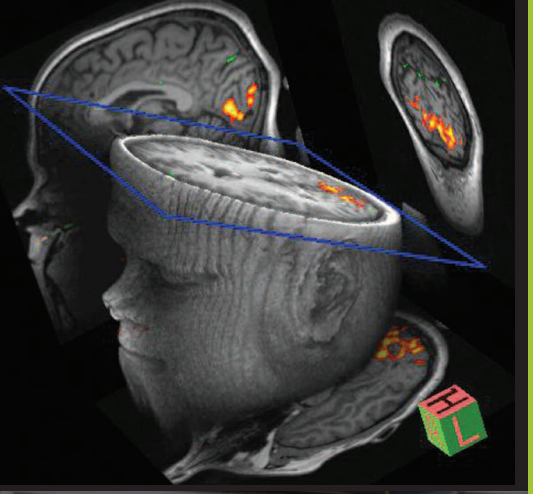
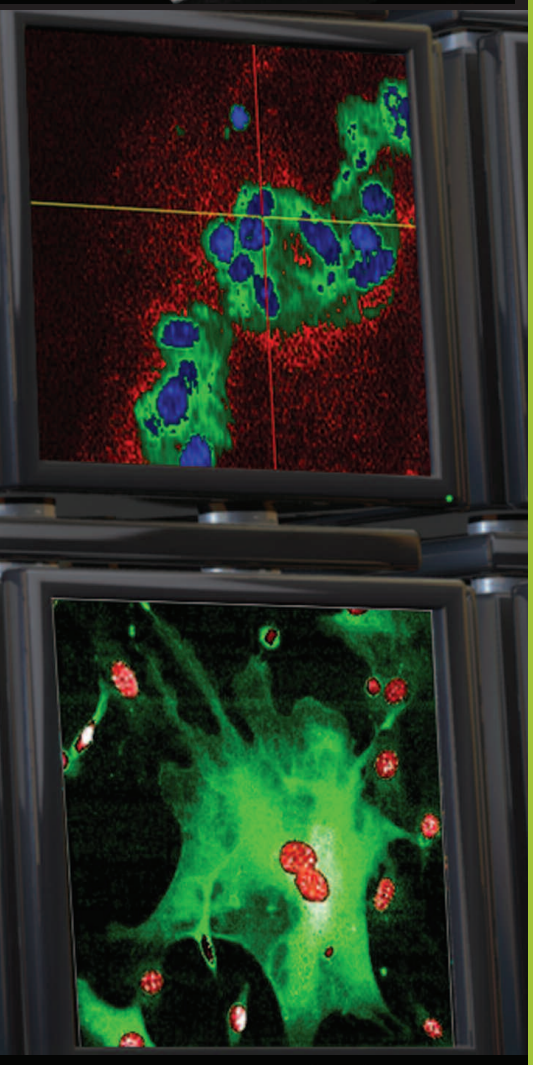
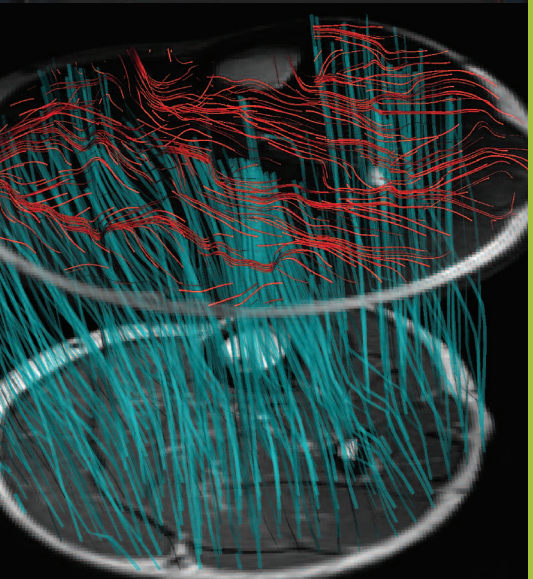
Bioimaging Research

Beckman Institute

FOR ADVANCED SCIENCE AND TECHNOLOGY



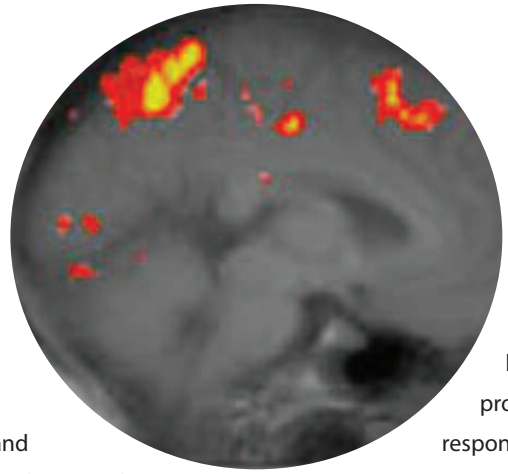




Bioimaging Research

Biological imaging methods like ultrasound and Magnetic Resonance Imaging (MRI) have been important tools in medicine for decades, but in recent years these and other, newer, imaging modalities have increasingly become an integral part of research in a wide variety of scientific disciplines. These imaging tools are providing never-before-seen views of the biological world, both for scientific research and for medical purposes such as diagnosis and therapy.

Beckman Institute researchers are in the forefront of this imaging revolution. They both develop and use functional MRI (fMRI) to link neural physiology to cognitive function by measuring blood flow in activated areas of the brain. Beckman researchers are advancing ultrasound techniques for applications such as improving detection of diseases like cancer. Other Institute researchers in the area of biological imaging are developing their own distinctive techniques, ranging from methods involving light diffusion to measuring the electrical signals generated by the brain. Bioimaging is also being used to measure microfluidic flow, such as in our blood vessels, and includes development of mathematical algorithms and computer programs for simulating dynamic biological processes.



Stephen Boppart, who developed a technique using optical coherence tomography (OCT) for real-time non-invasive or minimally invasive imaging of breast cancer cells, has joined with Institute colleagues **Michael Insana**, **Thomas Huang**, **Zhi-Pei Liang**, and **Rohit Bhargava** on a Beckman seed proposal aimed at developing multimodal approaches to imaging breast cancer. This comprehensive approach seeks to improve techniques for non-invasive breast cancer imaging at the molecular level, both for diagnostic applications and to understand how the cancer is formed and progresses.

William O'Brien and **Michael Oelze** are working to advance ultrasound techniques for applications such as assessing solid lesions in the breast and the prostate, and for assessing cervical ripening during pregnancy.

Gabriele Gratton and **Monica Fabiani**, co-directors of the Cognitive Neuroimaging Laboratory at Beckman, have developed new techniques for the use of near-infrared light for non-invasive optical imaging of the brain, providing a detailed view of dynamic activity in specific areas of the brain.

Neuroscience researchers like **Art Kramer, Diane Beck**, **Brian Gonsalves**, **Gratton,** and **Fabiani** use the Institute's Biomedical Imaging Center (BIC) for functional Magnetic Resonance Imaging (fMRI) to study patterns of brain activation in the service of understanding memory, attention, and brain changes across the lifespan.

Michael Insana develops novel ultrasound techniques and instruments for imaging soft tissue microstructure, elasticity, and blood flow in order to understand basic biological mechanisms, disease progression, and therapeutic responses.

Zhi-Pei Liang has been a pioneer in advancing methods to optimize the acquisition, reconstruction, and processing of magnetic resonance images toward applications in functional neuroimaging, and cardiac and cancer imaging.

Brad Sutton is creating new methods to image structure and physiological function with magnetic resonance imaging. Sutton develops image acquisition and reconstruction strategies to advance MRI capabilities for biomedical and research purposes, including functional neuroimaging and dynamic imaging of muscle function during speech.

Klaus Schulten is leader of the Theoretical and Computational Biophysics group at Beckman, which has been at the forefront for more than two decades in developing dynamic atomic scale computer simulations of biological processes and structures.

John Wang creates modalities for imaging thermal properties of the brain. A neurosurgeon at Carle Foundation Hospital, Wang is developing a cooling helmet for treating patients with head injuries or who have suffered a stroke.

Gabriel Popescu develops novel optical imaging techniques based on light scattering, interferometry, and microscopy to quantify structure and dynamics of cells and tissues.