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## Revealed: How We Detect Fear in Others' Eyes

Stefan Lougren  
for [National Geographic News](#)  
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How do we recognize fear in another person?

Scientists have long known that the amygdala, an almond-shaped part of the brain, is critical for the perception of fear. But exactly what role it plays in recognizing facial expressions has remained a mystery.

A new study shows that the amygdala actively seeks out potentially important information in the face of another person. In particular, it focuses our attention on a person's eyes, the facial features most likely to register fear.

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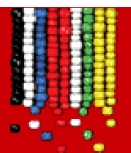
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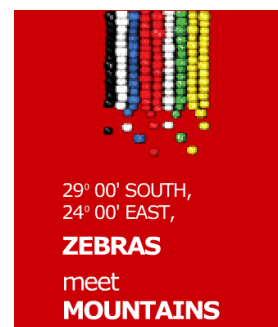
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"These findings provide a much more abstract and general account of what the amygdala does," Ralph Adolphs said. Adolphs is a professor of psychology and neuroscience at Caltech University in Pasadena, California, and the University of Iowa in Iowa City.

Adolphs's study focuses on a 38-year-old woman with an amygdala that is damaged from a rare genetic disease. As a result, she is unable to recognize fear in people's facial expressions.



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However, the scientists have found that she is able to recognize fear if instructed to concentrate her attention on a person's eyes.

Adolphs says the research could help those who suffer from other disorders such as autism, which can dull some people's ability to discern important facial signals.

The study is published in this week's issue of the science journal *Nature*.

### Seeking Fear

Adolphs and his colleagues have studied the woman, known as SM, for more than a decade. She has a brain lesion in the amygdala. Not only can she not recognize fear, but she also fails to judge how trustworthy people look.

To find out how a person perceives fear in other people, the scientists had study participants look at photographs of fearful and happy faces through holes that revealed only small parts of the images.

People with normal brains always looked immediately at the eye region of a face—even more so when the face was fearful.

SM, on the other hand, failed to spontaneously look at the eyes, instead staring straight ahead at the photographs. As a result, she judged that each face had a neutral expression.

"She simply doesn't know where to look in faces in order to seek out potentially useful information," Adolphs said. "That knowledge is something that other people do automatically."

Although SM's damaged amygdala is unable to direct the visual system to seek information, its capacity to process visual information is intact.

Remarkably, the scientists found that SM was able to recognize fear in a person if told explicitly to look at the eyes of the other person. This solution, though, was short-lived, as SM needed to be reminded continuously to look at the eyes.

"This reveals that the deficit caused by amygdala lesion is not causing a loss of the knowledge of what fear is or looks like, which is what people would have thought until now," Patrik Vuilleumier said. Vuilleumier, a neuroscientist at the University Medical Center of Geneva, Switzerland, wrote a commentary in *Nature* on the study.

### Brain Network

The results reinforce the idea that the amygdala can modulate perception and attention and is not responsible only for "knowing" or "analyzing" signals of fear, Vuilleumier said.

In other words, in addition to analyzing other people's eye signals, the amygdala "tells" you to check others' eyes in the first place.

"The amygdala is able to guide the visual system to respond to faces, not only the

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converse that the visual system is feeding the amygdala," he said.

The scientists have also discovered that the amygdala is activated by other stimuli that don't have anything to do with fear, such as erotic images.

"The simple answer that the amygdala processes fear or the threat of danger is only a very small part of the story," Adolphs said. "What we're looking for is a more comprehensive account of what the amygdala does that may begin to tie all these pieces together."

Adolphs says many parts of the brain work together and that more research will probably relate cognitive abilities to a network of brain structures.

Meanwhile, the study could lead to therapies to help patients with defective emotional perception lead more normal lives.

People with autism, for example, may have similar brain impairments to those of the woman in the study. Some autistics may be unable to make normal eye movements when looking at other people. They may therefore fail to make judgments about other people's emotions.

"To the extent that we could actually instruct people with autism how to look at the world and other people's faces, we might be in a position to improve their impaired social functions," Adolphs said.

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