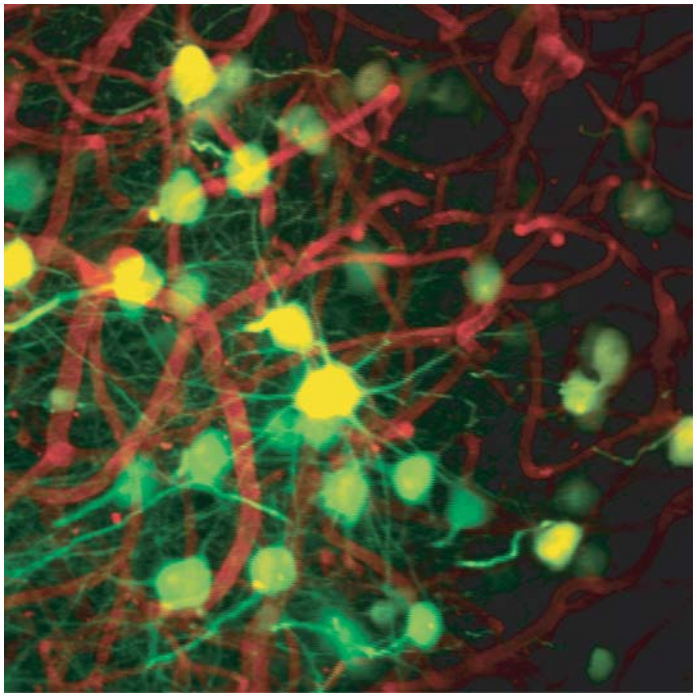
The Institute of OPTICS

Colloquium

University of Rochester

Nonlinear optics in the study of animal models of neurological disorders



Professor Chris Schaffer

Biomedical Engineering, Cornell University

BS Physics, Florida, 1995
PhD Physics Harvard, 2001

In this talk he will describe the use tightly-focused femtosecond laser pulses to injure endothelial cells and nonlinear optics to study the physiological consequences of these lesions to blood flow, neuronal function, cell death and exacerbation of neurodegenerative diseases.

3:00-4:00 pm, Monday
April 13, 2009
Sloan Auditorium, Goergen Building
Refreshments served

Nonlinear optics in the study of animal models of neurological disorders

Professor Chris B. Schaffer

Biomedical Engineering, Cornell University

Abstract

Nonlinear optical techniques provide unique capabilities for the observation and manipulation of in vivo biological systems, enabling the discovery of a microscopic-scale understanding of normal and disease-state physiological processes. We use nonlinear optics as a tool for precise ablation of structures and quantitative observation of dynamical processes in the brain of live rodents. With these methods, we investigate the role of cortical microvascular clots and hemorrhages on the health and function of brain cells and the link between such lesions and neurodegenerative diseases, such as Alzheimer's disease. We use tightly-focused femtosecond laser pulses to injure the endothelial cells that line specifically targeted blood vessels and thereby trigger clotting or hemorrhage. This method allows us to selectively lesion any vessel in the top 1 mm of the cortex. We also use optical techniques, such as two-photon excited fluorescence microscopy, to study the physiological consequences of these occlusions in terms of blood flow change, loss of neuronal function and cell death, and exacerbation of other neurodegenerative diseases.

Biography

Chris Schaffer received his undergraduate degree from the University of Florida in 1995 and his Ph.D. from Harvard University in 2001, both in Physics. He is currently an Assistant Professor at Cornell University in the Department of Biomedical Engineering. His research has centered on the development of optical tools for in vivo manipulation of biological structures and the use of these tools to study the role of cortical microvascular lesions in neurological disease.