Tiniest two-photon MEMS microscope performs brain imaging

Researchers at Stanford University (Stanford, CA) have developed an incredibly small two-photon microscope imager that uses a microelectromechanical systems (MEMS) laser-scanning mirror to image (v) the brain of a mouse.

Previously devised miniature endoscopes either used a double-clad optical fiber to route fluorescence signals reflected off a MEMS mirror (reducing robustness to light scatter in cases of deep-tissue imaging) or included only spatially filtered images; neither method was shown to be capable of live imaging or of having sufficient sensitivity for fast physiological measurements. Alternatively, the tiny two-photon MEMS imager (only 2.9 g in mass) from Stanford uses a hollow-core bandgap fiber to deliver ultrashort pulses from a tunable Ti:sapphire laser to the microscope. The light is collimated and reflects off the 1 × 1 mm MEMS scanner into an optical assembly comprised of four gradient-index lenses and a dichroic microprism that is focused to the specimen. The full aperture of emissions from the specimen (in this case, the neocortical capillaries and erythrocyte flow in the live brain of an anesthetized mouse) passes back through the optics and into a polymer fiber to a photomultiplier tube for analysis. Illumination power was 27 mW at the sample; eight frames acquired over 2 s at 4 Hz were averaged to obtain the microvasculature images. *Contact Mark Schnitzer at mschnitz@stanford.edu.*

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