Skysong Innovations
Advancing the Arizona State University Knowledge Enterprise

1475 N. Scottsdale Road, Suite 200
Scottsdale, AZ 85287-3538
Phone: 480 884 1996 Fax: 480 884 1984

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Inventors

Christopher Miranda

Barbara Smith

Contact

Jovan Heusser
jovan.heusser@skysonginnovations.com

Novel Ion Indicator Systems

The activity of neurons has long been studied to characterize and understand neurological activity. Neurological activity is directly related to changes in membrane potential due to ion flux across the neuronal membrane. Imaging of this ion flux can provide insight into neural activity and enable research into function and disorders. Current approaches to image neuronal ion flux utilize fluorescent ion indicators (FIIs). However, these FIIs only provide an indirect measure of action potential, offer poor contrast and the use of fluorescence limits the depth at which imaging can occur.

Researchers at Arizona State University have developed a system of novel intracellular ion indicators and methods for measuring the membrane potential of a neuron with high resolution and at great depths. Some of the ion indicators comprise an agent that is configured to selectively bind to sodium, calcium or potassium ions and a reporter agent that does not utilize fluorescent molecules. Other ion indicators are absorption-based and also bind to sodium, calcium or potassium ions. The method uses a probe that emits a light signal as well a receiver that receives the signal. From the received signal, the membrane potential of the neuron is calculated.

This novel system could have a profound impact on current approaches to monitoring membrane potential and neuronal activity across the brain.

Potential Applications

- Optical measurement of membrane potential
  - Monitor real-time neuronal activity/function/disorders
  - Elucidate the behavior of single cells & neural networks in deeper regions of the living brain
  - Could have implications in cancer
  - Visualizing changes in cardiovascular health and activity

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For more information about the inventor(s) and their research, please see

Dr. Smith's departmental webpage