- Technology Presentation #4 -

“LITE microscopy: Tilted light-sheet excitation of model organisms offers high resolution and low photobleaching”

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Abstract: Fluorescence microscopy is a powerful approach for studying subcellular dynamics at high spatiotemporal resolution; however, conventional fluorescence microscopy techniques are light-intensive and introduce unnecessary photodamage. Light-sheet fluorescence microscopy (LSFM) mitigates these problems by selectively illuminating the focal plane of the detection objective by using orthogonal excitation. Orthogonal excitation requires geometries that physically limit the detection objective numerical aperture (NA), thereby limiting both light-gathering efficiency (brightness) and native spatial resolution. We present a novel live-cell LSFM method, lateral interference tilted excitation (LITE), in which a tilted light sheet illuminates the detection objective focal plane without a sterically limiting illumination scheme. LITE is thus compatible with any detection objective, including oil immersion, without an upper NA limit. LITE combines the low photodamage of LSFM with high resolution, high brightness, and coverslip-based objectives. We demonstrate the utility of LITE for imaging animal, fungal, and plant model organisms over many hours at high spatiotemporal resolution.

Publications (selected)**:**

LITE microscopy: Tilted light-sheet excitation of model organisms offers high resolution and low photobleaching. Tanner C. Fadero, erese M. Gerbich, Kishan Rana, Aussie Suzuki, Matthew DiSalvo, Kristina N. Schaefer, Jennifer K. Heppert, omas C. Boothby, Bob Goldstein, Mark Peifer, Nancy L. Allbritton, Amy S. Gladfelter, Amy S. Maddox, and Paul S. Maddox , J. Cell Biol. Published February 28, 2018