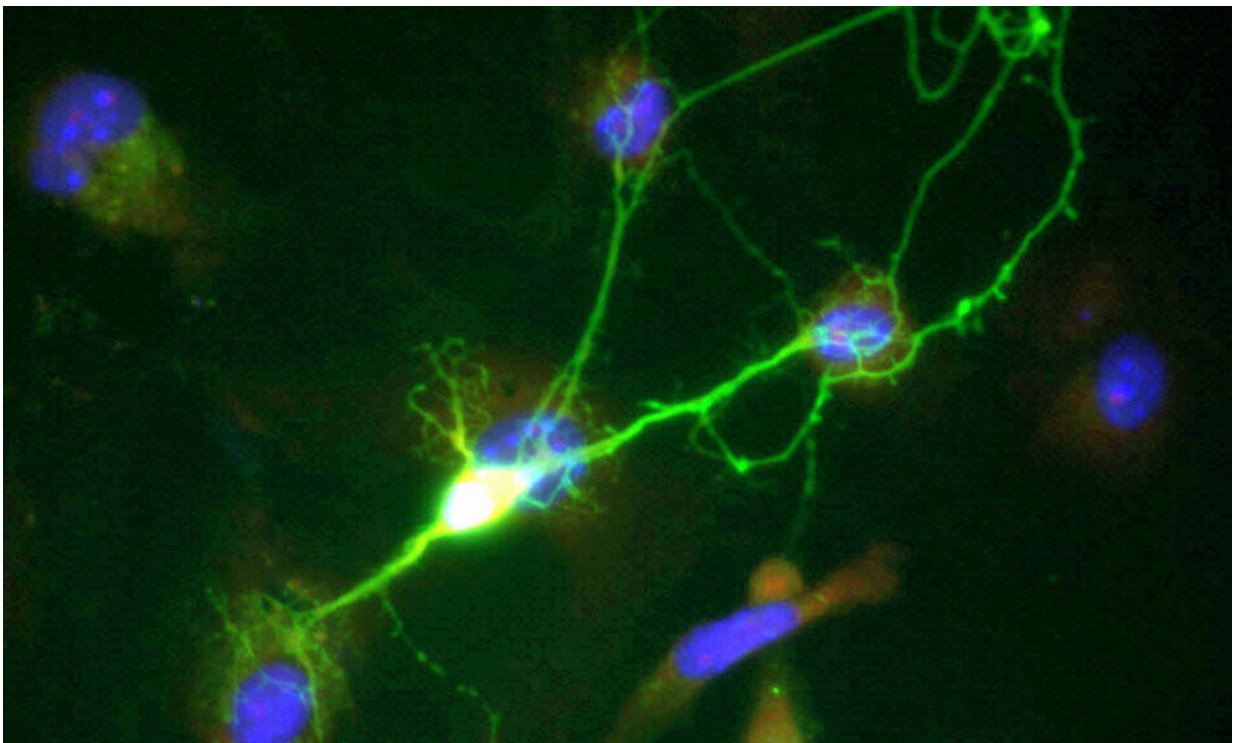


Research breakthrough in understanding how neural systems process and store information

April 14 2021



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A team of scientists from the University of Exeter and the University of Auckland have made a breakthrough in the quest to better understand how neural systems are able to process and store information.

The researchers, including lead author Dr. Kyle Wedgwood from the University of Exeter's Living Systems Institute, have made a significant discovery in how a [single cell](#) can store electrical patterns, similar to memories.

They compared sophisticated mathematical modeling to lab-based experiments to determine how different parameters, such as how long it takes for neuronal signals to be processed and how sensitive a cell is to external signals, affect how neural systems encode information.

The research team found that a single neuron is able to select between different patterns, dependent on the properties of each individual stimulus.

The research offers a new step towards developing a greater understanding of how information is encoded and stored in the brain, which could open up fresh insights into the cause and treatment of conditions such as dementia.

The research is published in the *Journal of the Royal Society Interface* on Wednesday, April 14th 2021.

Dr. Wedgwood, from the University of Exeter's Living Systems Institute said: "This work highlights how [mathematical analysis](#) and wet-lab experiments can be closely integrated to shed new light on fundamental problems in neuroscience.

"That the theoretical predictions were so readily confirmed in experiments gives us great confidence in the mathematical approach as a tool for understanding how individual [cells](#) store patterns of activity. In the long run, we hope that this is the first step to a better understanding of memory formation in neural networks."

According to Professor Krauskopf from the University of Auckland: "The research shows that a living neuron coupled to itself is able to sustain different patterns in response to a stimulus. This is an exciting first step towards understanding how groups of neurons are able to respond to external stimuli in a precise temporal manner."

"Communication between [neurons](#) occurs over large distances. The communication delay associated with this plays an important role in shaping the overall response of a network. This insight is crucial to how [neural systems](#) encode memories, which is one of the most fundamental questions in neuroscience," adds Professor Tsaneva from the University of Exeter's Living Systems Institute.

"Robust spike timing in an excitable cell with delayed feedback" is published in the *Journal of the Royal Society Interface* on Wednesday, April 14 2021.

More information: Kyle C. A. Wedgwood et al, Robust spike timing in an excitable cell with delayed feedback, *Journal of The Royal Society Interface* (2021). [dx.doi.org/10.1098/rsif.2021.0029](https://doi.org/10.1098/rsif.2021.0029)

Provided by University of Exeter

Citation: Research breakthrough in understanding how neural systems process and store information (2021, April 14) retrieved 24 April 2024 from <https://medicalxpress.com/news/2021-04-breakthrough-neural.html>

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