

To see or not to see

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How do the visual images we experience, which have no tangible existence, arise out of physical processes in the brain? New research at the Weizmann Institute of Science provided evidence, for the first time, that an 'ignition' of intense neural activity underlies the experience of seeing.

In research recently published in the journal *Neuron*, Prof. Rafael Malach and research student Lior Fisch of the Weizmann Institute's Neurobiology Department worked with a [neurosurgeon](#), Dr. Itzhak Fried of Tel Aviv Sourasky Medical Center, a distinguished team of medical doctors from the Center and Weizmann Institute students. They asked a group of epileptic [patients](#) who had had electrodes clinically implanted into their brains in preparation for surgery to volunteer for some perceptual awareness tasks.

The subjects looked at a computer screen, which briefly presented a 'target' image - a face, house, or man-made object. This image was followed by a 'mask' - a meaningless picture for distraction - at different time intervals after the target image had been presented. This allowed the experimenter to control the visibility of the images - the patients sometimes recognized the targets and sometimes failed to do so. By comparing the [electrode](#) recordings to the patients' reports of whether they had correctly recognized the image or not, the scientists were able to pinpoint when, where and what was happening in the brain as transitions in perceptual awareness took place.

Malach: 'We found that there was a rapid burst of [neural activity](#)

occurring in the high-order visual centers of the brain - centers that are sensitive to entire images of objects, such as faces - whenever patients had correctly recognized the target image.' The scientists also found that the transition from not seeing to seeing happens abruptly. Fisch: 'When the mask was presented too soon after the target image, it 'killed' the [visual input](#) signals, resulting in the patients being unable to recognize the object. The patients suddenly became consciously aware of the target image at a clear threshold, suggesting that the brain needs a specific amount of time to process the input signals in order for conscious perceptual awareness to be 'ignited.'

This study is the first of its kind to uncover strong evidence linking 'ignition' of bursts of neural activity to perceptual awareness in humans. More questions remain: Is this the sole mechanism involved in the transition to perceptual awareness? To what extent is it a local phenomenon? By answering such questions, we might begin bridging the mysterious gap between mind and the brain.

Provided by Weizmann Institute of Science

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