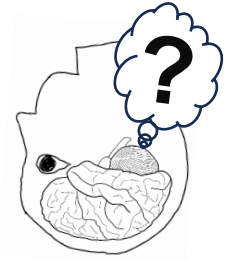


Flipping BRAIN SCIENCE on its head!

Predictive processing, owning emotions, and effective placebos can increase health and opportunity based on the groundbreaking research of Anil Seth, Lisa Feldman-Barrett and Andy Clark.



We do not see things as they are, we see things as we are. ~ anonymous

Discoveries in brain science offer powerful insights to help us build our future. Current research shows that our minds are more flexible, more intentional and more in control than previously understood.

For many years, we believed our brains passively accepted information from the world around us. We thought that our perception of a sad face, a red apple or the taste of chocolate, was unfiltered reality.

Many of us also learned that we possess a deep, primal, reptilian brain which controls our most basic responses to threats, such as fight, flight or freeze. This story continues to be widely repeated today.

Over the past twenty years, neuroscience researchers have disintegrated the myth of the 'reptilian' brain. New hypotheses have led to studies which show that our emotions are constructed throughout our lives; they are not 'hard-wired,' nor do they suddenly surface when we feel threatened. They do not 'happen' to us, we create them. And each person experiences them differently.

Instead of passively receiving information, our brains actively generate our models of reality. They are more like "prediction machines," making best guesses of the information that comes in through our senses, weighing it against a lifetime of experiences, predicting what is happening, and deciding our best course of action. Perception is strongly influenced by our past experiences and how we feel in the moment.

From infancy, through to this moment, we have accumulated an enormous amount of information. As we move about in our world each day, our mind filters all new information through past experiences to leverage the lessons we've learned in various settings. Tapping into our previous experiences is like taking a shortcut to making a decision: if it was this way in the past, it might be this way now; and this action that worked in the past may work again now. This 'quick thinking' can be very helpful when we need to act right now. It can also cause us to make hasty, biased or ineffective decisions, so be careful.

Consider this example: I win the imaginary 'baseball lottery' and I find myself standing at home plate in Wrigley Field, waiting for the perfect pitch. I've imagined it a thousand times: I watch the pitcher wind up, and release the ball, and... But the next thing I see is the ball in the catcher's mitt. I didn't even swing! Why? Since the ball flew toward me at 90 mph, my untrained brain did not have time to calculate, decide and act. I had no prior experience to guide me.

A professional baseball player has a very different experience. Because they have seen, and hit, many 90 mph pitches, they can watch the pitcher carefully and make a good prediction about where the ball will be when it crosses the plate. They start their swing long before the ball is within hitting range to maximize the force of the bat. Sometimes their guess is so accurate that the ball goes flying across the entire field and into the stands for a home run!

The baseball example demonstrates how our minds work all of the time. We act, or don't act, based on our prediction.

During our waking hours, our minds are constantly preparing us for the various settings in which we immerse ourselves each day. Because it uses so much information from the past, and because life moves so quickly, our brain may make the wrong prediction now and then, and we might find ourselves having to apologize (my hand is up here) or ice a swollen knee (I was sure I could land that jump!). Mistakes give our brain new information to improve our predictions for the next conversation or ride in the halfpipe.

And prediction processing doesn't only serve us in activities or conversations, it is also how we construct our emotions.

Although it seems like our emotions have always been a part of us, and show up on cue - like tears - they are not like tears at all. Tears have a physiological function in our body: their job is to keep our eyes moist. We produce tears constantly.

Emotions have no physiological foundation. We've been building them for a long time – since before we can remember. They are deeply ours. But ours alone...based on cues we gave meaning to through interactions with our families, friends, culture, schools, books, public events, TV, movies, and the world around us. We saw and heard how emotions were expressed in others, and we created our own.

Each person expresses and interprets emotion in a unique way.

We will explore this in the coming pages but, in short, like getting a zap from an electric fence, we will interpret future predictions

based on the adjustments we had to make now (ow!)...or those we made in the past. Something that was not great for us many years ago (school, for example) may cause us to steer clear of similar things now, even though the challenges from that time are gone. The prediction is strong, but it doesn't apply. This is one way emotions can block us from seeing opportunity.

Modern neuroscience may have shaken off the myth that emotions are 'hard-wired' and out of our control, but the hard work of sorting out fear, anxiety and other tough emotions remains.

The great news here is that we have a lot more power over our destiny than we might think!

"When you understand how something works, you'll be able to tinker with it," says neuroscientist Lisa Feldman-Barrett.

Learning to tinker with our minds, to get them to work to our advantage, could help us resist the 'fake' and stay on our own track.

The media is presenting a difficult quandary; it is becoming very difficult to figure out what is real. Our emotions are targeted through music, and our eyes are manipulated – potentially shifting a belief – through deep fakes. To properly brace ourselves for the world today, understanding how we construct our perspective and our emotions has become an essential life skill.

With increased understanding, we can tinker with our minds to reduce the impact of marketers and fear-mongers, and strengthen predictions to determine our destiny.

The scientists on the following pages study predictive processing. You can read more about their findings in their books, or watch their fascinating TED talks!

ANIL SETH

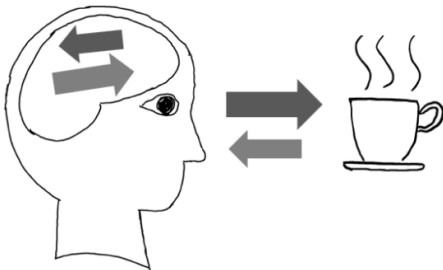
Book - BEING YOU: A New Science of Consciousness

We don't just passively perceive the world. We actively generate it. The world we experience comes as much, if not more, from the inside out as from the outside in. - Anil Seth

What is it like to be you? At first thought, you might find that there are aspects of 'being you' that are like all living things, and upon a closer look, you might see aspects of you that are like all mammals, or all humans, but no comparisons will ever get close. What it's like to be you is an experience that is completely unique to you. No one else sees the world in the same way that you do. Your beliefs, perspective, gifts, emotions and experiences are yours alone.

And since you are so unique, your experience of reality is at least a little different from everyone else's, too.

Anil Seth studies consciousness, perception and what it means to be a 'self'. He knows we tend to believe that what we see and hear is reality. His research shows that our perception is not a direct reflection of what is happening in the world, but an active construction of it. He says we do not receive a direct, incoming flow of information into our brain because our brain receives only signals from our senses, and it has to guess what the signals mean based on prior experience. Perception, he says, is an inside-out best guess about what caused the sensory signals that the brain receives.



This theory can be hard to grasp. The belief that we see things as they are is very strong!

For example, when we look at a ripe banana, we believe that it is yellow. What we may not know is that the yellow color we see is just reflected off of the peel and not emitted from it. The yellow color will change as the light changes. When we see a rainbow, we see the familiar colors of various wavelengths of light, but what we see is just a narrow range of them. Many more wavelengths are not detectable by the human eye.

Although scientists and philosophers have been studying predictive processing theory for two decades or more, this theory is only now becoming more broadly known.

We once thought the sun revolved around the earth. We had evidence for our belief: we could watch the sun 'rise' on the eastern horizon and set in the west. But Nicolaus Copernicus didn't accept that belief. He introduced a theory claiming that the earth, and our nearby planets, revolve around the sun, and it is the earth, spinning on its axis, that creates night and day. He captivated people's attention with his theory in the early 1500s, but the heliocentric – or sun-centered – view of our solar system would not take hold for nearly 100 years.

This is the type of shift happening today in neuroscience. Understanding predictive processing will transform the way we conduct – and construct – everything...including ourselves, our world, and our future.

Anil Seth's TED talk: Your brain hallucinates your conscious reality, can be found here: www.youtube.com/watch?v=lyu7v7nWzfo

LISA FELDMAN-BARRETT:

BOOKS: 7½ LESSONS ABOUT THE BRAIN *and* HOW EMOTIONS ARE MADE: The Secret Life of the Brain

Sometimes in life you are responsible for changing something, not because you are to blame, but because you're the only person who can. – Lisa Feldman-Barrett

Our brains were not created to think, argues Lisa Feldman-Barrett (LFB), they were created to keep us alive. “The most important job your brain has is to regulate the systems of your body,” she says. “You see and think and feel in the service of that goal.”

She also says that because the brain is locked in the skull, completely dependent on senses and previous experiences, the predictive processing model is the best fit for how we interpret the world and express ourselves.

Her Theory of Constructed Emotions uses the predictive processing foundation, and includes our feelings, our beliefs, and our lifetime of experience to create our unique emotions.

The old story about emotions told us that they come from deep inside of us, from the two oldest areas of a triune (three parts in unity) brain. The theory, developed in the 1960s, claimed our reptilian brain - the oldest, instinctual part of the brain - drives the immediate emotions including fight, flight or freeze reactions. This story made us perpetually vulnerable to our own minds.

Lisa Feldman-Barrett's response to this view, which she argues in her small book *7½ Lessons About the Brain*, states, “The triune brain story is one of the most successful and widespread errors in all of science.”

If we accept that we create our emotions, we can see them for what they are and allow them to serve us well. For instance, we can learn to resist the subliminal pull of emotive music in commercials and news stories. And we can also learn to resist a knee-jerk reaction to say something we might regret later.

It feels like emotions grab hold of our minds and bodies, but that's because we don't understand what they are telling us. Emotions show us the meaning that we have built into situations, words, gestures, behavior and other cues. Because we've constructed them since we were infants, they seem like they are part of our body. They come from within us; not as physiological actions, but as messages that convey the ways we've learned to show pain, anger, frustration, sadness, etc. At their core, LFB says emotions are predictions about what is going on and how we should respond. By learning how to read our emotions, we can improve our responses in a number of ways.

We can start by naming the emotions that we feel. (Check out the new Feelings Wheel on page 83.) LFB says: “The more precisely you can describe your emotions, the better you can understand how to use them in a careful, thoughtful way. When we don't understand something, like emotion, we can get hurt, and other people can get hurt, too.”

"Expanding your emotion vocabulary is like a mental well-being thesaurus, giving you a strong sense of agency over the situations and responses you experience." – LFB

Also, we can realize that we should not assume anything about another person based on how we see them. (*We see things as WE are, not as they are.*) According to LFB, no facial expressions are universal; “the same exact face can be used in different emotions, and the same emotion can have many faces. When we're happy, we laugh, cry, smile, scream, and have all kinds of facial expressions.”

We can also change the meaning we have given to emotions, which can alter their intensity and give us time to think about them before reacting. Rather than try to subdue our emotions, we can learn to recognize and leverage them.

We feel primarily through our senses: hunger, cold, etc., but to study emotions, we have to consider another set of feelings.

Remember, LFB told us that one of our brain's most important jobs is managing our 'body budget': checking on our levels of salt, glucose, oxygen, hormones, and other critical elements that keep us alive. The feeling that we receive from our body is called affect. According to LFB, "Affect is your brain's best guess about the state of your body budget."

Affect, also called *mood*, is a combination of your energy level and your valence: whether your body feels pleasant or unpleasant. Affect is with you every waking moment of your life.

Examples of Energy: Are you sleepy?
enthusiastic? calm? exhausted?

Examples of Valence: Feeling comfortable?
crummy (stomach ache, fever)? strong?

"Every sense that you have, in every waking moment of your life, is colored by how you feel...and it has very profound consequences," says LFB.

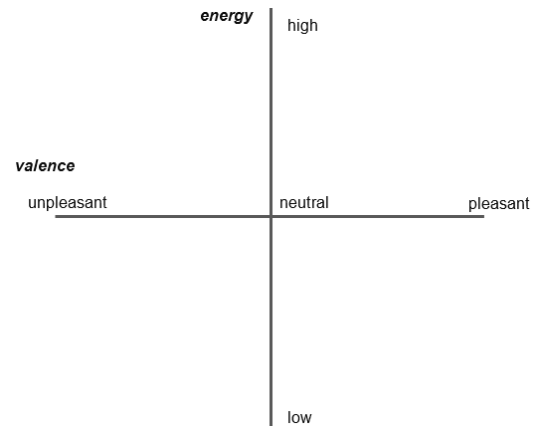
ANDY CLARK

BOOK: THE EXPERIENCE MACHINE: How Our Minds

Predict and Shape Reality (He has written many other books on this topic.)

"Nothing we do or experience... is untouched by our own expectations." - Andy Clark

Andy Clark is a philosopher and cognitive scientist. He's the author of several books grounded in predictive processing. His work considers how our brains reach out of our skull and connect to the world. In a recent talk, he described how expectations can fill information gaps and greatly alter our experience.



Draw this template to chart your affect. Notice how the feeling changes over time. Can you see how your mood can impact your day?

Our brains are using past experiences to predict and create our current experiences. Our past experiences might not be the best guide for our current or future experiences, but we're not stuck. LFB reminds us of our power:

"You can challenge the beliefs that you were swaddled in as a child. You can change your own niche. Your actions today become your brain's predictions for tomorrow, and those predictions automatically drive your future actions. Therefore, you have some freedom to hone your predictions in new directions."

LFB's TED talk - You aren't at the mercy of your emotions –your brain creates them:
[youtube.com/watch?v=0gks6ceq4eQ](https://www.youtube.com/watch?v=0gks6ceq4eQ)

"Would you know if a 15 cm nail penetrated your foot?" he asked his audience. Clark then shared a story about a construction worker who fell from scaffolding on to a 15 cm nail, which completely pierced his boot. Attending paramedics could see that he was in great

discomfort and gave him drugs to relieve the pain. At the hospital, doctors could see in the x-ray images that the nail had passed cleanly between two toes without touching his flesh at all. Yet his suffering was real.

Clark explained that this is an extreme example of the power of prediction; in this case, the expectation of a serious injury.

He says the brain is wired from the inside out. Even when we're at rest, our brains are constantly running a simulation of reality, weighing confidence in the predictions it makes. When we are fooled, as with optical illusions, our brains are confident that the prediction model is accurate. This is what happened with the nail.

The predictive processing theory includes taking decisive action. We can influence our brain's guesses with experiences that provide confidence, such as executing tasks successfully or using placebos to relieve pain.

If you're not familiar with the term, placebos are inert pills created to test the efficacy of new drugs. Several trials have shown that placebos can be as effective as the drugs themselves!

Ted Kaptchuk researches placebos, including *honest placebos*, where the patient knows they are taking sugar pills. He has been surprised by his results: in several studies, even treatment-resistant participants found relief using an honest placebo. Kaptchuk explains, "*A placebo's active ingredient is a person's psychological response to being treated.*"

Clark sees this as evidence of our powerful predictions: "honest placebos appear to work by activating subterranean expectations through superficial indicators of reliability and efficacy, such as good packaging and professional presentation."

In 2013, I read an article about researchers who discovered that acetaminophen could reduce feelings of existential angst: dread, uncertainty, and meaninglessness. (Be careful here – the drug can also cause severe liver damage.) Although my feelings about the world are generally optimistic, there are occasions when I slip into despair thinking about the suffering that I can't reach or stop. These feelings can be so strong that I find it difficult to function. When I heard about the research, I purchased a very small bottle of Tylenol and covered the label with the words "Existential Angst Reliever." Thirteen years later, I have yet to open the bottle. Although I doubt that a philosophical problem can be resolved with drugs, when I feel the burden of my limitations, rather than put a real or fake pill into my mouth, I find relief just by going to the cabinet and looking at the bottle. I give it a shake if I really need a boost. And it works!

A few of the other conditions that respond well to honest placebos include depression, pain, allergies, fatigue, irritable bowel syndrome and insomnia.

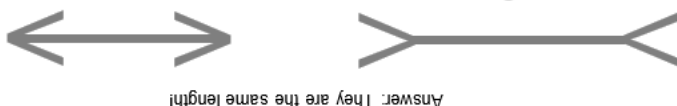
Today, we can purchase branded 'honest placebos', such as Magic Bullet and Fukitol. They are effective, inexpensive, have no adverse side effects and activate systems of healing in our mind and body.

Learning more about predictive processing may prove a valuable investment for navigating our increasingly unpredictable world.

"Since experience is always shaped by our own expectations, there is an opportunity to improve our lives by altering some of those expectations" ~ Andy Clark

Andy Clark's TED-type talk at Royal Institution: How the brain shapes reality
www.youtube.com/watch?v=A1Ghrd7NBtk

Question: Which line is longer?



Do you find the predictive processing theory interesting? These scientists have all written very readable books which you might also enjoy. (Ask the library? The free books orgs? Ebook or paper book?)