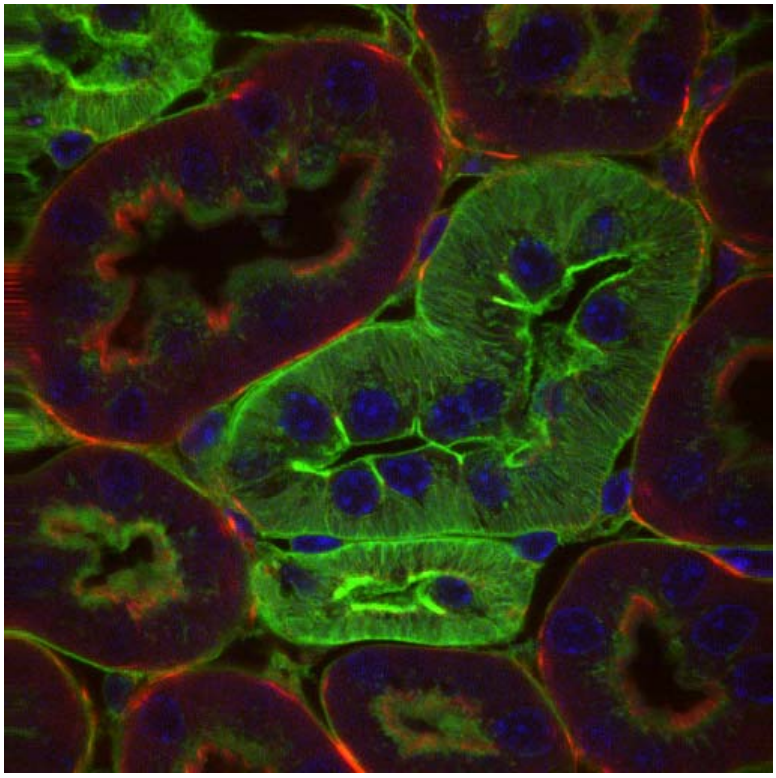
NSF Highlights

Ultrashort Pulses Improve Biomedical Imaging

Highlight ID:



The development of improved biomedical imaging methods depends on the ability of microscopes to detect signal only from the focal spot. Improving these nonlinear optical imaging modalities requires the delivery of ultrashort pulses at the focal plane, a task that is complicated by the significant dispersion introduced by the microscope objective lens. NSF-funded researcher at Michigan State University, have developed ultrashort pulse lasers and the technology to measure and correct the dispersion in the optical path. Their research is already yielding increased signal and reduced laser induced damage in biomedical imaging. The figure on the right was obtained using 15 fs pulses and it shows the cells inside a mouse kidney. Without pulse compression the signal would be a factor of 45 times weaker. This work is part of a multidisciplinary Major Instrumentation Grant from the NSF.

This work is notable because:
The methodology developed can be used to optimize all forms of nonlinear optical imaging that rely on ultrashort pulses.

This technology has been commercialized, and it is beginning to be used by a number of groups to improve their biomedical research. This technology is already generating jobs in the United States.

NSF Award Numbers:
CHE-0421047
Award Title: MRI: Development of phase-modulated ultrashort laser pulse technology for probing molecular dynamics, optical switches and materials, and coherent control of multiphoton microscopy

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