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Why your brain has a 'Jennifer Aniston cell'

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Anna Gosline

Obsessed with reruns of the TV sitcom Friends? Well then you probably have at least one "Jennifer Aniston cell" in your brain, suggests research on the activity patterns of single neurons in memory-linked areas of the brain. The results point to a decades-old and dismissed theory tying single neurons to individual concepts and could help neuroscientists understand the elusive human memory.

"For things that you see over and over again, your family, your boyfriend, or celebrities, your brain wires up and fires very specifically to them. These neurons are very, very specific, much more than people think," says Christof Koch at the California Institute of Technology in Pasadena, US, one of the researchers.

In the 1960s, neuroscientist Jerry Lettvin suggested that people have neurons that respond to a single concept such as, for example, their grandmother. The notion of these hyper-specific neurons, coined "grandmother cells" was quickly rejected by psychologists as laughably simplistic.

But Rodrigo Quiroga, at the University of Leicester, UK, who led the new study, and his colleagues have found some very grandmother-like cells. Previous unpublished findings from the team showed tantalising results: a neuron that fired only in response to pictures of former US president Bill Clinton, or another to images of the Beatles. But for such "grandmother cells" to exist, they must invariably respond to the "concept" of Bill Clinton, not just similar pictures.

Wired up, fired up

To investigate further, the team turned to eight patients currently undergoing treatment for epilepsy. In an attempt to locate the brain areas responsible for their seizures, each patient had around 100 tiny electrodes implanted in their brain. Many of the wires were placed in the hippocampus - an area of the brain vital to long-term memory formation.

They first gave each subject a screening test, showing them between 71 and 114 images of famous people, places, and even food items. For each subject, the researchers measured the electrical activity or "firing" of the neurons connected to the electrodes. Of the 993 neurons sampled, 132 fired to at least one image.

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Better than
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The team then went back for a testing phase, this time showing participants three to seven the initial 132 photo subjects that hit. For example, one woman saw seven different photos alongside 80 other photos of animals, buildings or additional famous people such as Julia almost ignored all other photos, but fired steadily each time Aniston appeared on screen.

Conceptual connections

The team found similar results with another woman who had a neuron for pictures of Halle Berry drawing of her face and an image of just the words of her name. "This neuron is responsive to an abstract entity, of Halle Berry," says Quiroga. "If you show a line drawing or a profile, it's also showed pictures of her as Catwoman, and you can hardly see her because of the red. It's the Halle Berry then the neurons still fire."

Given more time and an exhaustive list of images, the team may well have landed upon the activity of the "Halle Berry" neuron. In one participant, the "Jen" neuron also fired in her former Friends cast-mate, Lisa Kudrow. The pattern suggests that the actresses are memory associations of this particular woman, says Charles Connor, a neuroscientist at Johns Hopkins in Baltimore, US.

These object-specific neurons may be at the core of how we make memories, says Connor. "You are looking at the far end of the transformation from object to conceptual memory-related information. It is that transformation that underlies the world. It's not enough to see something familiar and match it. It's the fact that you place it in the rich tapestry of memory that brings it to life."

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