Welcome to the Huberman Lab Podcast, where we discuss science and science-based tools for everyday life.
I'm Andrew Huberman and I'm a professor of neurobiology and ophthalmology at Stanford School of Medicine.
My guest today is Dr. Lisa Feldman Barrett.
Dr. Lisa Feldman Barrett is a distinguished professor of psychology at Northeastern University.
She also holds appointments at Harvard Medical School and Massachusetts General Hospital,
where she is the chief scientific officer of the Center of Law, Brain and Behavior.
Dr. Barrett is considered one of the top world experts in the study of emotions,
and her laboratory has studied emotions using approaches both from the fields of psychology and neuroscience.
Indeed, today you will learn about the neural circuits and the psychological underpinnings of what we call emotions.
You will learn what emotions truly are and how to interpret different emotional states.
You will also learn how emotions relate to things like motivation, consciousness, and affect.
Affect is the term that refers to a more general state of brain and body
that increases or decreases the probability that you will experience certain emotions.
During today's discussion, Dr. Feldman Barrett also teaches us how to regulate our emotions effectively,
as well as how to better interpret the emotional states of others.
You will also learn about the powerful relationship that exists between our emotional states and the movement of our body.
In fact, much of today's discussion is both practical and will be highly informative
in terms of the mechanisms underlying emotions, and it is likely to also be surprising to you in a number of ways.
It certainly was surprising to me.
I've been a close follower of Dr. Feldman Barrett's work over many years now,
and have always found it to be tremendously informative.
And when I say her work, I mean both her academic published papers,
as well as her public lectures that she's given and her two fabulous books on emotions in the brain.
The first one entitled How Emotions Are Made and the second book,
which includes information about emotions but extends beyond that,
entitled Seven and a Half Lessons About the Brain.
As you'll see from today's discussion,
Dr. Feldman Barrett is not only extremely informed about the neuroscience and psychology of emotions,
but she's also fabulously good at teaching us that information in clear terms and in actionable ways.
You'll also notice several times she pushes back on my questions,
in some cases even telling me that my questions are ill-posed.
And I have to tell you that I was absolutely delighted that she did that,
because you'll see that every time she did that,
it was with the clear purpose of putting more specificity on the question,
and thereby more specificity and clarity on the answer, which of course she delivers.
By the end of today's discussion, you will have both a broad and a deep understanding of what

emotions are
and their origins in our brain and body.
You will also have many practical tools with which to better understand and navigate emotional states.
And moreover, you will have many practical tools in order to increase your levels of motivation and better understand your various states of consciousness.
Before we begin, I'd like to emphasize that this podcast is separate from my teaching and research roles at Stanford.
It is, however, part of my desire and effort to bring zero cost to consumer information about science and science-related tools to the general public.
In keeping with that theme, I'd like to thank the sponsors of today's podcast.
Our first sponsor is AteSleep.
AteSleep makes smart mattress covers with cooling, heating, and sleep tracking capacity.
I've spoken many times before on this podcast about the fact that sleep is the foundation of mental health, physical health, and performance.
One of the key things to getting a great night's sleep is to control the temperature of your sleeping environment.
And that's because in order to fall and stay deeply asleep, your body temperature has to drop by one to three degrees.
And in order to wake up in the morning feeling refreshed, your body temperature actually has to increase by one to three degrees.
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It's a mattress cover that allows you to control the temperature of your sleeping environment at the beginning, middle, and end of your night.
And in doing so, allow you to fall and stay deeply asleep throughout the night and wake up feeling extremely refreshed.
I started sleeping on an AteSleep mattress cover well over two years ago, and it has greatly improved the quality of my sleep.
If you'd like to try AteSleep, you can go to AteSleep.com slash Huberman to save up to $150 off their Pod 3 cover.
AteSleep currently ships in the USA, Canada, UK, select countries in the EU, and Australia.
Again, that's AteSleep.com slash Huberman.
Today's episode is also brought to us by Levels.
Levels is a program that lets you see how different foods and behaviors affect your health by giving you real-time feedback using a continuous glucose monitor.
One of the most important factors impacting your immediate and long-term health is the way that your body manages its blood glucose, or sometimes referred to as blood sugar levels.
To maintain energy and focus throughout the day, you want to keep your blood glucose steady without big spikes or dips.
Using Levels, you can monitor how different types of foods and different food combinations, as well as food timing and things like exercise, combine to impact your blood glucose levels.
I started using Levels a little over a year ago, and it gave me a lot of insight into how specific foods were spiking my blood sugar and then leaving me feeling tired for several hours afterwards, as well as how the spacing of exercise and my meals was impacting my overall energy.

And in doing so, it really allowed me to optimize how I eat, what I eat, when I exercise, and so on, such that my blood glucose levels and energy levels are stable throughout the day.
If you're interested in learning more about Levels and trying a continuous glucose monitor yourself, go to Levels.link slash Huberman.
Right now, Levels is offering an additional two free months of membership.
Again, that's Levels.link, L-I-N-K slash Huberman to get two free months of membership.
And now for my discussion with Dr. Lisa Feldman Barrett.
Dr. Lisa Feldman Barrett, welcome.
Oh, it's my pleasure to be here.
I've wanted to talk to you for a very long time.
I'd like to talk about emotions.
I think everyone has a sense somehow of what an emotion is, feeling happy, feeling sad, feeling excited, feeling curious, perhaps.
There's even emotion, I don't know, you'll tell us.
What are the core components?
What are those sort of macronutrients of an emotion?
Because I know there's a debate about whether or not we should be talking about emotions versus states, but what is an emotion?
We all are familiar with what one feels like to us, but from a scientific perspective, how do you define an emotion?
Well, this is a scientist's debate about this.
Nobody in the last 150 years has ever been able to agree on what an emotion is.
And I think from my perspective, the interesting but tricky bit is that anytime you want to talk about what the basic building blocks are of emotion,
none of those basic building blocks are specific to emotion.
So for example, there are a group of scientists who will tell you, well, an emotion is a coordinated response where you have a change in some physical state,
a change in the brain, a change in the physical state, which leads you to make a particular facial expression.
So you've got physiological changes in the body, changes in the brain, changes in the face or in motor movements.
But that describes basically every moment of your life.
Your face is always moving in some way.
If it wasn't, you would look like an avatar basically.
So we're constantly engaged in movements and those movements have to be coordinated with the physiological changes in the body
because whether we're in a state that we would conventionally call emotion or not,
because the physiology is supporting the glucose and the oxygen and all the things that you need to make movements of your body.
And of course, all these movements are being coordinated by your brain.
So of course there's a coordinated set of features that doesn't really describe how emotions are distinct from any other experience that you have.
But the claim was for a really long time that there would be diagnostic patterns.
So when something triggered fear, you would have an increase in heart rate and you would have a

propensity to run away or to freeze
or not just to fall asleep, although that is something animals do when they are faced with a predator.
But that's not part of the Western stereotype for fear.
So that wasn't what scientists were looking for.
And also that you would make a particular facial expression which was presumed to be the universal expression of fear,
where you widen your eyes when you gasp.
That set of facial movements in other cultures, like in Melanesian culture, for example,
is a symbol of threat, where you are threatening someone.
You are threatening them with aggression, basically, is a war face.
But in Western cultures, that's the face that Western scientists believed was part of that distinctive pattern for fear.
And so the way that scientists defined emotion for a long time was these kind of states where you'd see this diagnostic ensemble of signals.
And that would mean that anytime someone showed one of those signals, they may move their face in a particular way
or their heart increased at a particular time, you'd be able to diagnose them as being in a state of fear
as opposed to a state of anger or sadness or whatever.
The empirical evidence just doesn't bear that out.
And so it was kind of a mystery.
The mystery is, how is it that you feel angry or sad or happy or full of gratitude or awe?
It is it that you experience these moments, but scientists can't find a single set of physical markers that correspond with each state distinctively, right?
In a way that you could tell them apart.
That was a really big puzzle for a really long time.
I have to ask you about this perhaps myth, perhaps truth about facial expressions and emotions.
Because as you were explaining the core components of emotions, I had to think back to the classic textbook images of the different faces associated with fear, with delight, with confusion, and on and on.
We will get to that and your opinions on that scientifically informed opinions, of course.
But there is a bit of a myth that the emotion system and the facial expression system run in both directions.
For instance, people will say, if you smile, it's harder to feel sad or anxious.
I can't say that's been my experience, but I very well could be wrong.
So we know that when people's emotional states change, their facial expressions often will change, right?
If you see someone crying on the street versus somebody smiling really big, we can make some assumptions about what might be going on internally for them.
But put simply, is it true that changing one's facial expression can direct shifts in the brain and body, perhaps, that change our emotional states?
If you'll permit me, what I would say is that your question is ill-posed.
So first of all, it presumes that there's an emotion system and that there's a facial expression system.
Now, clearly, there's a system for moving facial muscles, okay?

But a movement is not the same as an expression.
A movement is a movement. An expression is an interpretation of the meaning of a movement.
Not all movements of the face are expressions.
And this is, you know, a problem. It's a problem in science.
It's often the case, I think, in my experience in the science of emotion, but elsewhere too, that scientists in their efforts to make their work meaningful to people
will try to interpret their findings in ways that the average person would find interesting.
Or the way that a physician would find interesting, or a teacher, or what have you, to be able to use this information.
But then they forget that they're actually making an interpretation and they start to refer to their observations with the labels of interpretation.
So facial movements are facial movements. People move their faces and those movements have meaning, but they're not always to express an internal state.
In fact, one might think that they're very rarely to express an internal state.
So I don't know that there's a facial expression system either.
So that's, there's certainly, like I said, there's a circuitry for moving a face, but what those movements mean is highly variable.
And so that would be my second point that where I would say, when you see someone crying on the street, you are not looking only at their face.
You might be aware that you're focusing on their face.
That might be the part of the entire sensory ensemble that you are focusing your attention on.
But your brain is taking in an entire ensemble of signals.
As you know, it's taking in not just the movements of the face, the tears or whatever.
It's taking in all of the entire sensory array, the sounds, the smells, what's going on inside your own body.
Your brain is being bombarded with signals from all of those sources.
And when it's making a meaning out of any signal, it's doing it in an ensemble of signals.
So research shows that babies' cries aren't acoustically specific to when they're tired or hungry or right.
You can, I can show you a video without context and show you someone crying.
And you might make a judgment, you might think, make the stereotypic judgment in the West.
Oh, that person is sad.
And then we pan out and really, you know, it's a little girl whose dad just came home from Iraq or something, right?
So brains are always interpreting faces in context.
They're making guesses.
This is something that I've talked about quite a bit, that we don't read movements in people.
We don't read emotions in facial expressions.
We make inferences about the emotional meaning of facial movements.
And we do it in an ensemble of other signals, the context, if you will.
And that's really what's happening.
So do I think that there is feedback from the face to the brain?
Sure.
I mean, there's feedback from every muscle.

But there's this constant conversation between the brain and the body.
The brain is sending motor commands.
The body has sensory surfaces, which are sending signals back to the brain.
So if the face is influencing the brain, it's doing so in a way that's not special.
It's doing it in a way that works for all other parts of your body, too.
And I guess what I would say is kind of a long-winded answer.
Over time, your brain has learned that certain patterns of signal over time recur.
And so if you're smiling, if your brain is telling your facial muscles to move in a particular way that looks like smiling,
it's happening in a larger ensemble of signals, and then the brain is predicting what's going to happen next,
because it's learned over time what happens next.
So, probabilistically so, if you think about that as cause, then sure.
But it's not this simplistic kind of idea that an emotion is triggered.
It causes facial muscles to move in a particular way.
And therefore, if you just pose your face in that particular arrangement,
that will somehow feedback to the emotion system and change that system,
because there is no emotion system in your brain.
And the causation just isn't that, it's not that simplistically mechanistic.
That makes sense to me. I frankly never bought the idea that just smiling would make me feel happy, especially if my internal state was not one of happiness, like fighting the internal state.
Also, in the early 2000s, I think it was, there was a lot of discussion about how positioning the body in certain ways,
you know, taking up more space would allow people to feel more powerful,
especially some of these studies and argued that there were even hormonal shifts associated with taking up more space
that were associated with feelings of empowerment, and then when shrinking of oneself was associated with elevated cortisol states.
And as I say all this, I want to be clear that I do not take a simplistic view of the nervous system or endocrine system.
And I don't think that you were implying that either.
I just want to make sure that anyone listening or watching isn't thinking that, for instance, that cortisol is bad.
Cortisol is wonderful and essential. You just need it regulated properly.
Or that the idea that the body and emotional states are an extricable link makes a ton of sense to me.
But the idea that you could just, you know, grab onto one of the nodes in the emotion,
and now I have to be careful not to say motion system, like position of the body, like being hunched over makes you depressed.
No, that never made sense to me. Taking up more space makes you feel more powerful.
That doesn't, it can't be that way. And yet we were told for about a decade through, especially through popular press, that this stuff was true.
And so what I love about your work is that it includes a neuroanatomical, a psychological, a network perspective that there isn't one seat of emotions and so on.

So if we could go a little bit further into the facial expression piece for a moment.
Sure.
I was taught in my psychology and neuroscience textbooks, because it was right there in front of me, that there were some core categories of facial expression
that were universal cross cultures that conveyed something about the internal state of the person.
That the downward, you know, lips in the corner and some and maybe even a furrowing of the brow was associated with negative valent states like sadness, perhaps even depression.
That the opposite of upward turn corners of the mouth and widening of the eyes was delight and excitement.
Some of that feels pretty true to my experience, but how do you and other serious scientists of emotions view that somewhat classic literature now?
Yeah, so I'll just say that my, my journey here, my scientific journey was not one of attempting to overturn a centuries worth of.
Are we allowed to swear? Bullshit, basically. I mean, it's just, it's like, it's, it's stereotyped, it's basically Western stereotypes enshrined as scientific fact.
And that sounds like a pretty harsh thing to say, but I think I pretty much stand by that at this point.
But for me, when I was a graduate student, when I was an undergraduate in psychology and in physiology and in anthropology, you know, I also had read that Darwin said that there were these distinctive facial expressions that were coordinated with specific emotional states,
the specific states of the nervous system. This was Darwin's view. And I assumed it was correct until I started to try to use that information in the lab and everything fell apart, you know.
So when you show someone in a laboratory, like a student or somebody from the community, a face, a disembodied face, where they're, the person's eyes are widened in the face and they're gasping like a stereotypic fear expression.
Most of the time they don't know what it is. And so I would try to use these faces and as stimuli and experiments and they weren't working the way that they were supposed to work.
And there were really going all the way back to the beginning of psychology. There were always debates about whether or not this was actually accurate.
And there's a really interesting story about how Darwin came to this idea, which I can tell you about, but it's not because he cared about emotion.
And he was basically taking his own very Western views about emotion to make some claims about evolution, actually.
So I have more to say about that and about why it's a problem to take anything that anybody said, even Darwin from, you know, 150 or so years ago, or whatever it is, and treat it like it's a modern text.
You know, he was writing at a particular time for a particular purpose. And that doesn't necessarily mean that whatever he wrote is true.
But I'll just tell you what the evidence says.
That there has been in psychology a debate, really vicious debate, actually, for probably 50 years about the nature of facial expressions and whether they're universal and whether there's this one-to-one correspondence between a particular face and like a facial configuration and a particular emotional state.
Smiling and happiness, scowling in anger, wrinkling your nose and disgust.
And so in 2016, I think, the Association for Psychological Science tasked me and some other senior

scientists with attempting to write a white paper, a consensus paper on what the literature actually shows.
So what does the research actually show? You read all the research, you know, can you find a pattern there? Does it actually reveal anything about whether or not facial expressions are universal, particularly for emotion?
And the way they do this, they have a journal for this purpose for taking a widely held belief that is highly debated and bringing together a panel of experts who disagree with each other at the outset.
And they have to work together to see if they can come to consensus over the data.
And this is something that, you know, people have tried in the past.
And I mean, they're really vicious. People have been vicious with each other over this question.
So when we brought together a group of people, several people refused to serve, senior scientists refused to serve on this panel.
A lot of fear of losing their funding or something.
You know, that's a whole other conversation about why a certain scientist would not want to engage with people who disagree with them.
That's an interesting conversation to have, but I don't think it's as simple actually as just their careerists or they care about, you know, their money or funding or whatever.
That would be an easy answer, but I don't actually think that's what's going on.
But that's another sort of...
But anyway, so there were five of us who got together, all senior scientists, all from different fields.
Some of us hadn't met each other before. We all knew of each other, of course.
And we met over Zoom for two and a half years.
This is pre-COVID because people were all over the world, right?
And we read over a thousand papers.
So I was the only one in this group of the five of us who...
My starting hypothesis was that facial movements are meaningful, but they're not...
There's no one-to-one correspondence between a particular facial configuration like a scowl and anger.
Not just that it would vary across cultures, but that it varies for you across situations.
I mean, do you scowl every time you're angry? I don't scowl every time I'm angry.
In fact, and I also scowl at times when I'm not angry.
And there are scientific reasons to think that the collection of facial expressions that people make when they're angry or when they're sad or whatever would be highly variable.
So that was my starting position. And then there were varying four guys.
I just refer to them as the guys because it was me and four guys.
And the guys, to some extent, thought that facial expressions were universal, but they had differing reasons for hypothesizing that.
And they also had different degrees of commitment to that position.
But we right off the bat sort of agreed that it didn't matter who was right. That was just not relevant.
The only thing that mattered was that we could come to the consensus over the data.
And if we couldn't, we had to really pinpoint why.
So what would be the critical experiments that would have to be done in order for us to come to consensus over the data?
And we also agreed that we had all kinds of contingency set up.

So you've got five senior people who are all running big labs and they're investing upwards of three years working on a paper.
So if we can't come to consensus, what are we going to do?
Are we going to write one paper and sort of write about the process or are we going to write separate papers?
But we had all these contingencies laid out.
But the key here, I think, is that we agreed that we were not going to be adversarial about it because it didn't matter who was right.
And in fact, if somebody had to admit they were wrong and someone was going to have to admit they were wrong,
I mean, it turns out all of us were wrong about something, but we were going to be supportive of each other and really encourage each other.
Because, you know, being wrong is no one likes to be wrong, but for scientists to admit they're wrong is hard.
And it's something that we should encourage each other to do, I think, more and more publicly.
And I think the people who do that are really brave.
And so that was my position and they all agreed.
And the long story short here is that two and a half years, a thousand papers later,
we all very reasonably came to consensus that there was no evidence for facial expressions of emotion being universal.
And that instead what there's clear evidence of is that facial expressions, the way that people move their faces in moments of expression,
is highly variable, meaning sometimes in anger you scowl, meta-analyses, so statistical summaries of many, many, many studies,
even in the West, show that people scowl about 35% of the time when they're angry, which is more than chance.
So it gets you a good publication in, you know, the proceedings of the National Academy.
But that means 65% of the time people are moving their faces in other meaningful ways.
That's not scowling.
So if you actually used a scowl or even, you know, a scowl in blood pressure or, you know, just maybe not one signal,
but a couple signals, but you would be wrong more than half the time.
You would miss more than half the cases.
And even more importantly, I think, that's the reliability question.
So there's lower liability for the correspondence between a scowl and anger.
It's above chance.
So scowling is one expression of anger, but it's certainly not the dominant one.
And there is no dominant one.
It's just highly variable, depending on the situation that you're in.
So sometimes when I'm angry, I sit quietly and plot the demise of my enemy, you know?
Sometimes I smile in anger.
Sometimes I cry in anger.
It really depends on the situation.
But more importantly, half of the scowls that people make are not related to anger.

That means that the specificity is, again, higher than chance, but not that much higher than chance.
So if you see someone scowling, the chances are that they might not be angry.
They might be concentrating really hard or they might have gas.
I mean, there are a lot of reasons why people make a scowl.
And we found this for every emotion category that had ever been studied.
And I want you to notice what I just did there.
I'm no longer referring to an emotion as if it's an entity or a thing.
So anger isn't one thing.
It's a category of things, a grouping of things.
And if I'm not mistaken, it includes verbs, right?
Like anger as a set of verb actions in the brain and body.
It's a process.
It's not an event.
Exactly.
It's not a noun.
It's a verb.
And it's a process.
But the point is that it's a highly variable grouping of instances.
If you are talking about all instances of anger, all instances of anger that you have ever experienced or witnessed
is a highly variable grouping of instances that vary.
That doesn't mean they're random.
But what the body does in anger depends on what the physical movements will be in anger.
And that depends on the situation that you're in and what your goal is.
And there are ways to talk about that in neuroscience terms, which are a little more precise.
But the important thing to understand here, I think, is that we're only talking about western cultures now.
The minute that you go outside of the west to, or even to the east.
I mean, so there are other cultures that have been studied like China and cultures in China and Japan and Korea.
They all have access to knowledge about western cultural practices and norms.
So what happens when you go to remote cultures, which have much less access?
So it's not like they have no access because we live in a globalized world.
So even hunter-gatherers in Tanzania, the Hadza, have access to western practices and norms, but much less, much less.
And we did do that.
And all bets are off there.
I mean, most of the time they don't even understand or experience facial movements as having anything to do with emotion.
So if they saw an emoji of a smiley face, would they just assume it was a couple?
They might think it's a face.
Because as we both know, there's some fairly hard-wired brain circuitry for the two eyes and a line beneath it and something in the middle that pseudo knows.
That organization of just spatial features queues up face for most primates, including us.

It's really interesting that you say that because, yes, of course, that's true, but it's not there at birth.
What's there at birth is a preference for that configuration.
And we could talk about why that's there.
It's actually very controversial.
But newborns orient to that configuration, but it doesn't have to be a face.
And then very quickly they start learning faces because they're exposed to face.
I mean, really the first three months of life is almost like a massive, continuous tutorial on what faces are because they're being fed.
And everyone's in your face.
So a baby last night and you see the baby of some friends and have an unbelievably cute baby with big cheeks and there's this desire to see the baby smile.
So you do the things that, and if the baby shows some sort of facial expression that makes it seem like it's a little bit like resistant.
What you're doing, you stop doing it.
You change up your strategy.
And then when baby cracks a smile, now I'm going to assume that the baby may or may not have been happy inside that little baby head.
But when they do, there's a reciprocity, then we smile.
Exactly.
And so there's a template that's very robust.
Right.
But I want you to notice, though, that, so first of all, I'm not saying that recognizing a face as a face is not hardwired.
It is, but it's hardwired by not by genes alone.
Right.
And in fact, there's a really wonderful book called not by genes alone.
Basically, there's cultural inheritance.
We have the kind of nature that requires nurture.
We have the kind of genes that require early learning.
We have, we need wiring instructions from the world to get the rest of the information that we need to be competent, culturally competent in our, in our, in our lives.
And that starts at birth.
It probably starts before birth, even.
But in the third trimester, there's some evidence of learning fetal learning, even in the third trimester.
So the point is not that people aren't hardwired for viewing faces or recognizing faces.
It's just, where does that hardwiring come from?
It's not by genes alone.
Genes aren't the blueprint.
The brain is expecting certain inputs from the world and it needs that because infant brains are wiring in themselves to their world.
And part of that world is people making faces of them and smiling.
And those people happen to also be the ones who are maintaining, who are maintaining that baby's nervous system.

I mean, there is reward learning, right?
Or reinforcement learning right off the bat because these are the people who keep you comfortable.
They are the ones who feed you.
They're the ones who help you get to sleep and so on and so forth.
And so you're going to be very, very sensitive to changes in the contingencies of their behavior.
Your brain as a pattern learner is just going to learn those patterns.
If we know that smiling is a cue for happiness, it's because we've learned it.
And that doesn't mean that that learning isn't hardwired.
It just means that that information got into your brain by cultural inheritance, which is a part of evolutionary theory in the extended evolutionary synthesis,
not in the original formulation that some people still kind of stick to.

So it's far more nuanced than it was presented to me in those textbooks.
And it sounds like it was outright wrong on many dimensions.
Well, can I just mention one thing now?
Please.
This is really serious stuff.
Like sometimes people think, well, you know, what's the big deal?
This is such a big deal.
I'll tell you why it's a big deal.
Because in our culture, people believe that they can read mental states of other people by their face.
And they believe it so much that it's enshrined in the legal system.
And there are people who lose their lives because juries believe that they can read remorse or the lack of it.
And in fact, there was just a case last year, I believe, where the Innocence Project got involved because there was a woman who was on death row.
And what put her on death row was a police officer's claim that he could read her emotions by the comportment of her face and her body.
And, you know, it was possible to get a stay of execution so that she could be retried and, you know.

So I'm not saying she was guilty or not guilty.
I'm just saying what put her on death row was evidence that would not be admissible in a scientific way now.
And there are lots of cases where judgments are made that end up impacting people's lives in pretty serious ways.
So this is a really serious thing.
And it's puzzling to me why it's got such traction, this idea that there are these universal expressions that we can use to read each other.
You know, it's just not true.
I mean, the science just, it's so overwhelmingly.
I feel like, you know, scientists, I don't like to use the t-word, you know, the f-word fact.
You know, it's a scary word, t-word truth.
But I think in this case, I feel like I can really, at least with a little t, I can use it.
You probably have particular facial movements that you make on a regular basis that are tells for you.
I know I do.
You know, my husband can look at my actions and he can make really decent guesses about what's going on for me upstairs, right?
But that's because he's known me for 30 years, actually 30 years today.
Congratulations.
We met each other 30 years ago today.
But he's, you know, brains are pattern learners.
So I'm not saying that everything is random and that there's no, it's all noise.
I'm saying that there just aren't these, you know, universal templates.
They just, it's not like that.
And we really have to stop assuming that there are.
Well, I'm so glad that you're getting that message out there.
I'm very thankful that you highlighted the seriousness of this, these myths that have propagated.
And that's a perfect segue into what I was already going to ask, which is, it's based on something that I think is in very much agreement with what you're saying.
A previous guest on this podcast, I think it was our first guest episode, Dr. Carl Deisroth, colleague of mine at Stanford, incredible bioengineer.
And really, you know, 0.01% in his, you know, category of science as well as a practicing psychiatrist said something which really stuck with me over the years, which I once heard him say, you know, we don't really know how other people feel at all.
In fact, most of the time we don't even know how we feel.
And that prompted the question for me about how good or poor are we at gauging our own emotional states, and in particular at labeling them both to others and for ourselves.
And so here's the direct question.
Is language sufficient to capture this incredibly complex thing that we're calling emotions.
So for instance, the other day I was in New York with my sister, then she left, I went out for a bit, I was having a pretty good day and then I returned to the place where I was staying and I was hit with this feeling of intense loneliness.
And I don't know why.

And then I had a bunch of ideas about how that related to growing up and I was going to see friends the next day and I'm an adult and so I could use some top down regulation and say, you know, maybe I'm a little tired or I didn't because I hadn't slept as well the night before.
I've been pretty rested recently and then I actually wrote in my journal I said, you know, maybe most of feeling good is being pretty well rested and not in any physical pain.
That's a big part of feeling good is the absence of fatigue and the absence of physical pain.
And, and then I thought, wow, that's just so basic.
There's like two building blocks is clearly insufficient.
But then I couldn't think of a word to adequately describe the emotion that came about an hour later when I was feeling a little bit better, but not completely better.
So was I lonely?
Not really.
Not anymore.
Was I sad?
Not really.
But, you know, as I had headed out into the city, I was thinking, I don't really have a word for how I feel.
I'm sort of okay.
Not great.
Not low.
You know, and so I think that we have emotional labels.
I certainly do for peaks, you know, these peak emotional states super happy.
I loved the time with my sister.
We do this every year.
This was a particularly good year for us to do this and it went really well.
We're texting back and forth how great it was.
I certainly know what it feels like to be really down in the pits.
I've got language for that.
But then there's this huge range in between.
And so I guess the simple question is, should we even trust the language as a way to understand how we're feeling or their additional, if not better signals that we should perhaps learn to understand.
Perhaps learn to elaborate our understanding of emotions with.
So I'm going to give you a simple answer and then I'm going to give you a more complicated answer.
So the simple answer is no, language is not sufficient.
Period.
I think the way that you have, well, I should say one language is not sufficient.
English is not sufficient and probably French on its own is not sufficient and probably Swahili on its own is not sufficient.
Although it's very interesting that the states that we mark with words in each culture, some of them overlap, but a lot of them don't.
And it's very, very useful to have labels of emotion concepts from other cultures that capture configurations over a state that we don't really mark.
We don't mark those and sort of distinctively pull them out as different from other states.
I'd love to know what some of those are.

I should have brought them with me.
I mean, there are some like, there's one, there's a German word, which I can't remember the name of the word, but it's like the experience of someone having a face that deserves a punch.
I'm sure someone will tell us in the comments.
Someone, someone who knows German or spend time there, please put that word in in the comments, but don't don't punch anyone.
Another one that's my favorite is ligut, which is a, it's a Polynesian head hunting emotion word.
And it means exuberant aggression in a group like soccer or head hunting.
Right where you're basically, or I should say also in the military.
So when I was listening to NPR one day a couple of years ago, it must have been more than that because it's in my book.
So it was probably more than seven years ago.
I was listening to these guys talk, these former military personnel talk about being deployed in a war where they're with their buddies and they're,
they're basically hunting the enemy and they feel exuberant.
Like they're, you know, and, and they're, it's not that they're happy, but they're, it's pleasant and it's very intense, very high arousal.
You know, and in the moment it, it seemed right.
And then they come back, you know, and they ask themselves like they come back and so they're now, you know, their deployments ended.
Now they're back home and they're like, am I a psychopath?
Like I enjoy killing people.
What is this about?
And I was thinking, no, no, you just experienced Ligut.
And if you had a word for it, you would understand that it's a groupie feeling where you're all in it together and it's really intense.
And, you know, they were experiencing the intensity of having their life on the line and being responsible for their, for their brothers, you know, and sisters in their troops.
And, you know, so the, the, what they would realize is it's perfectly, it's perfectly within the range of normal human variation.
It's just that in English, we don't have a word for it really.
But there are words, there are concepts in other languages, right?
Or the other one that I like is called Giggle, which is where when you see a baby who's really cute and you just want to like, oh.
And they experienced yesterday evening.
The kid was so cute.
There's little cheeks.
There's just like jumping at you.
And the parents are delightful people too.
And they was just facing out because they had one of those outward facing baby things.
And it's just sort of like, yeah.
It's Giggle.
It's called Giggle.
Giggle.

Oh, Giggle is from the other episode that we did on Health with Health.
Well, it also has to do with babies, but yeah, in a different way.
Or there's one in Japan.
I think there's a Japanese word for the despair that you feel when you got a bad haircut.
Really?
Yeah.
Cause it's, I mean, it's really is a different kind of feeling than, you know, cause you've got to like wait for it to grow out, you know, whatever.
Anyways, the point being that words for us mark particular states and they're not all that they're not always the states that other people in other cultures care about.
But there's a, but even again, the freezing of your question, I just want to come back to and I'm not trying to pick at you, but.
Feel free.
What I love is that what you said before, when you said my question was ill posed.
In your, in the answer that followed, it made it very clear why and I learned something about how the, the, the not emotion system, but the things plural that, that create emotions work.
So feel free.
I grew up in the same culture that you did.
I'm not Canadian by birth, but, but in the academic culture, you know, I mean, the stuff that we take online, by the way, folks is nothing compared to the kind of hazing that I experienced growing up in, in academic culture as it was done then.
I don't know if it's still that way now.
So feel free.
I'm tougher than I look.
Well, I think my point is that I'm trying to get at here is that when we ask questions, any of us, me too, anybody asks a question, there are certain assumptions that we're making in order to allow us to pose the question.
And sometimes what I'm taking issue with is not the question itself, but it's the assumptions behind the question.
Right.
And this is a very classic thing in philosophy of science, which I know I just said the P word philosophy, which scientists, you know, usually they roll their eyes back in their head and the fall over when you talk about that.
But I think it's really important.
So, you know, Ken language is language sufficient to label or to, to, to gauge emotional states kind of sounds like, and this is the assumption that people make that there's a state in here called an emotion.
And now I have to label it.
I have to identify it.
That is not how it works.
Like that is not what your brain is doing at all.
And in order to explain what I think is happening and what I, my best available guess, you know, like based on what I understand, it's like not even remotely that, that is just not a

meaningful question at all.
I do think words are important.
I just don't think that they have to be insufficient by virtue of what the brain is actually doing.
And the way that I come at this is just really different from a lot of my colleagues.
So really for a hundred years at least, I hate when people say things like that, like for a hundred years, but it really is like for a hundred years at least, what psychologists and neuroscientists do or did and are still doing is they start with a folk experience, a folk category, a common sense experience.
I feel angry.
I'm making a decision.
I'm having a memory.
I'm remembering something.
They start with their experience and then they go looking for the physical basis of that experience in the brain or in, you know, in the body.
I think that's really problematic because not everybody in the world actually uses those categories or has those experiences.
A lot of that has to do with the scientific publication process.
For sure.
One of the most important statements I ever heard is from the late Ted Jones, one of the greatest neuroanatomists of probably the last 500 years, which was the following.
He said, a drug is a substance that when injected into an animal or a person produces a scientific paper.
That is wonderful.
Yeah.
It kind of gets you square in the face.
Can you go, oh, right.
I mean, basically every drug disrupts, if taken an hour or two before sleep, changes the amount of REM sleep that you get.
So I could imagine that almost any perturbation of the language system, the body, the facial movement system could give you a quote unquote effect that you could write a paper about.
Yeah.
But that doesn't mean it has any semblance whatsoever to what's happening in the world when we or other people experience emotions.
And here's the, you know, there's so much in what you said that I just want to, it's very exciting to talk to you.
So the first thing I'll say is that, you know, we often will identify, we as in the people, but also scientists, identify biological signals by what we believe them to mean psychologically.
So serotonin is a happiness chemical.
No, serotonin evolved as a metabolic regulator.
It is a metabolic regulator.
And whatever it's doing, it's allowing an animal to spend resources when the animal, the animal's brain isn't sure there's a reward at the end of that, right?
So you were saying before, you know, the absence of fatigue, the absence of discomfort, that's a pleasant feeling, right?

Well, yeah.
So maybe serotonin has something to do with pleasantness because it has something to do with energetics, right?
Cortisol.
Cortisol is on a stress hormone.
It's not a stress hormone.
I mean, it's a hormone that is secreted more when the brain believes that there is a big metabolic outlay that's required.
That's what stress is, basically.
It's the brain believes there's a big metabolic outlay that's about to be required.
And it matters.
These kind of like little semantic tweaks, like they matter a lot because of how we do, because of how we do research.
So I would say I don't start with the categories that derive from English and my own experience.
I start with the nervous system.
I try to learn what is the best available evidence for how that nervous system evolved, how it developed, how it structured, right?
Anatomy, to me, is very important.
Some of my best hypotheses come from just learning the anatomy and realizing, oh, well, there's a connection there.
That's direct.
That should mean something.
I mean, I could give you lots of examples of where we've made discoveries solely because we noticed a set of anatomical connections and we're really curious about what they might be involved with.
But if you start with that premise, then you think about the brain and I think about the brain in a really different way, right?
So I don't think about the brain as a stimulus-driven organ.
I think about it more like this, that the brain is, first of all, the brain is not running a model or making inferences about the world.
All the brain knows are signals from the sensory surfaces of its body.
So your brain is modeling your retina and it's modeling your cochlea and it's modeling the sensory surfaces of the skin.
And, sure, signals hit those surfaces and those surfaces transduce those signals and send them up to the brain, but the brain only knows the body.
And anything it knows about the world, it knows about the world through the body, through the sensory surfaces of the body.
So that's the first, for me, really big important point.
The second important point is that I think about the brain as being trapped in a dark silent box called your skull.
And it's so weird saying these things to you.
You're so much, you're this really esteemed neuroscientist and here I am explaining to you how I think the brain works.
It's just very...

Well, it's important for our audience, but it's also important for me even though, yes,
I know these facts, but it's, I believe, it's always informative to go back to the fundamentals because we forget.
Actually, I would say that someone once described, I'll call him the great because he's a great visual neuroscientist, Tony Moveshin who founded the Department of Neuroscience at NYU once ago.
A real intellectual is somebody that can appreciate and work with a topic at multiple levels of granularity.
Right, for sure, for sure.
Right, it's not about...
And oftentimes, the more expertise is associated with more focus on detail.
So I love returning to the core basics.
So I think it's wonderful.
Okay, okay.
Please continue.
So I think about the brain as being trapped in this box and it's receiving signals continuously from the sensory surfaces of the body, but those signals are the outcomes of some set of changes.
And the brain doesn't know what the changes are.
It doesn't know the causes of those signals, it just knows the outcomes, it knows the signals.
That's what it's receiving.
And so it has to guess at what the causes of those signals are in order to stay alive.
And so that's in philosophy called an inverse problem.
So the brain just has a massive continuous inverse problem that it has to deal with all the time.
Like it can't have, it doesn't have access to all the information.
It's just a guessing machine.
It's a guessing machine.
So for example, if you hear a loud bang, what is that loud bang?
Could be a car door slamming.
It could be thunder.
It could be a car backfiring.
It could be a gunshot.
The brain doesn't know.
It has to guess.
And it's not making a guess like an intellectual guess.
The guess is a motor plan.
It's a plan for changing the internal state of the body in order to support motor, skeletal motor movements.
Do I need to run?
Do I need to shut the window?
Do I need to get an umbrella?
Do I, you know, do I need to hold my breath because a car is backfired?
You know, what do I need to do?

So where does that plan come from?
Well, it comes from past experience, the experience that's been wired into the brain.
I think that the evidence suggests that what the brain is doing is basically reinstating bits and pieces of past experience, so remembering, although we don't experience ourselves as remembering, but basically it's re-implementing ensembles of signals from the past that are similar to the present in some way.
Now a bunch of things which are similar to each other in psychology is a category.
So what the brain is doing is it's creating, it's constructing a category.
And in fact, we think about the brain as a continuous category constructor.
It's constructing a category of possible futures, possible outcomes, possible motor plans, and how does it know which is the right one?
Because it's not just picking one.
There's going to be some sample that it's re-implementing, but how does it know which one?
Which is the right one?
Because there can only be one.
Well, I feel like in the example of a loud noise, what I immediately thought of as you were describing that is that my system would become aware of it, I would become aware of it, but then it's a question of, is there another loud noise?
How closely are those loud noises spaced?
Is it getting louder or less loud?
And so a bunch of categories, it's like a bookshelf with an infinite number of books, but then with the second loud noise, now it's just one wing of the library.
And then with the next thing that happens and the context, it starts narrowing and then pretty soon you get presented with the book that says the roof is about to cave in.
And I think your analogy there is pointing out two things.
One is that really what the brain is attempting to do is to reduce uncertainty, because uncertainty is super expensive.
Now sometimes we deliberately cultivate uncertainty, we deliberately try to learn things that we don't know, we put ourselves in novel situations, we seek novelty and because it's fun and interesting and whatever, sure.
But imagine every single waking moment of your life was like that, where you couldn't narrow things down from the library to the wing to the bookshelf to the particular shelf on that bookshelf to the...
Be terrified.
Yeah, it would be...
Terrifying.
That's the label I would give it, it would be terrifying, because I couldn't plan anything or do anything because all possibilities are open.
Right.
That's just actually metabolically unsustainable and there are some brains that are wired in a way that they don't predict very well, they don't create these categories very well and so they're dealing with really unbelievable amounts of uncertainty.
So that's one thing, part of what's the goal here, if you could say there's a goal, is

to reduce uncertainty.
And I'm going to get to why this has anything to do with emotion in a minute, but I just need to set up the ground rules or the assumptions of what I'm working with here.
So the other thing though that you pointed out, which I think is really important is that none of this is static, it's all evolving over time, the signals are evolving over time.
So both the signals that are constantly hitting the sensory surfaces of the body and making their way to the brain, but also the intrinsic signals in the brain, it's all changing over time.
So when we talk about context that's important, how is the brain making a decision about similarity, like what are the features that are similar, it's not just at a single snapshot in time, it's always happening dynamically over time, right.
And most of the time though, you don't ask, you don't wait to hear a second sound, you're not deliberately attempting to figure out what the sound is, your brain is just sorting it out, right.
And it's sorting it out by narrowing down the possibilities and there are some selection mechanisms in the brain that help it guess better.
But also the signals coming from the world are also helping to select which possibility is the right one.
I'd like to take a quick break and acknowledge our sponsor, Inside Tracker.
Inside Tracker is a personalized nutrition platform that analyzes data from your blood and DNA to help you better understand your body and help you meet your health goals.
I'm a big believer in getting regular blood work done for the simple reason that many of the factors that impact your immediate and long-term health can only be analyzed from a quality blood test.
However, with a lot of blood tests out there, you get information back about blood lipids, about hormones and so on, but you don't know what to do with that information.
With Inside Tracker, they have a personalized platform that makes it very easy to understand your data, that is to understand what those lipids, what those hormone levels, et cetera mean, and behavioral supplement, nutrition and other protocols to adjust those numbers to bring them into the ranges that are ideal for your immediate and long-term health.
Inside Tracker's ultimate plan now includes measures of both ApoB and of insulin, which are key indicators of cardiovascular health and energy regulation.
If you'd like to try Inside Tracker, you can visit insidetracker.com slash Huberman to get 20% off any of Inside Tracker's plans.
Again, that's insidetracker.com slash Huberman to get 20% off.
There's this scene that comes to mind from that movie.
I think it was Saving Private Ryan where the guys that are about to hit the ground on D-Day are flinching with every crack of gunfire.
Everything's a stimulus to move.
And then some of the more seasoned soldiers are literally having bullets whizzing by their head and people are dropping dead all around them and they're moving forward steely-eyed and stable and upright.
In part, we look at that and say, okay, they're courageous, they're seasoned, maybe they're desensitized in certain ways, but actually it fits much better with the idea based on

what you're saying.
It fits much better with the idea that they have intimate knowledge, both conscious and unconscious knowledge, that something right next to them is a threat, but not a threat worth responding to.
Right, exactly.
But if it were headed straight for them, they would quite understand what we're talking about.
What I would say is that it's not...
I keep referring to things as signals and really that's my generic word for a quantity of energy of some sort.
But my brain, every brain is constantly making signal, noise, distinctions, do I need to care about this?
Do I not need to care about this?
And we have ways of learning and we also have ways of queuing each other, so humans use eye gaze to queue each other about what is signal and what is noise.
So if you and I were sitting, let's say we were at a coffee shop and we were in a part of town that I had never been to before and we were sitting having coffee and a loud siren went by.
If you turned and looked, I would probably turn and look because you just queued me that that was something I needed to care about.
If you ignored it, I would probably ignore it because you just queued me that I didn't need to worry about it.
I didn't need to care.
And we're constantly doing that with each other and we also do it with little babies and with kids and that's how we teach children.
This is signal, this is noise.
You need to worry about this.
You can ignore it.
And so yeah, your description is perfect.
So what does this have to do, any of this have to do with emotion?
In order to answer that part of the question, I want to say, so okay, you've got these signals.
The brain has these electrical signals going on.
We'll just ignore the hormonal signals for the moment because one is complicated.
So it's got all these electrical signals going on.
And it's remembering something, it's just basically reinstating a pattern of signals.
And it's got these signals coming in from the sensory services.
Okay, so what is the brain doing?
It's a signal processor, so I don't mean a computer, I mean a signal processor in the engineering sense.
So what is it doing without getting into all the dynamics of prediction and whatever?
What the brain is doing is it's assembling a set of features.
Some of the features that it's assembling are very close in detail to the sensory surfaces of the body.
So in primary visual cortex, there's a retinotopic map.

The details there are very, very low level, like a line, an edge, same thing in primary auditory cortex, right?
It's tonotopic.
So there are tones.
And it's very, very, very low level details.
And we might, there are many, many, many, many of these little features.
So we would say it's a high dimensional array, lots and lots and lots and lots of features.
And then, and let's just talk about one structure, just the cerebral cortex.
Let's not worry about, but what I'm about to say is basically true of really the rest of the brain as well.
If you take the cortex off the surface, the cortical sheet, off that wavy, you know, cortical sheet, you dig it off the rest of the brain, the subcortical parts, and you stretch it out like a napkin, you can see there's a compression gradient there in the architecture of the neurons.
So at the primary sensory areas, there are these tiny little pyramidal neurons that are representing these very low level features.
And they feed into bigger neurons, which feed into bigger neurons, which feed into bigger neurons.
So what's happening is you've got this very detailed array being compressed in its dimensionality until you get to the middle of the brain at the front, where there are many fewer neurons, but they're bigger and they have many more connections.
So it's a dimensionality reduction that's happening.
Also just to make sure I understand correctly and that the audience understands, the physical world obviously is transformed by our sensory apparatus, the retina, the cochlea, the sensing neurons in our skin.
It's physical things, mechanical pressure, light, photon, sound waves, okay.
That's translated into neural code, which is chemical and electrical.
And those sensory inputs are fairly vast in these high dimensionality.
So lots of different orientations of lines.
Even though it originates with just three cone photopigments, lots of opportunity for encoding different shades of color, contrast, okay, and all of that.
And so you have lots of little neurons to represent all the possibilities of the physical world that are occurring.
But as that information is passed further up along, excuse me, I have to be careful with the use of hierarchies because that's controversial nowadays, not for political reasons, but for accuracy reasons.
As that information is passed along, there's more convergence onto a smaller number of larger neurons.
So these are neurons that have access to a lot of information, but in coarser form.
Right.
So they're low.
It's like compressing an MP3, like how an MP3 compresses information, for example.
So the cortex is representing features.
So and I represent, I'm just using that in a generic way because that's also controversial

about exactly how it's the, okay, but yeah, but for now I'm using it just in a generic way.
So you go from lines and edges to a shape, like a round shape to a face to, right?
So you're basically, you're going, what's happening is there are summaries of summaries of summaries of summaries.
I love that.
I hope everyone hears that because I've been in this field of neuroscience a long time.
As you move along the nerve axis from the sensory epithelium, now it sounds very nomenclature-ish, but from the surface of the skin inward, you're getting summaries, more and more summaries.
I think that's so important.
That's like a gazillion dollar statement for understanding of the nervous system.
So but each of those points correspond to some mental feature, like a line or an edge or a circle or a square or a face or, right?
But now then you, when you're in the midline at the front, what are those features?
Well, those features are things like, they are, they are multimodal summaries, meaning they're summaries of the sights and sounds and smells and, right?
But they, and they are lower dimensional, meaning they're, they're coarser.
So they're things like threat, reward, pleasure.
I mean, really abstract.
That's what abstract means.
It doesn't mean that those representations have no sensory or motor meaning.
It means that threat, for example, a summary can have many different patterns associated with it and the brain is treating them all as equivalent.
This to me, again, feels so, so important for people to understand because as I'm hearing this and this word summaries is just ringing in my mind, it's so important because one of the core components of my experience, of my emotions, because that's all I can really say for sure, my subjective interpretation and labeling of my own emotions is that they are pretty broad bins, like I described earlier.
They are pretty broad bins.
And so that's where I was exactly where I was going.
So what about the word anger?
Where is that represented?
Well, that's, that's one of these multimodal abstractions.
In fact, anger is just a couple of phonemes.
It's a couple of sounds, but those sounds, the sound of anger corresponds over thousands of instances that you've learned in your life to very different patterns of sensory motor features.
That's right.
What's going on in your body during anger can vary.
What the way you move your face in anger can vary, depending on the situation.
What you see someone else doing in anger can vary.
And so the word anger or any word is actually just a multimodal summary of many, many, many, many, many instances, which are in their sensory and motor features.
The sensory and motor meaning very different.

And it seems to me are highly constrained by developmental and cultural experience because just today I learned that there's a word in Japan for the feeling that one has of having gotten a haircut they don't like.
There's a word in Germany that pertains to the feeling of wanting to punch someone specifically because of the look on their face.
To you, it feels like they're asking to be punched in the face.
So you added yet more dimensionality to it.
So upon learning just those things just today, there is additional dimensionality brought in such that if I were to ever want to punch somebody in the face simply because of the look on their face, that I wouldn't necessarily label that as anger alone.
It now has another dimension to it.
And so I think I'm finally starting to understand how the developmental and the cultural influences plus the fact that language is a pretty crude descriptor for this neural process that you're describing.
Oh, it's absolutely.
Absolutely.
But before you use the word granularity, and so I'm going to use that word too.
In fact, I've coined that phrase emotional granularity.
This is an aside, I coined that phrase almost 30 years ago, and now people study it like it's a phenomenon, which is cool in a sense.
But also I kind of want to keep reminding them that's a word that refers to a process.
It's not a thing.
It's a process.
But the process is, so when the brain is a category constructor, how fine-grained are the categories?
How precise are the categories?
If your feature of equivalence that your brain is using is threat, you're in really big trouble because there are like a gazillion different sensory motor patterns that could go with threat.
So your category is going to be massive.
So how does the brain figure out which of those massive number of options is the one to use in this instance?
If on the other hand, you don't just want to use sensory motor patterns as the features of equivalence or the features that you're using to say this instance right now is similar to these past instances, if I had to search like right now, what is similar to right now?
It would be me sitting across the table from somebody who has a beard and is dressed in black, and there are a lot of details there that probably don't matter.
So you'd be searching for a specific match from the past.
That's not very efficient either.
So you need something in the middle, and that is to say your brain has to be able to make categories that are more fine-grained, but not super fine-grained, but they have to be more fine-grained than just threat.
You want to keep in the library analogy that I made earlier, you want to keep the rest of the library accessible at some level.

So you're not just staring at that one book.
But if you use the category bad, this feels bad, then your brain is basically going to be partially constructing an entire wing full of books, like an entire wing full of options.
If you use the word angry, then maybe it's a bookcase.
It's constructing a bookcase full of options and a category that's the size of a bookcase.
And if you were using the word frustrated, then maybe it's a shelf.
The brain can learn to construct categories at different scales of generalizability.
So if I'm in an instance and my brain is making a guess, is it drawing from past instances that were associated with the word anger, were associated with the word fear?
Maybe it's some combination.
The words are just features, they're just sounds.
There are also all sorts of other features, like what was my heart doing?
What kind of motor actions did I make?
What did I see next?
So the point being that I'm trying to bring here is that it's not like your brain creates an emotional state and then labels it.
What your brain is doing is creating a category of possible futures, of what it's going to do next.
And that state is largely determined by what the brain is remembering and how it's drawing from that huge population, that huge library of options.
Which books is it sampling?
I love this so much because it explains so much that frankly has been perplexing to me and also somewhat troubling to me.
For instance, we hear about emotional intelligence and sometimes I wonder whether or not true emotional intelligence would be what you just described, the understanding of how this process works so that you can work with it.
And I definitely want to talk about how one can work with this knowledge because I think it's incredibly powerful in its explanatory power but also its actionable power.
The other thing is that it's clear to me just based on my experience today of hearing these words from other cultures that relate to different emotional states that unlike a lot of systems in the brain, I like to think is fairly plastic.
The moment that you know that there are additional dimensions to sadness, anger, et cetera, there's something comforting about that.
What's really unsettling is the idea that we have such broad bins that we would define a near infinite number of situations as just fear.
That would suck.
That's not a good existence.
And yet I have to ask whether or not you think that as a species, not as a culture but our entire species, whether or not we are taking the exact opposite approach that we're sort of moving into the emojization, is that a word?
I'll make it a word and people can assault me in the comments.
The emojization of this very rich and complex system, we're starting to get into this mode of I'm going to post an angry face and therefore I'm angry at you.
This is a bad interaction.

It's potentially combative.
Or maybe Twitter, X or Instagram or other social media sites are kind of the epitome of this where you reduce this high dimensional space.
You keep the sensory stimulation very high.
It's movie after movie after movie and color and sound and people doing crazy parkour stuff and bears eating giraffes or whatever it is, probably not bears eating giraffes.
You know what I mean?
And you can see stuff that's sexual and violent and political and emotional and sweet.
And then the cats are kissing the monkey and you're like, or the monkey is kissing the cat.
And so it's high dimensionality in terms of sensory space.
But then what do we call it?
We're like, oh, this is an emoji.
You assign an emoji.
You're hearting something.
You're giving a thumbs up or a thumbs down.
I almost feel like we're trying to, we're regressing to a state where we're kind of like an infant trying to figure out like what the hell is going on.
And we're saying, you know what, you get like six categories of response when in reality we should probably be expanding the number of different responses that we can have in order to accurately match the way that our nervous system actually works.
Yes, exactly.
There are many different things we could talk about with respect to the summary that you just gave, which I think is completely accurate.
So what I would say is that if you look through even just the last, I don't know, hundred or so years, like the 19th, you know, 19th, 20th centuries, maybe you can see that the complexity of the, of people's responses expands and contracts, right?
So for example, this is something that I've written really speculatively about, but one of the things that I found really interesting is that, you know, authoritarianism, authoritarian thinking is the reduction of complexity to some things that are really, really simple.
Like you're getting rid of all the complexity to, you know, basically these very, very coarse low dimensional judgments and things become black and white.
It's the avoidance of complexity so that there can be simple, single answers to things.
And it happens in human culture at times and then there's an expansion of complexity at times too.
So what predicts that?
Like what is it in the human nervous system or our collective human nervous, you know, like we're, we're just a bunch of brains attached to bodies interacting with other brains and bodies, right?
So like what is it that causes these ripples of and, and I have some thoughts about that that are really, really, really speculative.
But I think the other thing that's, that's really important is that we've talked about it was a little go back to our, our cortical sheet that we've, and by the way, this is just one compression gradient in the brain.

There are others too, right?
There are at least four others that I can think of.
So this is just one.
But all compression gradients work the same way, which is that now we've talked about going from the low level details, compressing to these multimodal summaries, these really like simple features that are right.
But that compression is what engineers would call lossy, meaning you lose the information.
You lose the information.
So when you go from lines and edges to a face, those neurons, they just know the face.
They don't have, they lose what they've thrown away.
The details they've thrown away, those details are gone for those neurons that are representing a face.
They don't have access to that.
They don't have access to it.
So we said, well, the brain is making a guess.
It's making a guess about what these, what this big, very, very high dimensional, you know, soup of signals in the world and in the body, like, what do they mean, right?
When the brain makes a guess, it starts with the compressed low dimensional signals.
It starts with the features like anger or like threat, or it starts with these summaries, and then it has to infer or guess at every synapse, there's a guess that's being made about what the details are at the next level.
Because what's happening is the guess is basically the brain going from these really general things to these very specific sensory motor patterns.
It happens along the cortical sheet.
It happens also down the nerve axis, down the nerve, you know, from the cortex to the midbrain to the brainstem to the spinal cord.
You have to go from a representation of, you know, run to the actual physical movements of muscles, spindles and, you know, angles of joints and things like that.
So what you're doing is you're going in the other direction.
You're adding detail, you're particularizing, and the brain is guessing.
Well, if it's using anger as the general feature, well, which instance of anger is it?
And what are the specifics that are going to happen?
And what are the adaptive steps that I might take or not take?
Because I'm quoting a lot today, so forgive me, but in the words of the great Sherrington, Nobel Prize-winning physiologist, the final common pathway is movement.
And movement is nuanced, right?
Humans, I suppose, have among the greatest variety of different speeds and types of movement.
I think about parkour, gymnastics, think about then what a cheetah can do.
Cheetahs are impressive.
A gymnast is truly impressive in terms of the range of movements and speeds, et cetera.
In any event, the ultimate choice that a nervous system has to make is whether or not to move, which direction, how fast, or stay still, move forward, move back.
And I'll just add, because I'm hoping that you'll expand on this, it's been said before that ultimately the nervous system is trying to make decisions about yum, yuck, or meh.

Like, am I going to move towards something?
Am I going to move away from it, or am I just going to stay put?
Well, that's only at the, that's a very, I would say that those are very low-dimensional features.
Those are those compressed features, but that's not the only thing the brain has to decide.
That's just a misnomer.
Well, I can get out of this little pickle that I just put myself in by saying that.
I didn't say that.
Now I won't quote who did, because he's a very famous neuroscientist,
but he tried to reduce it all.
He's at Caltech.
He's not somebody who studies emotion.
He studies the visual system.
But he said that the neural circuits, maybe it's because he studies mice,
are essentially bend into yum, yuck, and meh outputs.
And I've always liked it on the one hand, because threes work, and it's simple,
but rarely is the way that we describe things the way it actually works.
So we would, you know, in studying humans, we would say, well, that's affect.
Affect, that's mood.
Or, you know, it's just like, is it, should I move towards it?
Is it pleasant?
Should I move away from it?
Is it unpleasant?
Or, you know, is it irrelevant?
Basically, I don't care.
Okay, think about when you're feeling horrible.
You just feel, you just feel, you feel bad.
What do you do?
You don't know what to do?
You don't know, because you don't have a plan of action.
And that's ultimately, that is what those, those compressed like summary features,
those very low course features, they have to be decompressed into details.
Otherwise, you don't know what to do.
So ultimately, what the brain is doing is it's sampling from the past,
based on similarity to the present, to plan an action.
And when I say action, I don't just mean skeletal motor action, like moving a limb.
The first actions that are planned are the actions of coordinating the heart and the lungs.
And, you know, all of the internal actions that are required to support the motor,
the skeletal motor movement.
So your brain is making, is categorizing and making a, it's, it's creating a category.
And it's, there are options there.
Those options, the motor plans begin with, should the heart beat faster?
Should it beat slower?
Does blood pressure need to go up?
Should the, you know, should the blood vessels constrict or should they dilate?

Should the breathing be deeper or more shallow?
I mean, those are the first plans that get made.
And then milliseconds later, there are the skeletal motor plans.
And then your experience of the world derives from those motor plans.
Those visceral motor, that is the plans for the viscera, for the internal organs,
and the skeletal motor.
So I'm just going to refer to them as motor.
Those motor plans actually give rise to your experience of the world.
There's not some state that exists as an emotional state, which then you apply a label to.
The label is just a set of features that are useful for generalizing from the past to the present.
And the bin size or the, you know, of what a word refers to can change.
It can change.
It's different for different people, and it can change in your lifetime.
And you can add new bins.
That is, you can, so for example, there's a, there's a concept Gisgen look,
which I probably just butchered.
So if you speak Turkish, I'm sorry.
But it's like, it has features of it, of like loss and like people blocking your goals.
So we would say it's anger and sadness together.
That's Gisgen look when you lose something and you're pissed off about it.
That's a, but that's a category on its own, right?
It's just a different way of parsing that, that, that really detailed soup.
And the more words, you know, the more words are just useful for
pointing to a set of features that are similar to each other.
So what I mean by that is, if I say to you, Andrew, I had pizza last night for dinner,
pizza, two sounds, two syllables, that those two syllables sat, they stand in for like 50
different sensory and motor features.
Because I don't have to say to you, I had a food, I didn't have pizza last night,
but let's say I did.
I had a food that was round and flat and had sauce and also cheese.
And it had mozzarella cheese and also a little Parmesan cheese.
And it had mushrooms on it and a little bit of olive.
And, you know, that's like really, really detailed and complicated.
But instead I can just say, I had pizza, two features, two sounds, two syllables, phonemes.
And with those two phonemes, I have just communicated to you in your brain.
My brain had 50 features.
It was representing of details.
And now I have just communicated those to you or some number of them with two sounds, very
efficient.
Now, of course, you might think that I was from Chicago and had deep dish pizza.
And I'll just resist.
I don't want to like offend anybody from Chicago.
It's not pizza.
That's not real pizza.

I'll say it.
That's not real pizza.
Right.
So you could then ask me, oh, was it, but you're from Chicago.
Is that deep dish pizza?
And then I would say, no, no, I'm actually from Toronto, which is just like New York.
And so, no, it was thin crust pizza, which is really the only kind of pizza there is.
Just saying.
But, you know, but my point is that words are just stand in for,
they're just low, these like low dimensional features, these, these sort of gross features
that stand in for many, many, many, many little detailed features.
And that's how we communicate with each other.
And we are constrained by, you know, what we know in our, so, and what we can say and the extent of our vocabulary.
And I'll just say that little babies, three months old, they don't speak yet,
and they don't understand language, but they can use words to learn abstract categories.
So what abstract just means that, that the word refers to many different patterns
of sensory motor features.
So the word is, or the category, the things that make the instances similar
are a function or a goal, not like the sensory motor features.
So you say to a baby, very explicitly, like, because if we're talking about three,
four month old babies, right, babies can also do this implicitly too.
But in experiments, you say to a baby, look, sweetie, this is a bling.
And you put the bling down and it makes a beeping noise.
And then you say, now this looks different, feels different, right, smells different.
Look, sweetie, this is a bling.
It beeps.
Now you take something else, which also is different.
And you say, look, sweetie, this is a bling.
Now the baby expects this to beep.
By the way, folks, just listening, Lisa just gave three examples first with a pen,
then a coffee mug, and then her very own watch, three very distinct objects,
but all of which make, that are told, the baby is told, make a bling sound.
And they will bin those three visually distinct objects,
functionally distinct objects into one single bin.
Because they make a, because they are sharing a function, which is to beep.
I think this is so important.
And if I may, I want to ask whether or not we can take this incredible understanding of emotions, because that's really what we're talking about.
Well, we're really talking about how the brain, my version of how the brain works
and how emotions emerge out of this system, basically.
And absolutely, you described it far better than I could.
And anchor that to this concept of movement, that the movement is the final common path
with the understanding that the movement system, and forgive me,

but that we have systems in the brain and body that allow us to move.
That's for sure, systems, plural, that they run in both directions.
In other words, how we feel, what we feel, our emotions has some bearing on the movements that are more or less likely for us in a given context.
And our movements clearly can also influence the way that we feel internally.
Well, I mean, so if we just look at how things are happening, here's what the anatomy tells us, that when the brain makes a guess, that guess starts as a motor plan,
starts as a visceral motor plan and a skeletal motor plan.
So heart rate changes, breathing changes, blood pressure changes,
and potentially skeletal muscle movement.
Right. And literal copies, literal copies, efferent copies of those signals are sent to,
they propagate to the sensory areas, telling the brain, telling those neurons.
This is the last time we made this, in this context, when this other stuff just happened,
the temporal context, right?
And we made these movements, here's what we saw next, here's what we felt next,
here's what we smelled next.
I think of this as the image that pops in my mind, and we should explain to people what efference copy is. In neuroscience and neuroanatomy, the connection to a structure is called an afferent with an A, and the connection's out from a structure called the efference.
But the way I was thinking-
It doesn't even matter, it's just basically, the point here is that in our experience,
in the way, the brain, your brain conjures an experience, okay? And that experience is
that you feel something first, you see something, you feel something, you act.
That's not what's happening. What's happening is your brain is preparing the action first,
and the feeling, and your experience comes from that action preparation.
So it's a copy, it's like literally you have axons that are sending motor signals down the brainstem to the spinal cord, and literal copies of those axons, like those axons have branches, that collateral branches that just send axons other places. The same signal that is being sent to your spinal cord to move stuff in your body, that same signal is being sent to other neurons in the brain as predictions of the sensations that are going to happen in a second from now, a moment from now, probably faster than a second, but in a couple milliseconds, if you move. And so yes, it is the case that what you feel is linked to what you do, and what you do is linked to what you feel, but not in this simple mechanistic way that neuroscientists and psychologists have been using forever. It's not like you're probed by a stimulus, you see something, you hear something, and then you process it and evaluate it, and then you react to it. No, that's not what's happening. What's actually happening under the hood is that based on how things are right now, your brain makes a guess, or some guesses, and those guesses start as motor plans, and the consequence of those motor plans are predicted sensations.
And then of course, sensory signals are coming from the sensory surfaces, and here's the really, here's to me the really the most mind-boggling thing about this whole explanation. If your sensory neurons in your sensory areas are already, so they're firing, the action potentials, the spiking has changed based on these prepared motor movements, so these are sensory predictions.
And when I give talks and on my website, I have some cool examples of how this works,

you can experience it yourself. You start to experience, you hear things that aren't there, you feel vibrations in your chest that aren't there because your brain is predicting, it's predicting these sensations. So let's say the sensations come, the sensory signals, I should say. So the sensory signals from the sensory surfaces of the body make it to the brain. If you have, if your neurons are already firing in a way to anticipate those signals, those signals just confirm the firing, and then they're done, they don't make it any further into the brain. So when you're predicting well, your experience is constructed completely by your brain. The signals from the sensory surfaces are there just to confirm or to change the signal. So if there's things you didn't anticipate, then those errors of prediction, those are the signals that are propagated and become compressed and stuff. And we have a special name for that in science, we call it learning. Andy Clark is a philosopher who writes a lot about prediction, predicting brain and so on. And he talks about normal everyday experience as being a controlled hallucination. That's true. Yeah. I subscribe to that. It's a fairly adaptive in most circumstances, controlled hallucination, but it has its limitations. And I mean, what you were talking about, if I could be somewhat of a summary neuron, you can tell me if my summary is
too coarse. First of all, the neural systems and the brain, let's just call it the nervous system because we're talking about brain and body are incredibly dynamic. There's a bunch of inputs, those inputs are incredibly elaborate, they get summarized, the summary prepares the body for a certain action. That's a motor commands, a premotor commands, and then some action may or may not be taken. But already, as soon as an action is taken or not taken, the whole state of the neural system is different. It's changed as a consequence of what just happened. Now, of course, when people hear that and when I hear that, indeed, I feel like, wow, it's a tough system to study because these are dynamical neural systems. And we have the technology to put people in functional scanners and look at what lights up, so to speak. We have the capacity to ask people how they feel based on questionnaires, but you can imagine that's incredibly
crude. So then you give them Likert scales of rate from one to 10, how happy or sad you are. And so you're adding some depth and dimensionality to it, but it's incredibly crude. It's nothing like real experience. And if somebody is more verbal, less verbal, maybe they somaticize more or less. I mean, the example comes to mind that occasionally you learn from social media, which often I learn from social media. And someone once said, I don't think in thoughts, I think in feels. And I thought, okay, great, you're probably also from Northern California. And then I said, wait, Andrew, stop being so judgmental. What do you mean? And I asked and they said, I experience emotions in their mind. First, as a bodily state, then the label comes much later.
That's not how it works for me. It feels fairly more integrated, a brain and body for me. But other people started chiming in. No, I think of emotion, I experience emotions clearly as a verbal label. It's all in their head. And so you start to realize that we might all be encoding the world slightly differently or very differently. And it's changing in time. So then the question becomes, you know, how, what are the anchor points in terms of our understanding of emotions that we
can work with? And the following questions come to mind. Neither you nor I are clinicians, as far as I know, I'm certainly not. I was actually trained as a clinician. Oh, there you go. I'm wrong again. But I haven't, no, no, no. But I mean, I haven't, I haven't practiced in like really gazillions of years. Okay, well, you're, you're, well, you're more than qualified to answer the

question I'm about to ask, which is, to me, there is a great conflict of information in the psychology psychiatry. And let's just call it wellness and mental health space, which is when we are feeling lousy, like not good, let's put valence on it, just lousy. I don't want, in the state that we were having an emotion that we don't want to have.
There's an entire category of information that says you need to feel your feelings.
You need to feel your feelings. You need to acknowledge that they're there. You need to go into the feeling, maybe even full catharsis. You need to amplify the feelings until they quote, unquote, leave your body. After all, Steve Jobs was into scream therapy and he helped him expunge his anger. Who knows? You get these examples. He's probably the worst example,
because it seemed like he was angry a lot from what I hear. But then there's another category of thought, which is, no, you need to use your ability to top down control, inhibition of the cortex on lower structures. Again, I'm deliberately using crude language here to say, wait, this is an emotion. Emotions pass. This is not real. This is just a limited set of high dimensionality stuff that's been summarized. And you know what? I don't need to feel this way. I can make myself feel differently. Maybe I'll go for a run. In fact, I always feel better after I go for a run.
Even this question as simple as, should we feel our feelings or should we not feel our feelings?
And of course, you would hope that this would be answered appropriately,
such that people don't go harm other people or themselves. But assuming that they're not going to harm other people or themselves verbally or physically, then you really get yourself into a bit of a pickle. We don't understand what to do with emotions, ours or other people's, because clearly, we don't understand emotions per se. So I would say, I'm going to answer your question. And then I want to also pick it the word that I want to pick it an assumption, because it's come up actually a couple of times. And there's something super important in your descriptions that I just want to pull out for the listeners, because this thing is really important. And you're doing it very naturally, but I think some people, it just bears commenting on.
So let me just deal with the question of, should we feel our feelings or use our words?
We say to little kids, use your words. Don't throw a tantrum, right? But then there's also this other feeling, well, I'll just feel it's important to feel and you don't want to have it be pent up. Or use your body and hit a pillow. I mean, there's scream therapy, bite the pillow, scream the pillow, tear the pillow. You can pay $5,000 for a week of doing this. And they'll tell you, you're going to feel better at the end. So the answer there is, it's the wrong question.
Flexibility is important for everything always. So first of all, you don't have emotions in your body. Your body doesn't keep the score. Yeah, great book title, because it's super catchy.
But with all due respect to, I think, the important work of Vanderkel, I think it oversimplified and led people to believe that their back pain was trauma and that all trauma is somaticized and it's not. No, it's not. But I would go further and say, like, first of all, your body does keep the score. Your brain keeps the score. Your body is the scorecard. That's super important. And he has done really important work. But his explanations for why things work is scientifically incorrect.
It just is. Because we don't feel things in our bodies. Everything we feel, we feel in our brains.
We don't see in our eyes. We see in our brains. Of course, we need our eyes, but we don't see in our eyes. Just like if you pinch your hand, take skin and pinch between two fingers, the skin, you don't feel that actually in your hand. You feel it in your brain.
That's the magic of the brain, in a sense. So what I would say is it depends on the situation

and what your goal is. Sometimes it is useful to use your words and sometimes it is useful to go for a run. It just depends on what your goal is. Well, both those cases that you gave, both those examples, excuse me, it's a way of shifting off the emotion. I guess what I'm asking is... Well, sometimes you don't want to shift off the emotion. Sometimes the wisest thing to do is live in the emotion. That is sometimes discomfort. Sometimes when something feels bad, it doesn't mean something is wrong. It just might mean that you're doing something hard. Well, earlier, I wrote, when you were talking about the broad categorization of emotions, I wrote down simple as good when it feels good. You're like, I just feel really great. But then when things feel lousy, that's where nuance could be beneficial. Yeah, absolutely. Because emotions are recipes for action. When you go from feeling bad to feeling angry or sad, it's a recipe for action. And I would also say, and this is an analogy, but I stand by it. I had major back surgery a couple years ago and I know something about chronic pain. It's not my area of study, but I know something about it because I've reanalyzed some data sets and I've read a lot. So I'm not an expert, but I have ideas. And I thought to myself, well, I don't want to end up with chronic back pain. So what I did was I made sure after I got through the first couple of weeks where I really needed oxycodone so that I could walk. I was up and walking the same day I had surgery, if you could call it walking, as sort of a euphemism for hobbling around with a walker. But I made sure that I felt the pain. That is, I dosed myself with discomfort quite deliberately because I wanted to make sure that I'm sorry for using Cartesian language. I don't know how else to say this. I wanted my brain to be taking in the prediction error. I wanted my brain to feel I wanted to focus attention on the changing discomfort over time because it meant that my body was healing as the discomfort got less. But my brain would never feel that discomfort changing if I took painkillers. And because the prediction error, the things that the brain doesn't predict are teaching signals. And I think it's true also in your life. Like sometimes you want to feel it because you want to feel the discomfort because it's instructive about something. And sometimes it's not. And that's maybe that's not really an answer. But the only way that you can figure that out for yourself is to do it sometimes. If you're always getting rid of discomfort, you never know when it's useful. And it is useful sometimes. But now I want to get to this point that I was making before like we are talking about feeling and emotion interchange like they're interchangeable. And they're not right. So here's how I would say it. Your brain is always regulating your body 24 seven. And your body is always sending sensory signals back to the brain about the sensory state of the body. And our nervous systems aren't wired for us to experience those sensory changes that are happening in the body in any degree of detail.

We're just not. And it's a good thing. Like right now, as we talk here, our hearts are beating and our, you know, pancreas is squishing stuff out, you know, liver is, you know, filtering and like, you know, oxygen concentrations are changing. Like, Oh, there's a whole drama going on inside each of us and our listeners. And we're largely not aware. And I hope our listeners aren't aware because if they were, they would not be listening to anything we were saying, they'd be completely, you know, in raptured or in discomfort at what's going on inside them.

Instead, the brain creates a low dimensional summary, this gross kind of like barometer, which is feeling affective feeling, we call it or you could call it mood, but scientists call it affect with an A feeling pleasant feeling unpleasant feeling worked up feeling calm feeling comfortable feeling uncomfortable. It's kind of a general barometer of the state of the body. And it's not emotion that those feelings those features of feeling are features of consciousness

because your brain is always regulating your body, your body's always sending signals back to the brain. The brain is always representing them in this low dimensional way, whether you're paying attention or not, like whether the brain is focusing, it's, you know, applying attention to those neurons or not, the those signals are there. And even when we're not emotional, you know, like, if you're driving on the highway and somebody cuts you off and you think, what an asshole, the asshole-ness of that person, that intensity of that negative affect is you experience it as a property of that person. But really, it's coming from you. It's it's not a property of that person. It's that's a feature of your experience in that moment. And affect is always there. Sometimes it's in the foreground, sometimes it's in the background, but it's always there. And it's a summary of physical things, which is why it helps to if you take ibuprofen or Tylenol, it will reduce, I mean, studies show it reduces negative feeling. If you go for a run, if you go for a walk, if you shift your attention to the outside world, then the features that of experience that are derived from the inside world diminish. That's why going for a run helps or going for a walk helps or, you know, getting sleep helps, right? These are all things where you're changing the state of your body. And so the sensory state of your body is changing. And so your affect changes. But emotions are the story that the brain tells about what caused the sensory signals that affect derives from. So what caused those changes? What do I need to do about those changes? That's that's like it's a it's a much bigger event than just these features of experience, features of consciousness, which are always there. They're always there. And in fact, in our culture, we, we pathologize people when they just experience their bodies as physical sensations and not as emotions. Like we say, oh, that person is so much somaticizing or somatizing, they're not, they should, they're really, they're, they should be experiencing emotion, but really they're, you know, just experiencing a stomach ache and that's bad. But that's actually a judgment call that is probably sometimes wrong. Sometimes it's probably better to experience a stomach ache. Sometimes it's more productive. Part of being emotionally intelligent is knowing when not to construct an emotion. You know, like right before the COVID pandemic was announced officially, I was in New Zealand giving talks and my daughter who was who was in college at that time was flying literally like I think less than a week before the pandemic was announced, she got on a plane and she flew to New Zealand to meet me because it was spring break and I always would bring her with me on spring break. And in that and I remember really vividly, I was in New Zealand, there was only one case, one case of COVID in New Zealand at that point and I, I got on the phone to my husband and I said, I'm experiencing a very high level of arousal and it's very, very unpleasant. Now, my husband knows me very well and he said, yeah, there's a lot of uncertainty and I said, I know. Now he didn't say to me, well, you're anxious and you just don't really know it because I wasn't anxious. I was feeling uncertain and as you know, or maybe people know that when there's a lot of uncertainty, there's also a lot of arousal because the brain is attempting to learn and the neuromodulators that are important for learning new things happen to also cause a subjective sense of arousal and some, they actually also modulate your autonomic nervous system so your heart can beat faster and whatever. And our go-to explanation for what that is, is to experience that arousal as anxiety. But I was uncertain and remember that how your brain, the story it's telling itself, the category it's making is a plan for action. Well, what do you do in anxiety and fear? You freeze or you run away. What do you do in uncertainty? You forage for

information. You tolerate the discomfort and you forage for information, which is what I was doing when I called and said, what should we do? Should I meet her at the airport and turn around and come back or should we have a vacation? Like I don't really know. And you know, what I ended up doing was foraging for information for another couple of days and then made a split second decision in the air when we were flying from one island to the other and might just rerouted us and we went home and then the borders closed like two days later. But my point is that this is not just psychological mumbo jumbo. You can train yourself to experience your heart pounding in your chest as determination. When my daughter, this is all in how emotions are made, these examples, but they're
true. I mean, my daughter, this book I wrote a couple of years ago, when my daughter was 12 years old, she was testing for a black belt in karate. She was five feet tall, not even, and she was testing against these like massively large adolescent boys, okay, who were like a foot taller than her. And her sensei, who was a 10th degree black belt, didn't say to her, don't be afraid. He said, get your butterflies flying in formation. And I was like, in rapture, I was like, oh my God, this guy is totally brilliant. That is the best, you know, meaning to give to arousal that changes the meaning of it. What you do when you create an emotion is you're giving meaning to those affective feelings. And you have more control than you might think in how you do that. You can do it by changing the physical state that gives rise to those feelings, but you can also change it by learning more, how to make more categories and how to make them more fluidly so that you do something different. And it's not that things will necessarily feel any more unpleasant or any less or any more pleasant. It's that the feeling becomes a source of wisdom. It's a cue to do something different. This is a case where I absolutely believe that knowledge about how emotions and affect and states of the brain and body work, which is what you're beautifully describing for people today, is extremely useful in and of itself. And I think, frankly, it's a refreshing and welcome departure from a lot of the conversations that we normally have on this podcast where we talk a lot about protocols. We talk about tools. So I think is that people can do ways they can implement the knowledge. And here, this is certainly one of those cases as well. But it's a beautiful one and a very important one where the knowledge itself, just the knowledge of additional words for different states. I love the example of putting butterflies into formation because it inherent to that is that you're not trying to get rid of the butterflies, quite the opposite. You're deploying them in certain ways. And there's an action step and a psychological step there, of course, that's required, but that it isn't a view morning sunlight for an average of 10 minutes to set your circadian rhythm, which is something that I say over and over again, I'll go into the grave saying that they'll probably put a window over my grave so sunlight can get in at this point, but which would be fine with me. But in any case, knowledge is power, something that we hear, but it's not always true. Often it's knowledge is power, but you need to do X, Y, and Z in a certain order. But here what you've provided and you continue to provide is knowledge that people can use that real estate within their brain, I'm deliberately not giving it a name, because it's distributed real estate that allows them to take an unpleasant feeling and work with it, that it has more dimensionality than we probably realize. That's becoming clear to me that rarely, if ever, is there less dimensionality. You can always give it more dimensionality by just shifting your attention. And you can practice this really. So there's a story that I tell about the brief moment when I tried to learn how to paint. And so there's an object like a cup and you have this

three-dimensional object and you want to render it on a two-dimensional canvas. So you could just try to draw the cup and then what you get is a pretty shitty looking cup. But what a realist painter will teach you to do is to take the cup and to break it apart into pieces of light. And then what you try to paint are the pieces of light. So you're transferring, your first what you're doing is you're taking this very low-dimensional course object called a cup and you're breaking it into tiny little pieces of light.
Which is what the visual system does. Which is what the visual system does. And so what you're doing is you're categorizing it differently in order to emphasize the features that are more high-dimensional, that are in there, right? They're in there, in the brain. But what you're doing essentially is you're having, your brain is applying attention to basically focus more on those details. And then you transfer the details on to the two-dimensional canvas. And what you get is a pretty decent looking three-dimensional cup on a two-dimensional canvas. Unless you're me. And then it still looks shitty. And so maybe I'll take it up again sometime in the future. But my point is that you can do that with your own sensory condition of your body. In emotion, you can deliberately focus on what your heart is doing to the best of your ability that you can sense it, right? Or you can deliberately focus on your breathing. Or you could deliberately focus on what your muscles are, how tense they feel. You can change the dimensionality of your experience by the shifting of your attention.
I love it. And forgive me for giving another example, but I think it's one that will resonate with both of us and hopefully with our listeners as well, which is the great Oliver Sacks, neurologist and author, talked about and wrote about, you know, he'd worked with these patients that were either had locked-in syndrome or severe autism or severe Tourette's or Parkinson's. And, you know, most people would, even clinicians who specialize in those areas would look at those people and say that they're living in a diminished world. It's the lack capacities that other people have. And it's all about the absence of certain abilities. And then what he did eventually was incredible. He loved animals. So he would spend time thinking about what it would be like, for instance, to be a bat hanging in the corner of a room and experience the room, not through vision, but mainly through echolocation. And he would spend a lot of time thinking about that. He also did a lot of drugs at one point in his career and stopped because they were very destructive drugs, not just psychedelics, but also methamphetamine. So, yes, he has that. But he eventually changed his practice to trying to experience human emotion, but first think about animal sensory experience. And he would do that for lots of different types of animals, octopuses and bats and all these different things. And then it allowed him, in his words, it allowed him to then interact with patients in a way where he could feel, maybe even empathize a little bit with how they experienced life. And then he would write books about it in a way, and here I'm borrowing someone else's words, that storied these people into almost greater, larger than life characters. And now, of course, he wasn't trying to detract from their suffering, but he was trying to give people an understanding of what that suffering was like through their actual experience. And he did, in my opinion, and the opinion of many other people, a masterful job in doing that. But it came through much in the same way that your art teacher said, pay attention to the way the changes in light across the object as opposed to trying to draw the object themselves. So the takeaway here that I think we're arriving at is that you've provided, is that if we add dimensionality to our description of or experience of the sensory inputs, and there's a ton of it to reach to, and we maybe even come up with some

new internal labels or language-based labels, that we can experience the world in much richer and much more adaptive ways. Absolutely. And I love your stories, and I love this story in particular about Oliver Sacks, because it resonates with my experience when I was reading Ed Young's
new book. Oh. At first, he wrote We Contain Multitudes, which I think won a Pulitzer. And then what is the recent one? Right, with the animals. An immense world. An immense world. And what I was thinking was, you know, it's a, first of all, it's a masterful, masterful, masterful book. I wish I had written that book. I wrote him a fan letter. I was like, this is such an amazing book. It's an amazing book. But because he helps you experience, so what I want to say is this, that there are all these animals that have different sensory surfaces than we do, and they can detect signals in the world that are not relevant to us, because we don't have sensory surfaces for them. And it reminds you, first of all, that what you experience as reality is really not in the world alone, and it's not in your head alone. It is in the transaction between the two. You know, the neurons in your brain and in your nervous system are also part of the reality. And so, reality is the transaction. Reality are the features that are the transaction between signals in the world and signals in your brain. And the parts of the world that some other animals experience, that we will never experience, they're not really part of our reality, because they don't interact with any of the, anything that we have. But for those animals, it's part of their niche. It's part of their, you know, niche is just the word for the parts of the world that matter to you, basically. And I was thinking that if people read this book and, you know, maybe it will help them have empathy for other people who don't have minds like theirs, and who don't experience the world in the way that they do, your description of what Oliver Sacks, his, what his, his actions were and his goals, it did occur to me that this book by Ed Young would be a great tool for helping people to understand that the way that they experience the world, it might be different than how other people experience the world. And even a little bit of a window on that, it would be a good thing. So, I'd like to ask you more about this word affect. And then I'd like to discuss how things that we do or don't do might be useful for putting us in broad categories of affect so that we might experience particular arrays of emotions. So, this is my attempt to understand affect in an effort to think about some actionable items. Absolutely. I love the word affect the way you described it, as we're setting up a potential or a series of potentialities for different emotions to occur. I make it a point to get sunlight in my eyes in the morning to try and wake up my brain and body because indeed it does that.
Broadly speaking, I make an effort to get good sleep at night because that makes everything better. Absolutely. And when I'm not sleeping well or enough, it makes everything worse. This is non-clinical, non-nuanced language. But I think most people when they hear affect and they think about the examples I just gave, kind of understand like, yeah, like when a kid is tired, they get cranky. When we're sleep deprived, we get cranky. Indeed, there are times when I'm sleep deprived and little things great on me. They're like a splinter just feels super annoying and maybe even painful. But when I'm well rested, things are going better. It's not that bad. So, tell us more about affect because I think it's a really important anchor point for us to understand emotions in ourselves and other people.
Neuroscientists think about the sensory systems for touch and proprioception, which we call somatosensation as being in the service of skeletal motor movements.

Really, our sense of touch and even vision actually also works this way.
And actually Audition does too. These senses actually serve in the brain's ability to control the movements of the body. And the same thing is true for the regulating the systems of the body. So, brains, one of their fundamental jobs are to coordinate and regulate the systems inside your body, your heart, your lungs, your gut, all the moving parts. And the information, the sensory signals that those organs and tissues and so on send back to the brain.
As I said before, those sensory signals are important to the brain's ability to regulate the body, but we don't feel them directly. We usually experience them as affective feelings, these very simple physical sorts of feelings. And then we elaborate them in various ways.
When they get very intense, those are the moments when the brain creates a motion out of them.
So, the brain's regulation of the body, the predictive regulation of the body, is the technical term is allostasis. But when I'm explaining this to the public, I use a metaphor. And all metaphors are wrong, but some metaphors are less wrong and useful.
So, the metaphor that I use is your brain is running a budget for your body. And it's not budgeting money, it's budgeting glucose and salt and oxygen and water and all the nutrients that you need to stay alive and well. And so, you can think about withdrawals from that budget, like burning glucose or using up oxygen. You can think about deposits like sleeping and eating. You can think about savings. So, when you're with a friend who you trust and everything you do actually is just slightly less metabolically expensive, right? And you can also think about taxes. Like if you are socially stressed within two hours of eating a meal, that same meal will cost you the equivalent of 104 more calories in the inefficiency that you will metabolize it because of that stress. Meaning you'll burn more energy. You'll be more inefficient in metabolizing the food.
So, it's as if you had eaten 104 more calories. Oh, so, I had it exactly backwards. And so, over the course of a year, that's 11 pounds. So, when we say that people are taxing on us. Yeah, we like it's literally true. They're language works. So, the way I describe it is that you can think about affect as a quick and dirty summary of the state of your body budget.
If things are going reasonably well, then you'll feel okay. You might even feel pleasant.
If you're running a deficit in your body budget, then you're going to feel fatigued or distressed.
And that doesn't mean something is necessarily wrong. Like, for example, when you exercise, you get to a certain point where you've reached your ventilatory load. Usually, it's like, you know, 20 minutes in or 10 minutes in or whatever, depending on how hard you're working. And you start to feel unpleasant and fatigued. But that doesn't mean that something's wrong. That just means that you're working really hard and you have to push through it. And then, you know,
when you're, you know, drink water and you know, you eat afterwards and replenish and then you're fine, right? In fact, you're better. It's a way of building a better, stronger future you.
So, affect is basically, you know, when things, when you're feeling really worked up, it probably means that something's uncertain somewhere. So, I just think about these as like quick and dirty ways of thinking about your, what your affect means. And then oftentimes, as we've said before, emotion regulation that is controlling emotion really actually is not so much about changing the meaning of affect. It's changing the affect. And so, it's useful to understand that affect is tied to the state of your body. Or actually, what is tied to is your brain's beliefs about the state of your body. Your brain is modeling the state of the body. And that's interception. That's the technical word. Interception is not your awareness of your body. It's your

brain's modeling of your body. What your brain believes to be true about the metabolic state of your body. And that's how I think about affect. That's how I think about my own affect. That's, and my daughter actually, who, you know, was depressed for, so I should say depression is like a bankrupt body budget. Like, you just can't move. You feel so fatigued that you can't move and you're very distressed. It's like bankruptcy. And actually, if you, I mean, depression is a metabolic illness. And if you look at the symptoms of depression, they really are about metabolic, having metabolic deficits, basically. And it's interesting that one of the hallmark features of depression, subjectively speaking, is a lack of positive anticipation about the future, which makes perfect sense from the perspective of a depleted body budget. Yes, exactly. And you're basically, think about the fact that prediction error, right? So if you're feeling unpleasant, you're not going to be anticipating pleasant things. And even if those things that are in the world could give you pleasure, you won't notice them. Because learning from prediction error, things that you didn't predict is expensive. And if you don't have the resources, you're not going to, right? So it's, but anyways, my daughter came up with this after we had this very interesting thing that happened to us on another trip. We were in Sweden because I was giving a keynote at the Karolinska Institute and we went, I took her to Sweden. And this is when she was recovering from depression. And like, you know, she is just one of the millions of young adults who, you know, adolescents and young adults who were experiencing depression.

And we got to Sweden and she was very, very jet lagged. We both were. It was like one of these, like, you know, we had to like, you know, planes, trains and automobiles. It was just, you know, getting there. And she woke up the next morning and she, she looked horrible. She felt horrible. It actually seemed to me like she was about to enter another depressive episode. And I said to her, I basically got her out of bed. I fed her a meal. I gave her four ibuprofen and I put her back to sleep. And she got up five hours later and she was absolutely fine. Her mood was fine. Now I'm not telling you that ibuprofen is the, an antidepressant that you should take if you're depressed. But what I'm telling you is that, you know, you said something, Andrew, that was so interesting at the beginning. You said, am I fatigued? Does my body, do I have pain somewhere? Is my body hurt? You know, these are, well, right. When basically what she was having was she was fatigued and she was having what I would call, it's called the technical word is visceral, no seception, which means her stomach hurt, her, you know, everything hurt. And sure, you know, her muscles probably hurt too, but it was really her innards. Really, she just was distressed. And the ibuprofen helped her get back to sleep and then she slept and she got up and she was completely fine. And then we walked around Stockholm for the rest of the day talking about this experience, which for her was like flipping on a light switch. You know, how emotions are made, this book that I referred to, I wrote that book for her. I wrote that book for her, but also for me, because it was a way of putting down on paper all the things that I wanted her to know that, and that I thought other people should know about their kids, you know, and maybe even their kids could read it. But what she did with that was she came up with a new concept called the emotional flu. And the emotional flu is when you're having a bad body budgeting day and you're just like, you didn't get enough sleep maybe or, you know, there's some stress at work or at school that you can't get rid of otherwise. You know, my husband likes to say, well, you know, other people's opinions of you are just electrical activity in somebody's head, which I love. Like that's just another way of categorizing it. It's sort of like taking apart

the taking apart the cup into pieces of light, right? And so whatever, there are just these moments where you feel depleted and you could use that. I mean, we usually we often use affect to as a indicator of how the world is, you know, if I feel bad, something must be bad wrong in the world. But you have to resist that sometimes because sometimes there's nothing wrong in the world. It's just that you didn't get enough sleep or, you know, you need to have a little bit more, you know, protein or maybe you haven't gone for a walk and you're stiff or whatever, you need to do some stretching.

Are those sorry to interrupt, but I think people are going to want to anchor to a few of these positive steps that they can take to, I don't want to say replenish, but to shift affect in positive directions, sleep, movement, nutrition. And I've heard you say before that we are essentially amino acid foraging machines. So yeah, I noticed you said protein. You didn't say you need a bagel. You said protein. We could go down that rabbit hole. Maybe we do. Maybe we don't. But I want to use this also just as a quick opportunity to say, as you're saying all this, one can immediately understand why alcohol and drugs of abuse are both so compelling, right? You're not feeling well. So you're feeling tired, take a stimulant that releases dopamine and epinephrine, but you're taxing, you're already taxed body budget in a way that then puts you in a more depleted state later. Or alcohol, like you feel lousy. And alcohol never did this for me, but friends I have who are recovered alcoholics will tell me that it was like a magic elixir. It made them feel right. That's their language. But then of course, there's a price to pay later, because then it drops your baseline below where it was initially.

Absolutely. 110%. But I just also want to say that so is serotonin. So are SSRIs maybe. And when I say maybe what I mean by that is, if you really have a metabolic problem, like say something's wrong with your mitochondria, or you're recovering from an illness, or there's just some metabolic problem in your body, that metabolic problem is real. If you start to feel unpleasant, you will, I mean feel unpleasant, your mood will be negative. If you start taking serotonin, if you start taking SSRIs, which will leave more serotonin in the synapses of your neurons before it's taken up again, that will juice the system. You will be able to spend, you'll be able to move, you'll feel like you have more energy for a while. But your nervous system is a complex system. And so it's going to make adjustments elsewhere to try to deal with that budgeting problem. So exactly what happens when you take drugs of abuse, and what happens on the short term can happen for some people with SSRIs on the longer term, where at first it starts to work, and then it stops working and you start to gain weight, and because your metabolism is slowing, because your brain is attempting to deal with that budgeting problem. So it really matters what the source is. It could be that your brain believes you have a budgeting problem, but there really isn't one. It could be that there really is one. These things matter to how you treat it. One thing to just mention about SSRIs, and I unfortunately, for reasons of confidentiality, I can't cite the source on this, but let me just say that somebody who's highly informed in the landscape of pharmaceutical treatments for psychiatric challenges has told me that there's an emerging theory among psychiatrists. It's kind of a collective emerging theory that one of the reasons why nowadays you hear about so-called treatment-resistant depression, but you did not hear about so-called treatment-resistant depression prior to the advent of SSRIs is that there's a growing body of thought in the psychiatric community that SSRIs may, over time, as you're pointing out, deplete the very neural systems that subserve enhanced mood. So it's different than a drug of abuse that gives you a very acute

effect, like methamphetamine or cocaine or alcohol, but that over time you may actually be pulling the very neural circuits and neurochemicals that would allow for positive affect deeper and deeper into the trenches, so to speak. And so there's a growing number of people who simply don't respond to the drugs any longer or other treatments. Right. So I wasn't trying to say the mechanism is the same. I was basically saying the theme is the same. And I'm agreeing with you. What happens over the short term with drugs of abuse happens over the longer term with, for some people with SSRIs, because it hasn't been recognized yet that at the basis, depression is a metabolic problem. And when you have a metabolic problem, like diabetes or obesity or heart disease, it's not that that causes depression. It's that there's a common problem, which is that somewhere in this very complex system of your metabolism, there's a drag, and it produces negative mood. And that's how you experience it. Sometimes it's good not to it's productive, not to turn that negative affect into an emotion. Sometimes, sometimes a cigar is just a cigar. Sometimes you just need to deal with the affective problem by dealing with your physical state. And that's the tricky bit is knowing when is affect telling you something is wrong with the world? And when is it telling you that there's something wrong with your physical state that you need to attend to? I think everything to me at least starts with a good night's sleep on a consistent basis. And every psychiatric challenge and indeed suicide itself is seems to be associated with and often preceded by challenges in sleeping, changes in circadian rhythm. So I think that's why to me sleep is the foundation of mental health and physical health. Absolutely. And so when I tell people when they say, well, what can I do? I was like, well, if there's only if there's only one thing that you could pick, I would say get a good night's sleep on a regular basis. If you could pick two more, I would say eat healthfully, like stop eating pseudo food. Don't get me wrong. Like I love french fries. I love french fries. They're like, that's like God's most perfect food. I mean, really, but eat healthfully, like eat real food and get exercise. And if you do those three things, I know I sound like a mother and so feel free to roll your eyes at me. But as a neuroscientist, those are the actually before you start with all the, you know, mentalizing Jedi tricks, you could just start with this. And that would actually take you pretty far. And that will resonate very well with our audience. The basics of sleep, exercise, food, sunlight and social connection are the ones that we just anchor. Those five are the ones that we just keep returning to over and over again. And I think people will say, oh, it's just simple motherly advice. But I would, I think that those five things, even just the one thing around sleep, there's some work that's required to get that done. So it's not as simple, the categories are simple, but the work that's required to get great sleep as often as one can on a consistent basis. If you're raising kids, have a career, live in the world, there's a lot there. And so that's where I think there's, there's a, there's an elaboration of things and one needs to learn to be flexible. Like when you're traveling, how do you do that? When, you know, friends are visiting, how do you do that? When weather's off and so on. The relationship piece is something-
I was just gonna say, I'm so glad you mentioned that. I'm so glad you mentioned that. Because you said before, and this was another one of those moments I listened to you, listened to as many of your podcasts as I possibly can, but I think it was the first or the second one with Lex Friedman, where you said, you know, we are regulating each other's nervous systems. And I will never forget that. And, you know, I imagine that you married your husband for a number of different reasons, but when people pair up with romantic partners, with friends, with coworkers, the ideal situation is one in which we are not taxed, where maybe even people,

and just being around them or just knowing that they are in our lives, provides a sort of deposit to- Yeah, it's a savings. It provides a savings, for sure. And then I think that's a lot of what emotional resonance to put kind of pop language on it is all about. Who feels good to be around, who doesn't feel good to be around. Yeah, I would say the best thing for a human nervous system is another human. And the worst thing for a human nervous system is also another human. And so you really want to be around the people who make you the best version of yourself that you could be. And that doesn't mean that you always get a savings. Like, sometimes you're taking care of that person. And so you're absorbing some of their burden, right? And vice versa. But I would say the research on, you know, social isolation and loneliness and so on shows us that, you know, well, along with research on synchrony, and there's just a whole bunch of research to suggest that we are the caretakers of each other's nervous systems. And it doesn't matter what your opinion is. Like, it doesn't, you know, it just, but we just, that's how we evolve this species. And so you get to decide what kind of a person are you going to be? You know, are you going to be, are you going to be a savings? Are you going to be a tax? And in general, it seems that people who decide that they're going to be a savings tend to, because people gravitate towards that and want more of that. Yeah. And hopefully would provide that also. I mean, I think the reciprocity piece here feels really, really strong. Well, that's a really interesting thing about, about the synchrony work, right? So there's work that if you research that if you put people together who don't even know each other, but if they, if they like each other and they, they have a sense of trust, even after a couple of minutes, they start to synchronize their physical signals, their heart rate starts to synchronize, their movements start to synchronize, their heart rate probably synchronizes because their breathing starts to synchronize, right? And it's really interesting to see what you, what you typically see is that who is pacing and who is leading, like one person is the leader and then the other person is the pacer. And I got that language from when I learned hypnosis, by the way. And, but it switches back and forth, like who's the leader, like in a, in a good, in a, in a, what we say good, like in a, in an interaction that looks productive, it, it's switching all the time who is, who is pacing and who is leading. It's not that always one person is, is, is in charge, so to speak, physiologically speaking.

We did a series recently on mental health with Paul Conti, who's a psychiatrist and the word narcissism came up a few times because people have a lot of questions about that. And, you know, and he emphasized that narcissists are not confident. They, they operate from a place of, of a deficit of pleasure. It's never enough and an intense envy, although that's not how they present. And they're often usually not aware of it themselves, but it's what leads healthy people to feel as if the interactions with those people, narcissists often can be very compelling in the moment, but they feel very taxed afterwards and kind of confused by what happened. And it sounds like it ties back to this lack of synchrony on the positive side of things. It's also clear from what you just said that when people regulate each other's nervous systems in a way where people are making little deposits and providing savings for each other, or maybe things are just neutral, that those nervous systems are then in a position to like pay attention to other things too and, and not just trying to work out the dynamics. Oh, for sure. Oh, and that's very true at work. So there's research showing that especially in the creativity, you know, sector, innovation sector of the economy, the best predictor of performance on the job is the extent to which people feel, I mean, after you account for sleep and, and, you know, watering and sleeping and feeding, right? Like the, that the best predictor is the amount of trust that you have in your team

and in your managers. Because if the world is predictable, it could still be things could be hard. But even when things are unpredictable, you have people, you know, who have your back. And so basically what you're doing is your, your, they're making, you know, deposits or savings, they're causing savings in each other's body budgets. So their, their resources can be spent on the harder things, which is, you know, failing and, you know, having to pick yourself back up and try again, which is, you know, partly what you do when you're an innovator. So I think that there's also research to show that in your personal life, when you do random acts of kindness for people or when you're kind, in general, you derive also a body budgeting benefit from that. You know, so for a while, I had a friend who we would meet each other for lunch once a month and, you know, we would take turns paying. I mean, we could both pay for ourselves, but we kind of got a double hit, you know, he paid for me one month and then I would pay for him one month. And then, you know, so we get the double hit of, you know, being kind to someone else and, you know, and also they got the, you know, benefit of someone being kind to them. And I'll just say, I think kindness is a, I don't know that we have so many conversations about that in our culture right now, but I think kindness is very, very underrated and should be, you know, like when I'm, when my, when I feel like shit, I bake bread for my neighbor who's in his 70s, him and his wife. That's what I do when I, you know, when I'm not feeling good. And, you know, if I, I mean, after I've taken care of the physical, the possible physical causes, I, and then I feel great because he's always so, he's always so grateful. And, and then I felt like I made his day better. And then also he helps me in other ways, like with my garden and stuff, because he's just like a master gardener. And so I feel like we have this relationship where we help each other. And I know it sounds really sappy, but and even though all the research backs up what I'm saying, I, it doesn't quite describe the feeling of when someone is just really happy because you just gave them a little surprise. And they're, you know, like that's, there's just some juice in that, I think.

On some culture out there, there's a word for that. I'm sure there is. I'm sure there is. I'm sure there is. Well, I have to say, I've thoroughly enjoyed this conversation. I mean, I've been looking forward to it for a long time and you've provided us with a really broad arc, but also a deep dive into not just how emotions are made, not just about affect, but as you mentioned earlier, really how the nervous system works. And I am certain, in fact, that our audience is taking this in and realizing that that knowledge is incredibly powerful, the addition of nuance, both to language into sort of self reflection states as extremely valuable. Oftentimes, when one gets into a conversation that has some level of reductionism and you get into nomenclature and things like that, it can really pull away from the real life experience of something. But this is exactly the opposite. What you've done for us today is you've provided such a rich array of information that adds written richness and depth to the real life experience. And that is really invaluable. So on behalf of myself and all the listeners and the people watching this, I want to say thank you for today's discussion. Thank you for the books you've written, which we've provided links to in the show note captions. Thanks for showing up on social media, despite the challenges that exist there. Sometimes you always handle yourself so well there. And we will refer people to your excellent social media accounts as well. And just for all the work that you're doing and that your laboratory and your now director of various things and relate to AI and more, and we'll talk about this hopefully in future episodes, but just a really enormous thank you. Thank you. Thank you for joining me for today's discussion

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