

# Anxiety is not overcome in the brain's fear center

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Scientists from the Center for Brain Research at MedUni Vienna are investigating how anxiety is processed and the flow of information in the brain in general: In a study, which has now been published in the leading magazine *Science*, the team from the Department of Cognitive Neurobiology, led by Stephane Ciocchi and Thomas Klausberger, has managed to show how anxiety is coded by the neurons of the hippocampus and that this information is not then sent directly to the brain's fear center but rather to the prefrontal cortex, the brain's control center, for further processing and for decision-making.

Generally, the hippocampus, the switching point in the [brain](#)'s limbic system "transmits" information about memory and emotions to many other regions of the brain. According to the researchers, this can happen in two different ways: "Either like a radio station broadcasting its program and each person taking the bit that interests them, or like the post with specific addressees for different bits of information," explains Klausberger, Head of the Department of Cognitive Neurobiology.

Using the "memory", "goal-oriented behavior" and "[anxiety](#)" functions, the MedUni Vienna scientists investigated the flow of information. They were able to show that, in the case of memory, the [information flow](#) is widespread, possibly because several regions of the brain are involved with memory. However, in the case of goal-oriented behavior or anxiety, the hippocampus sorts the information and, using different [neurons](#), sends it very specifically to those specialized centers in the brain responsible for these functions.

## **Causes of anxiety and how it is processed**

However, at the same time they also discovered that anxiety is coded by certain neurons in the hippocampus and preferentially forwarded to a region that has not previously been associated with this function. If a person is anxious, the hippocampus does not pass the information to the amygdala, where feelings of fear are normally processed but to the [prefrontal cortex](#), where decisions are made. Klausberger: "For example, imagine you are setting off on a very high "skywalk" in the mountains and you are anxious and unsure whether to proceed. In order to see the view, your curiosity has to prevail and overcome your anxiety. The decision of whether to indulge your curiosity and step out or to stay where you are and keep safe is taken in the prefrontal cortex."

Klausberger: "This answers a very basic question of neurobiology, namely how feelings of anxiety are manifested and processed in the brain."

It is important to make a clear distinction between anxiety and acute fear, for example if you suddenly encounter a rattlesnake or a shark in the wild, which is often accompanied by the "freeze" response.

The [information](#) flow in the neurons of the [hippocampus](#) was analyzed in an animal model by means of an optogenetic and electrophysiological research method that uses light stimuli.

**More information:** "Selective information routing by ventral hippocampal CA1 projection neurons." *Science* 1 May 2015: Vol. 348 no. 6234 pp. 560-563 [DOI: 10.1126/science.aaa3245](https://doi.org/10.1126/science.aaa3245)

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