But that really just has more to do with how much affect you're feeling in that moment. And in fact, you can have very rational decision making when there's a lot of affect going on.

**Are there certain things that we can do to make better decisions when we are feeling emotional?**

This is what I say to my students too actually, whenever you hear something or you see something and you have this intense reaction of I love it, this is awesome, or a really negative reaction, intense negative reaction, like I hate this, that's stupid or I hate that person or whatever, those are the moments to just stop. And use the intensity of your affect as a cue to stop and interrogate what's going on.

If you love something, you're reading something or you're hearing something on the news maybe or you're watching a YouTube thing or whatever and you love it, whatever was just said validates some deeply held belief that you have. And whenever you hear something that you hate, that just violated probably some deeply held belief that you just had. So stop and take a moment and think about it, and try to observe what's going on. If you take a moment before the heat of the moment has you in its grip, you will make better decisions. But that's not about really being emotional or being rational. That's about using your affect as a cue, using it as a barometer, what it was designed by evolution to be, as a cue, that this might be a moment where you want to slow down for a minute and take stock.

**What are the things that we can do environmentally? You mentioned sort of not having the chips around. Are there other things that you've learned that we can increase our environment to nudge us toward or put us on the path to success?**

A lot of things that we know of that help to put us on the path to success are things that are only easy for people to do who have enough privilege to have control over their environments. So things like getting enough sleep. I said, if you could only pick one thing, that would be the thing, but not everyone actually has that luxury. Ambient noise is random kind of loud bangs and kind of loud noises. What happens, for example, if you live in New York or whatever. Eventually your brain stops hearing that noise. It just becomes background.

**But every time I go there, it's like, holy cow, what is going on?**

Right. It's really hard on your nervous system because your brain is trying to figure out what is signal and what is noise. What do I need to pay attention to and learn and make sense of and spend on and what can I ignore? That in and of itself, the amount of uncertainty is actually really hard on nervous system.

**It's so weird, like there'll be a firetruck that will go by my bedroom at night and I won't notice a thing. The window could even be open. But if my kids cough, I'm alerted right away to what's going on.**

**I often can't even go back to sleep because if I wake up, I'm on high alert. It's not even like I wake up and it's like what happened? Oh, they need me. They don't need me at all. They're back asleep and I'm wide awake and wired.**

This is the reason why when my daughter was six weeks old, I told my husband, she cannot continue to sleep in our room. I will never get another night's sleep ever in my life while this kid is in my room. Because every little thing, I would hear every little thing. And now we have a puppy and it's exactly the same thing.

**Talk to me more about sort of the brain interpreting things, and it's almost like a reality distortion.**

No, it's not a reality distortion, it's a reality creator.

**Reality creator. Okay, so what can we do, understanding that, I'm thinking is there anything thing that we can do to get closer to truth or reality, like understanding that our brain is sort of stimulating and interpreting and sort of making meaning, is there anything we can do to make to get closer to what's actually happening or closer to some sort of objective truth if you will? Like when that person cuts you off, or you're going to make meaning out of it and make sense of it, is there anything that we can do to get closer to the reality of the world versus the reality of our head?**

Well, the reality of your head was wired by the reality of the world, of some world that you grew up in. So oftentimes, what happens is that the micro-wiring of your brain is shaped by one kind of world, and then you move to a different kind of world. And then it's really expensive to retool. Some brains do it well and others don't. Then mistakes are made and things become very expensive in various ways.

I'm going to answer your question assuming that your question is valid, which is that we want to be closer to reality, whatever that means because sometimes I don't know that that's always really the right thing to do. So here's an example. So somebody cuts me off, and I'm really rushing to get someplace and someone cuts me off.

But the initial meaning my brain is going to make is from my own personal perspective because of course, that's how we all see things. You can practice trying to see something from another person's point of view. So, maybe that person just didn't see me. Maybe that person's rushing somewhere. Maybe that person has a kid who's in the hospital. Maybe that person has a really important meeting to be at or something really important to take care of.

There's this saying that comes from contemplative philosophy, which is that anger is a form of ignorance. And what that means is when you only see something from your own perspective and you fail to acknowledge that there's another perspective, you are ignorant of something. What you're ignorant of is the fact that you exist in a complicated network of connections to other people.

**You just can't see something and therefore you're ignorant and angry.**

Yeah. But you can try, you can practice. What it means to have control is not to then really try hard to take that person's perspective in that moment, because that's really hard. What it means to have control is that you practice taking other people's perspective before that moment so that when that moment comes, you can do it very automatically. It's like, if you need to build a skill, you don't wait until the exact second that you need the skill and then try it. No. What you do is you practice the skill in advance until you get, really practice at it, really automatic at it, and then you can kind of do it without a lot of effort. For example, taking somebody else's perspective is one way to get closer to reality because it dislodges you from the illusion that your way of seeing things is the only way. And in fact, in science, there's a wonderful book by this historian of science, her name is Naomi Oreskes. And the title of the book is called Why Trust Science. And her argument, which is a really intriguing argument is that the way that we know that something is "true" in science, is that a group of scientists who come from diverse backgrounds, and have diverse beliefs, and diverse values, all come to consensus about what the evidence says. Then you can really have much more confidence to call that finding a scientific fact.

Scientists don't like to use the word fact, and they don't like to use the word reality usually very much.

But fact is a real no, no, it's an F word we just don't use in science because it's always conditional, it's always probabilistic. There's a wonderful phrase by Henry Gee, who is a paleontologist who works for the Journal Nature. He wrote, science is the quantification of doubt. It's not about finding facts, it's about how likely is this observation to be true in these circumstances. If you get a group of scientists who all have different backgrounds and different assumptions and they come together in consensus, you can be much more sure that what you're observing is very likely to be the case in this circumstance. However, you have no diversity in science and you have really a bunch of people with the same background and the same history and the same assumptions, and they come together in consensus, what you're likely there to have is bias. Usually bias that upholds whatever advantage those people who are making the decision actually have. But the same principle is useful in your own life I think. And that is that you can choose to try to take somebody else's perspective.

You can choose, like right now, you can look around the room, you can listen, if you pay attention to your body, there are some things that you can focus on that you weren't focusing on a moment ago. And you can change your experience. Right now, what I'm about to say, there's something that you and I are both doing right now that our brains were not tracking, our brains were tracking but we weren't really aware, it wasn't in the forefront of awareness. But the minute I say it, it will be in the forefront of your awareness. And that is your legs pressing against the seat of your chair, or your back pressing against the back of your chair. That sense data is always there but you mostly don't pay attention to it unless you're in discomfort in some way.

### **Your focus determines where your attention goes.**

So here's an example of something that's similar that I do almost every day. I'm just trying to build a skill, build a muscle. Every day as I'm walking on the sidewalk, say, I look for a weed. I look for a moment where I can feel awe over the power of nature that just will not be repressed, will not be contained by humans need to try to control it. And for me, the perfect example is a weed. When I see a weed popping up through the crack of the sidewalk, I almost always now practice trying to see that as a really wondrous beautiful thing because it's a symbol of the fact that nature is irrepressible. There are many things in life which are much bigger than you.

And when you cultivate those moments, where you realize that the world, that the natural world is much bigger than you, well, at least for me, anyways, I don't experience that as an existential crisis. I experience that as an existential break. Okay, something's bigger than me. Many things are bigger than me. That means my problems in the moment are really small and conditional. And that gives my nervous system a break for a minute. I really try to cultivate every day at least one moment where I see like a speck.

**Because it puts everything into perspective.**

Yeah. Exactly. And I try to do this whether I'm feeling stressed or not, whether my brain has been busy trying to prepare me for expenditures or not because I'm trying to build a muscle and keep it fit for when I need it.

**That's an excellent place to end this conversation, Lisa. I really want to thank you for your time. This has been phenomenal.**

Oh, it's my pleasure. It was so much fun talking to you.

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