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Probing Neural Circuits with Shaped Light

Abstract: To understand computation in the brain, one needs to understand the input-output relationships for neural circuits and the anatomical and functional relationships between individual neurons therein. Optical microscopy has emerged as an ideal tool in this quest, as it is capable of recording the activity of neurons distributed over millimeter dimensions with sub-micron spatial resolution. I will describe how we use advanced microscopy methods to image neural circuits at higher resolution, greater depth, and faster speed. By shaping the wavefront of the light, we have achieved synapse-level spatial resolution through the entire depth of primary visual cortex, optimized microendoscopes for imaging deeply buried nuclei, and developed a video-rate (30 Hz) volumetric imaging method. We apply these methods to understanding neural circuits, using the mouse primary visual cortex as our model system.

Bio: Na Ji received her B.S. in Chemical Physics from the University of Science & Technology of China in 2000. She received her Ph.D. in Chemistry from Berkeley in 2005. She started working as a postdoctoral fellow at Janelia Research Campus, Howard Hughes Medical Institute in 2006, before becoming a Group Leader there in 2011. She returned to Berkeley and joined the Physics and Molecular & Cell Biology Departments in 2016. She became a full-time faculty member there in summer 2017.