

Researchers pinpoint epicenter of brain's predictive ability

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Credit: Human Brain Project

In recent years, scientists have discovered the human brain works on predictions, contrary to the previously accepted theory that it reacts to the sensations it picks up from the outside world. Experts say humans' reactions are in fact the body adjusting to predictions the brain is making based on the state of our body the last time it was in a similar situation.

Now, University Distinguished Professor Lisa Feldman Barrett at Northeastern has reported finding the epicenter of those predictions.

In an article published in *Nature Reviews Neuroscience* last week, Barrett contends that limbic tissue, which also helps to create emotions, is at the top of the brain's prediction hierarchy. She co-authored the paper with W. Kyle Simmons, of the Laureate Institute for Brain Research in Tulsa, Oklahoma.

"The unique contribution of our paper is to show that limbic tissue, because of its structure and the way the neurons are organized, is predicting," Barrett said. "It is directing the predictions to everywhere else in the cortex, and that makes it very powerful."

For example, when a person is instructed to imagine a red apple in his or her mind's eye, Barrett explained that limbic parts of the brain send predictions to visual neurons and cause them to fire in different patterns so the person can "see" a red apple.

Barrett is a faculty member in the Department of Psychology and is director of the Interdisciplinary Affective Science Laboratory. A pioneer in the psychology of emotion and affective neuroscience, she has challenged the foundation of affective science by showing that people are the architects of their own emotional experiences.

In the *Nature* paper, Barrett summarized research on the cellular composition of limbic tissue, which shows that limbic regions of the brain send but do not receive predictions. This means that limbic regions direct processing in the brain. They don't react to stimulation from the outside world. This is ironic, Barrett argues, because when scientists used to believe that limbic regions of the brain were the home of emotion, they were seen as mainly reactive to the world.

Common sense tells you that seeing is believing, but really the brain is built for things to work the other way around: you see (and hear and smell and taste) what you believe. And believing is largely based on feeling. In her paper, Barrett shows that your brain is not wired to be a reactive organ. It's wired to ask the question: "The last time I was in a situation like this, what [sensations](#) did I encounter, and how did I act?" And the sensations that seem to matter most are the ones that are inside your own body, which are called "interoceptions."

"What your brain is trying to do is guess what the sensation means and what's causing the sensations so it can figure out what to do about them," Barrett said. "Your [brain](#) is trying to put together thoughts, feelings, and perceptions so they arrive as needed, not a second afterwards."

Provided by Northeastern University

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