



SCIENCE JOURNAL
By ROBERT LEE HOTZ



Get Out of Your Own Way

Studies Show the Value of Not Overthinking a Decision

June 27, 2008; Page A9

Fishing in the stream of consciousness, researchers now can detect our intentions and predict our choices before we are aware of them ourselves. The brain, they have found, appears to make up its mind 10 seconds before we become conscious of a decision -- an eternity at the speed of thought.

Their findings challenge conventional notions of choice.



"We think our decisions are conscious," said neuroscientist John-Dylan Haynes at the Bernstein Center for Computational Neuroscience in Berlin, who is pioneering this research. "But these data show that consciousness is just the tip of the iceberg. This doesn't rule out free will, but it does make it implausible."

Through a series of intriguing experiments, scientists in Germany, Norway and the U.S. have analyzed the distinctive cerebral activity that foreshadows our choices. They have tracked telltale waves of change through the cells that orchestrate our memory, language, reason and self-awareness.

In ways we are only beginning to understand, the synapses and neurons in the human nervous system work in concert to perceive the world around them, to learn from their perceptions, to remember important experiences, to plan ahead, and to decide and act on incomplete information. In a rudimentary way, they predetermine our choices.

To probe what happens in the brain during the moments before people sense they've reached a decision, Dr. Haynes and his colleagues devised a deceptively simple experiment, reported in April in *Nature Neuroscience*. They monitored the swift neural currents coursing through the brains of student volunteers as they decided, at their own pace and at random, whether to push a button with their left or right hands.

In all, they tested seven men and seven women from 21 to 30 years old. They recorded neural changes associated with thoughts using a functional magnetic resonance imaging machine and analyzed the results with an experimental pattern-recognition computer program.

While inside the brain scanner, the students watched random letters stream across a screen. Whenever they felt the urge, they pressed a button with their right hand or a button with their left hand. Then they marked down the letter that had been on the screen in the instant they had decided to press the button.

Studying the brain behavior leading up to the moment of conscious decision, the researchers identified signals that let them know when the students had decided to move 10 seconds or so before the students knew it themselves. About 70% of the time, the researchers could also predict which button the students would push.

"It's quite eerie," said Dr. Haynes.

Other researchers have pursued the act of decision deeper into the subcurrents of the brain.

In experiments with laboratory animals reported this spring, Caltech neuroscientist Richard Anderson and his colleagues explored how the effort to plan a movement forces cells throughout the brain to work together, organizing a choice below the threshold of awareness. Tuning in on the electrical dialogue between working neurons, they pinpointed the cells of what they called a "free choice" brain circuit that in milliseconds synchronized scattered synapses to settle on a course of action.

"It suggests we are looking at this actual decision being made," Dr. Anderson said. "It is pretty fast."

And when those networks momentarily malfunction, people do make mistakes. Working independently, psychologist Tom Eichele at Norway's University of Bergen monitored brain activity in people performing routine tasks and discovered neural static -- waves of disruptive signals -- preceded an error by up to 30 seconds. "Thirty seconds is a long time," Dr. Eichele said.

Such experiments suggest that our best reasons for some choices we make are understood only by our cells. The findings lend credence to researchers who argue that many important decisions may be best made by going with our gut -- not by thinking about them too much.

Dutch researchers led by psychologist Ap Dijksterhuis at the University of Amsterdam recently found that people struggling to make relatively complicated consumer choices -- which car to buy, apartment to rent or vacation to take -- appeared to make sounder decisions when they were distracted and unable to focus consciously on the problem.

Moreover, the more factors to be considered in a decision, the more likely the unconscious brain handled it all better, they reported in the peer-reviewed journal Science in 2006. "The idea that conscious deliberation before making a decision is always good is simply one of those illusions consciousness creates for us," Dr. Dijksterhuis said.

Does this make our self-awareness just a second thought?

All this work to deconstruct the mental machinery of choice may be the best evidence of conscious free will. By measuring the brain's physical processes, the mind seeks to know itself through its reflection in the mirror of science.

"We are trying to understand who we are," said Antonio Damasio, director of the Brain and Creativity Institute at the University of Southern California, "by studying the organ that allows you to understand who you are."

Act First, Think Later

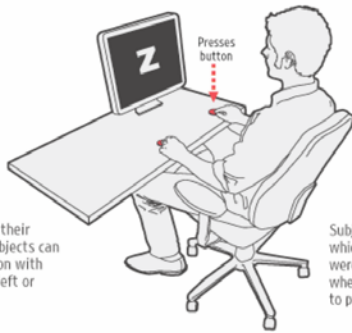
By scanning the brains of people performing simple decision-making exercises, scientists found that brain regions involved in making choices activate before people are consciously aware they've made a choice

On the screen

Subjects watch a screen that flashes a random sequence of letters at half-second intervals

At a time of their choosing, subjects can press a button with either their left or right hands

Subjects identify which letter they were looking at when they **decided** to push the button



Beneath the surface

Throughout the process, scientists are recording the subjects' brain activity



They found that regions involved in decision making became active up to 10 seconds before the subjects consciously decided to press the button



They also found that the motor cortexes became active five seconds before deciding to press the button. The brain scans also allowed them to predict whether subjects used their left or right hand.

Source: Nature Neuroscience