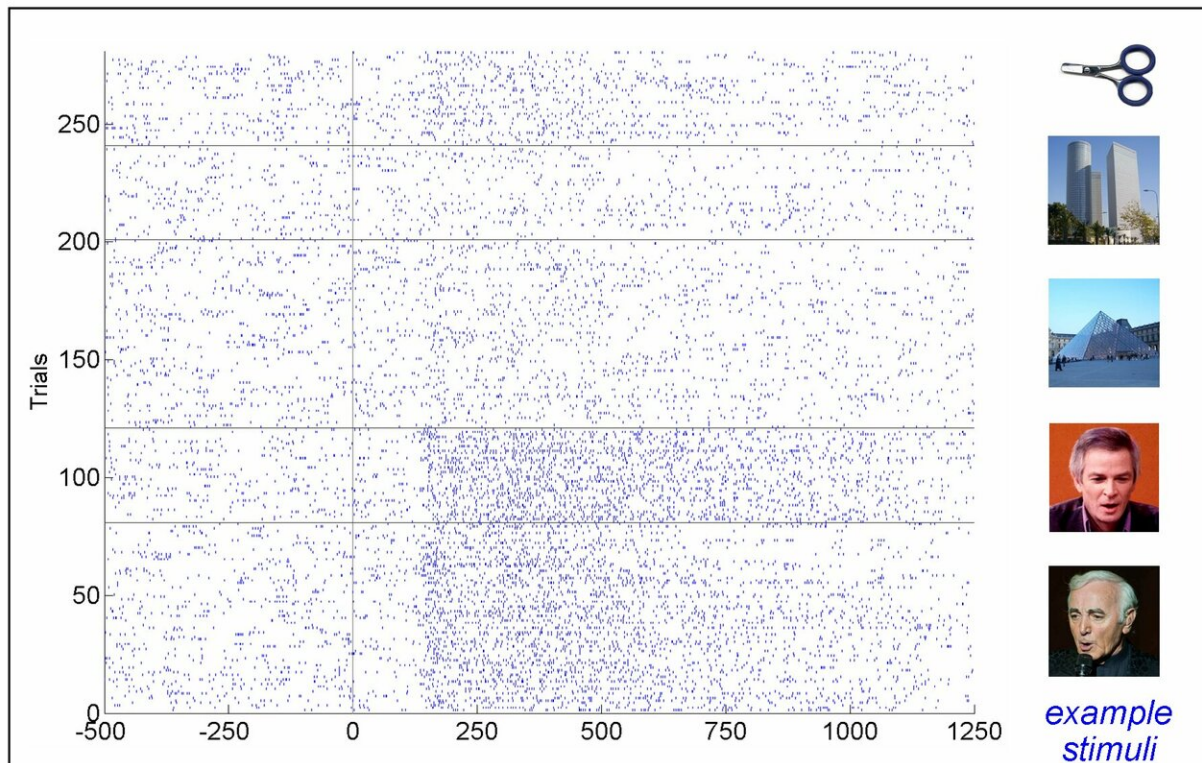


Researchers identify neurons in the human visual cortex that respond to faces

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A new study published in *Neurology* identifies for the first time the neurons in the human visual cortex that selectively respond to faces. The study was carried out by Dr. Vadim Axelrod, head of the Consciousness and Cognition Laboratory at the Gonda (Goldschmied) Multidisciplinary Brain Research Center at Bar-Ilan University, in collaboration with a team from Institut du Cerveau et de la Moelle Épineière and Pitié-Salpêtrière Hospital (team leader: Professor Lionel Naccache).

The researchers showed that the neurons in the visual cortex (in the vicinity of the Fusiform Face Area) responded much more strongly to faces than to city landscapes or objects. A high response was found both for faces of famous people (e.g., Charles Aznavour, Nicolas Sarkozy, Catherine Deneuve, Louis De Funes) and for faces unfamiliar to the participant in the experiment. In an additional experiment, the neurons exhibited face-selectivity to human and animal faces that appeared within a movie (a clip from Charlie Chaplin's "The Circus").

The present results provide unique insights into human brain functioning at the cellular level during face processing. These findings also help bridge the understanding of face mechanisms across species (i.e., monkeys and humans).
Credit: Dr. Vadim Axelrod

A world where everyone has the same face would be very different than the one we know, in which faces are different, conveying essential information. For example, most people can instantly recognize a celebrity's face or the face of an old college friend, even after decades apart. Most people can sense the mood of a significant other just based on facial expression. Often, people can establish whether someone is trustworthy by looking at his or her face. Despite intensive research, how the brain conducts all these tasks is still a great mystery.

A new study published in *Neurology*, the medical journal of the American Academy of Neurology (issue of January 22, 2019), identifies for the first time the [neurons](#) in the human [visual cortex](#) that selectively respond to faces. The study was carried out by Dr. Vadim Axelrod, head of the Consciousness and Cognition Laboratory at the Gonda (Goldschmied) Multidisciplinary Brain Research Center at Bar-Ilan University, in collaboration with a team from Institut du Cerveau et de la Moelle Épineuse and Pitié-Salpêtrière Hospital.

The researchers showed that the neurons in the visual cortex in the vicinity of the so-called fusiform face area respond much more strongly to faces than to city landscapes or objects (see examples above). A high response was found both for faces of famous people (e.g., Charles Aznavour, Nicolas Sarkozy, Catherine Deneuve, Louis De Funes) and for faces unfamiliar to the participant in the

experiment. In an additional experiment, the neurons exhibited face selectivity to human and animal faces that appeared within a movie (a clip from Charlie Chaplin's *The Circus*).

"In the early 1970s, Prof. Charles Gross and colleagues discovered the neurons in the visual cortex of macaque monkeys that responded to faces. In humans, face-selective activity has been extensively investigated, mainly using non-invasive tools such as [functional magnetic resonance imaging](#) (fMRI) and electrophysiology (EEG)," says the paper's lead author, Dr. Axelrod. "Strikingly, face-neurons in the posterior temporal visual cortex have never been identified before in humans. In our study, we had a very rare opportunity to record neural activity in a single patient while micro-electrodes were implanted in the vicinity of the fusiform face area, the largest and likely the most important face-selective region of the human brain."

Probably the best-known neurons that respond to [faces](#) have been the so-called "Jennifer Aniston cells," the neurons in the medial temporal lobe that respond to images of a specific person (e.g., Jennifer Aniston in the original study published in *Nature* by Quiroga and colleagues in 2005). "But the neurons in the visual cortex that we reported here are very different from the neurons in the medial temporal lobe," says Dr. Axelrod. "First, the neurons in the visual [cortex](#) respond vigorously to any type of face, regardless of the person's identity. Second, they respond much earlier. Specifically, while in our case, a strong response could be observed within 150 milliseconds of showing the image, the Jennifer Aniston cells usually take 300 milliseconds or more to respond."

The present results provide unique insights into human brain functioning at the cellular level during face processing. These findings also bridge the understanding of face mechanisms across species (i.e., monkeys and humans). Dr. Axelrod says, "It is really exciting that after almost a half-century since the discovery of face neurons in macaque monkeys, it is now possible to demonstrate similar neurons in humans."

More information: Vadim Axelrod et al. Face-selective neurons in the vicinity of the human fusiform face area, *Neurology* (2019). [DOI: 10.1212/WNL.0000000000006806](#)

Provided by Bar-Ilan University

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