New tool enables imaging of neural activity with near-infrared light

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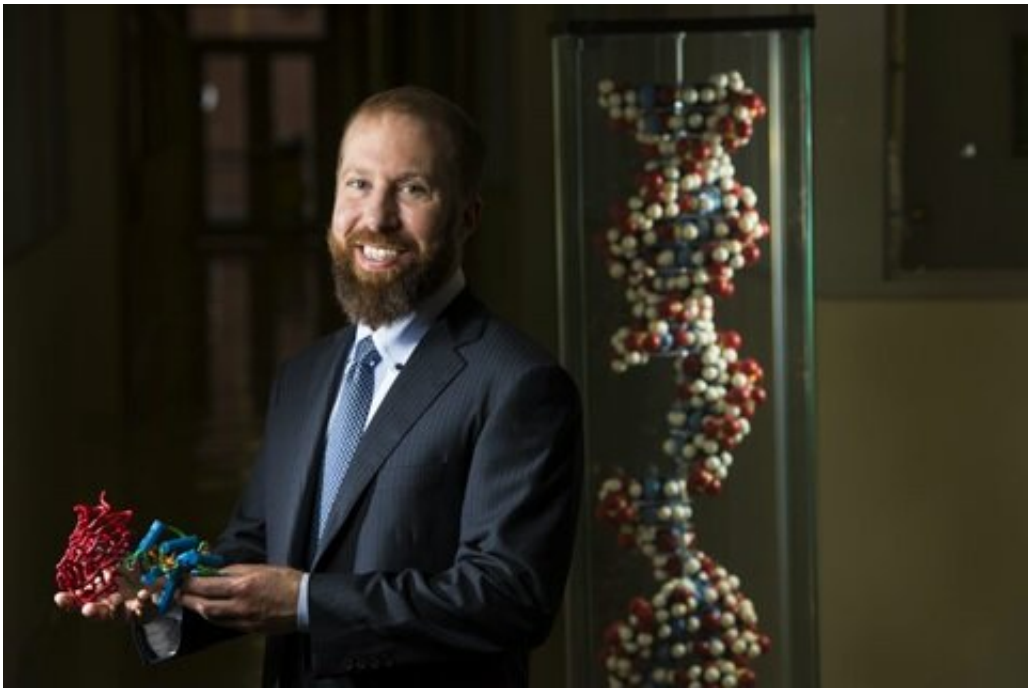

Robert Campbell, professor in the Department of Chemistry, led the team that developed a new detector to visualize the activity in neurons—with applications to help build better, more effective treatments for a number of pressing health conditions. Credit: John Ulan

A new, groundbreaking tool for visualizing neural activity has implications for understanding brain functions and disorders, according to new research by University of Alberta scientists and a team of international collaborators.

The tool, named NIR-GECO1, identifies when an individual neuron is active by monitoring for the presence or absence of calcium ions. "Specifically, it emits near-infrared light in the absence of calcium ions. When the concentration of calcium ions increases, it turns dark," explained Robert Campbell, professor in the Department of Chemistry and lead author of the study. "When a neuron 'fires' the concentration of calcium ions temporarily increases inside of the cell. We see this as a dimming of the emitted near-infrared light."

The research builds on previous work in Campbell's lab focused on developing a toolkit for visualizing and manipulating individual neurons. NIR-GECO1 is a protein encoded into DNA, making it most useful for cultured cells in a lab or in model organisms. The technology has the potential to allow scientists to determine the efficacy of therapeutic drugs at the cellular level, with implications for building better, more effective treatments for a number of pressing health conditions, including neurodegenerative diseases.

"Tissue is relatively transparent to near-infrared light, so this tool has the potential to enable researchers to visualize neuronal activity deeper within the brain than is currently possible," said Campbell. "This could lead to important insights in the areas of learning and memory, stroke prevention and recovery, and neurodegenerative diseases."

The paper, "A genetically encoded near-infrared fluorescent calcium ion indicator," was published in *Nature Methods*.

More information: Yong Qian et al, A genetically encoded near-infrared fluorescent calcium ion indicator, *Nature Methods* (2019). DOI: 10.1038/s41592-018-0294-6