

[https://www.salon.com/2020/04/12/while-you-sleep-specialized-neurons-in-your-brain-remember--and-forget\\_partner/](https://www.salon.com/2020/04/12/while-you-sleep-specialized-neurons-in-your-brain-remember--and-forget_partner/)

# While you sleep, specialized neurons in your brain remember — and forget

Forgetting has long been considered a passive process in the brain, but new research puts that idea to bed

By **KAMILA KOURBANOVA**

APRIL 13, 2020 1:00AM (UTC)

Depressed woman in bed with hand on forehead (Getty/ Martin Dimitrov)

[view in app](#)

[comments](#)

**This story** originally appeared on [Massive Science](#), an editorial partner site that publishes science stories by scientists. [Subscribe to their newsletter](#) to get even more science sent straight to you.

While you sleep, the brain forgets. But, until recently it was not clear how the brain *decides* to forget.

Scientists **analyze sleep** by measuring the electrical activity of neurons near the outer layer of the brain. By quantifying brainwave changes, scientists have already determined sleep is not just one process. There are two basic **types** of sleep: REM (rapid eye movement) and non-REM, or NREM. In **NREM**, your heartbeat slows, your muscles relax, and your brainwaves fall into a constant rhythm producing slow sleep **waves**. In REM, voluntary body motion is **paralyzed** and the brain's activity suddenly **jumps**.

*Advertisement:*

We don't remember every detail of our lives: Our brains decide which events are important for long-term storage and which can be purged. So, how does the brain divide memories between long-term safekeeping and the garbage bin?

A collaboration between Japanese and US researchers has revealed an unheard-of method of the brain actively "forgetting" under the lens of REM sleep. The researchers, authors of a recent **study** led by Shuntaro Izawa and published in the journal *Science*, have spent years studying sleep and wakefulness. They examined a group of neurons that produce melanin concentrating hormone (**MCH**) near a pea-sized area in the brain called the **hypothalamus**, which produces various types of hormones, including those needed for sleep. MCH neurons are known to **control**

[https://www.salon.com/2020/04/12/while-you-sleep-specialized-neurons-in-your-brain-remember--and-forget\\_partner/](https://www.salon.com/2020/04/12/while-you-sleep-specialized-neurons-in-your-brain-remember--and-forget_partner/)

**sleep and appetite**, but more recently they have been studied for their involvement in memory.

Izawa and the other researchers first confirmed that MCH-producing neurons sent blocking signals into the **hippocampus**, a brain structure important for memory. Once they visualized the interaction between MCH neurons and the hippocampus, they had to test the memory of the mice. They did this with a test called **Novel Object Recognition**. In this test, a researcher introduces two identical objects (say, film canisters) to the mouse and allows it to become familiar with the objects. The next day, the mice are exposed to the same two items but this time, after ten minutes, one of the items is replaced with a new item (a Lego block, for example). If the mouse remembers the film canister, it will spend less time exploring it, instead exploring the new item.

Izawa and the other researchers tested the memories of mice with and without active MCH neurons. Surprisingly, the mice lacking MCH neurons had a considerable improvement in memory. These mice remembered objects more quickly and for longer periods of time. In contrast, when testing mice with MCH neurons turned on, their memories plummeted. These mice spent equal time sniffing and licking the old objects (which they had already been introduced to) as with the new objects. In other words, it seemed like the mice did not remember old objects at all.

In the world of sleep science, MCH neurons have been quite **popular** due to their predominant activity in **REM**. Since REM is known to be **important in** memory consolidation, the researchers tried to see if memory retention (the period after learning something new but before long-term storage) was affected by manipulating MCH neurons *during sleep*. The researchers could precisely control when the MCH neurons were active in a sleeping mouse, effectively creating a time-specific "light switch," using lasers.

The results were phenomenal: by temporarily "turning off" MCH neurons during the REM phase, mice showed significantly increased memory during the memory tests, while "turning off" the neurons while the mice were awake or in NREM had no effect on their memory.

*Advertisement:*

It's easy to think of forgetting as a passive process, where things slip through the cracks. The results of this study suggest that MCH neurons can substantially impair memory and *prompt* forgetting during REM. Understanding the mechanisms of forgetting during sleep may help answer some questions about memory degeneration in

[https://www.salon.com/2020/04/12/while-you-sleep-specialized-neurons-in-your-brain-remember--and-forget\\_partner/](https://www.salon.com/2020/04/12/while-you-sleep-specialized-neurons-in-your-brain-remember--and-forget_partner/)

disorders like Alzheimer's Disease. For example, how is it an Alzheimer's patient is able to process and respond to new experiences but have trouble **retaining** them? Is this due to a neuronal "off" switch or does this entail multiple processes researchers are not fully aware of yet?

Sleep, particularly REM sleep, **has many functions**. For many of us, the dreams we would describe as **deeply emotional** and perceptually vivid happen during REM sleep. **Scientists speculate** dreaming may help us regulate our emotions better, process fears and trauma, and assist us in consolidating our memories and forgetting negative events. Studying memory and emotional modulation of dreaming can shed some light on disorders such as Post Traumatic Stress Syndrome as well as the **neuronal plasticity** involved.

*Advertisement:*

Sleep is a regular biological phenomenon that we all experience. Research investigating the relationship between memory, dreaming, and emotions can help us understand the significance of sleep. The importance of these results **points** out the fact that little is known about the process of forgetting, despite the mass of knowledge we have about memory. This new pathway can help scientists clarify how and why we forget, and how sleep may help us in trashing the "extra" memories while keeping the useful ones.