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Study uses 'Sherlock' to reveal how shared experiences shape our memories

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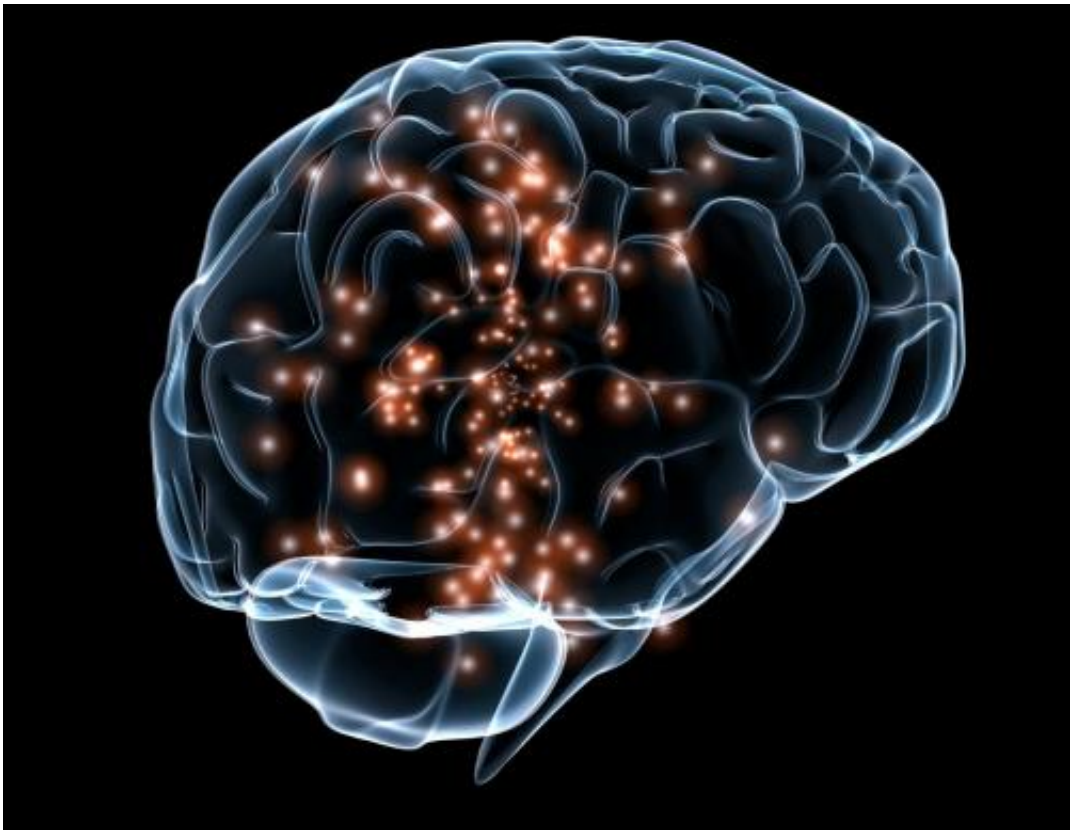

Credit: Wikimedia Commons

We tend to think of our memories as unique, but a Princeton University-led study shows that memories are often shared rather than idiosyncratic.

The findings appear in the journal *Nature Neuroscience*. The study

included researchers from Princeton University (Hasson and Norman groups in the Princeton Neuroscience Institute), Stanford University, Johns Hopkins University and the University of Toronto.

Every person perceives the world in his or her own way and describes the past through the lens of individual history. However, human brains have much in common with one another in terms of anatomy and functional organization, and the capacity to share memories is essential for our ability to interact with others and form social groups. The processes by which shared experiences contribute to a community's collective memory have been extensively studied, but relatively little is known about how shared experiences shape memory in the brains of people who are engaged in spontaneous natural recollection. If two people freely describe the same event, how similar (across brains) are the neural codes elicited by that event?

In the new study, researchers show that when people watch a movie, specific brain activity patterns can be identified for each scene in the movie. What's more, each movie scene brain pattern is similar between people while they watch the movie, and similar between people when they speak from memory about the movie in their own words. This goes beyond showing that some part of the brain is "active" (reacting high or low) during some movie scene; the researchers show there is a distinct brain pattern, like a fingerprint, for each movie scene.

"Usually memory experiments use very constrained material like single words or static pictures, so we're also excited to show that it's possible to do all of this during a much more realistic experience—watching an hour-long movie and talking freely about it for many minutes," says co-lead author Janice Chen, a postdoctoral research in Princeton's Neuroscience Institute.

The researchers found these shared activity patterns during recall in

higher level regions of the brain, which appear to recieve and combine information from lower levels. In these high level regions, information seems to be more abstract. For example, whether you watch the scene where Sherlock is meeting Watson for the first time in the BBC TV series "Sherlock" or you speak about it from memory, the researchers found similar brain activity pattern that is unique to this event.

"The function of these high-level regions has been controversial for a long time; they are very active when people are resting, daydreaming, remembering their personal past, imagining the future, during internally focused thoughts, evaluating social situations and a whole lot more other types of tasks that psychologists have come up with," Chen says. "The notion that they contain specific activity codes for specific scenes/situations might be able to unite many of the other proposals."

When people have this shared experience, they have shared memories too—the memory is a modified version of the original experience, and it changes in the same way across different people.

"We feel our memories are unique, but there is a lot in common between us in how we see and remember the world, even at the level of these brain activity patterns that we measure at the scale of millimeters," Chen says. "I think this is no accident: having a common framework for remembering makes it easier to communicate our memories to others, and that's a powerful thing that human beings can do. If I have a real experience, finding my way to the train station, for example, I can tell you about it and then you don't have to go through the hassle yourself. You can take advantage of what I learned—my memory communicated to you—and get to the train station, perhaps even getting there more efficiently than I did. In a way, you used my brain to process information from the world, taking a shortcut to acquiring knowledge."

More information: Janice Chen et al, Shared memories reveal shared

structure in neural activity across individuals, *Nature Neuroscience* (2016). DOI: 10.1038/nn.4450