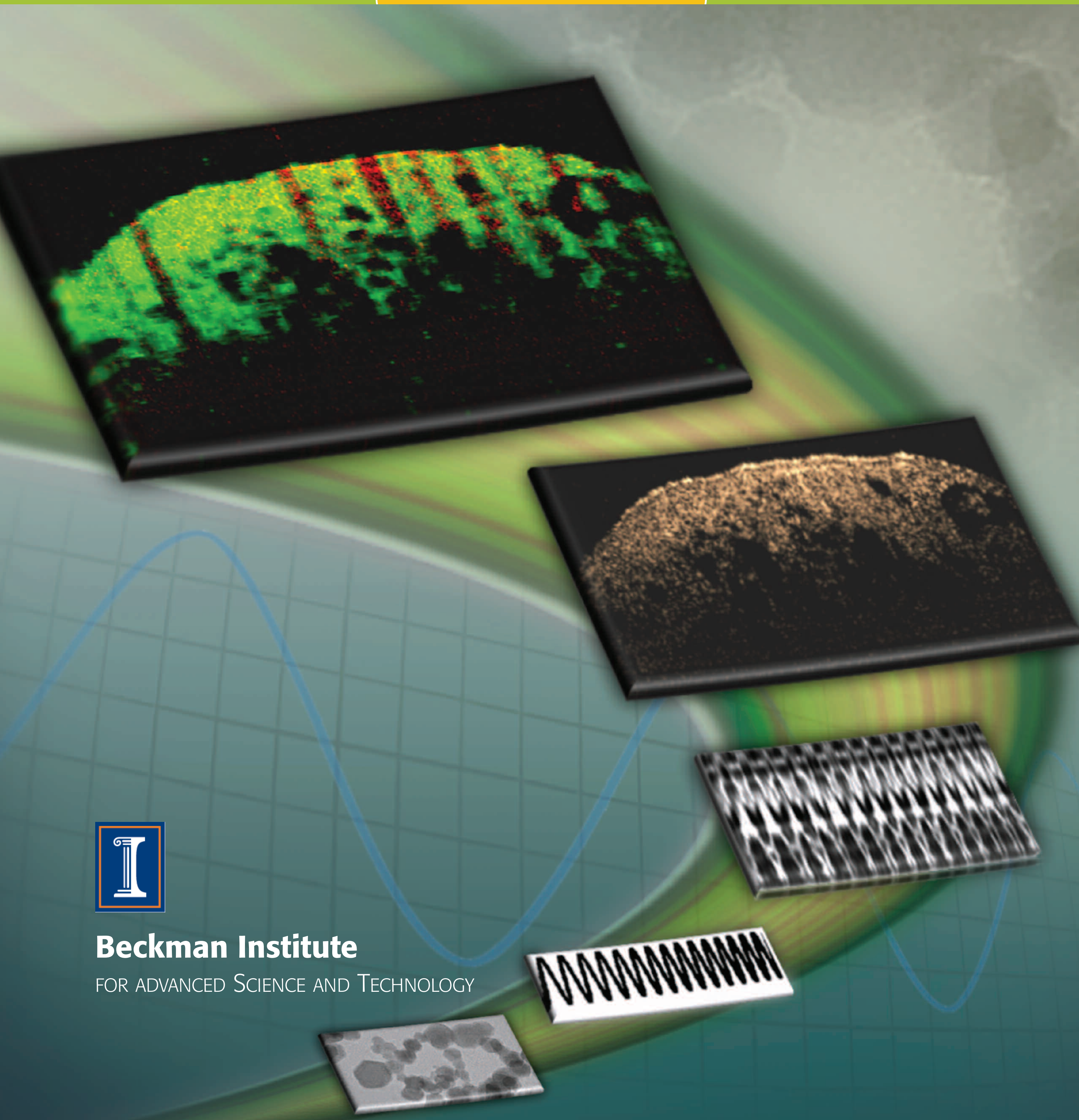
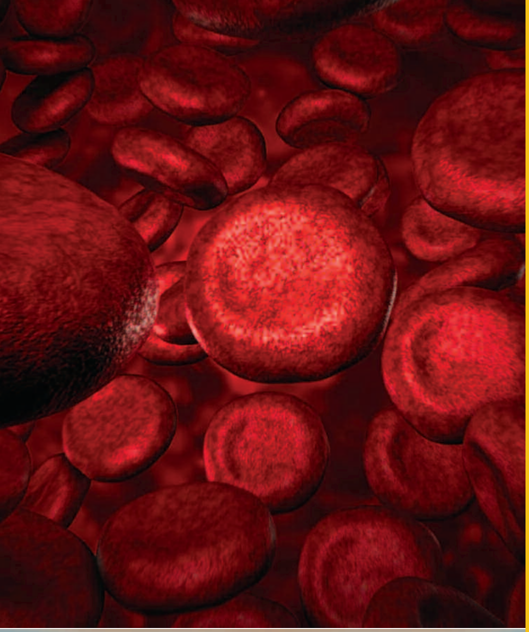
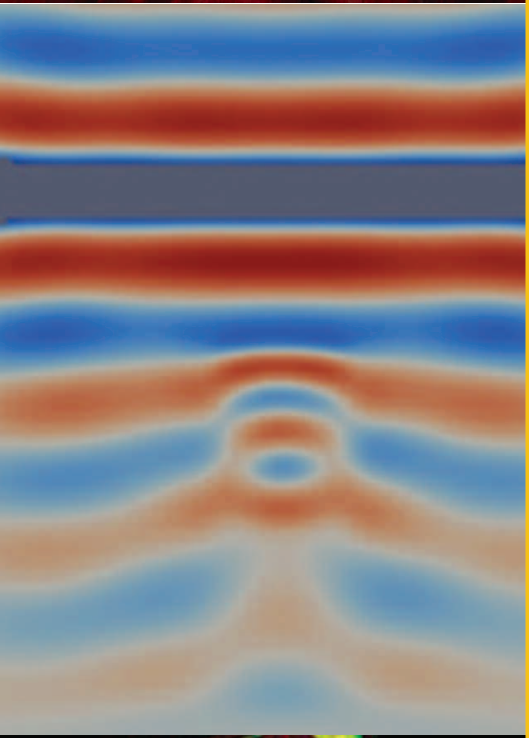
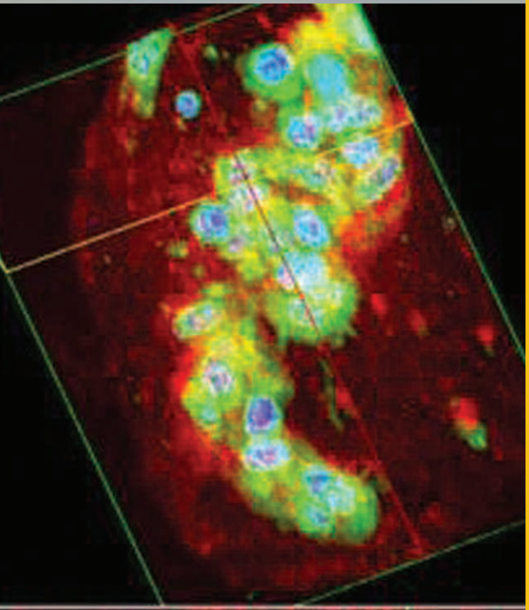
Cancer Research



Beckman Institute

FOR ADVANCED SCIENCE AND TECHNOLOGY

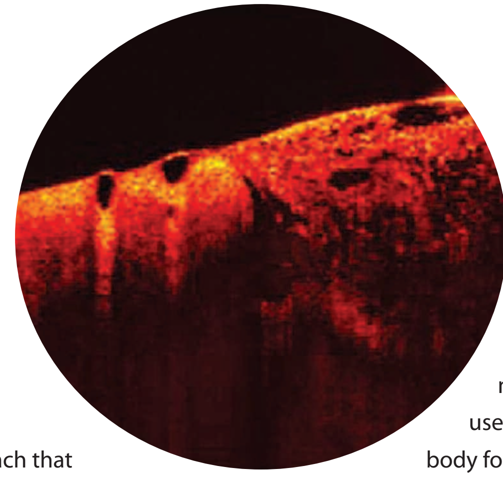

Cancer Research

TThe medical and scientific worlds have known for many years that in order to truly understand and treat cancer, the fight has to be taken to the cellular and even molecular levels of tissue. The margins between healthy tissue and cancerous tumors have to first be visualized at the smallest scales possible, and then treated in the most effective and least harmful ways.

Beckman Institute researchers are leading these efforts by creating new tools and advancing current techniques, thereby providing doctors and clinicians with faster, more comprehensive, and clearer pictures of the disease at smaller scales, and at earlier stages. They have developed imaging techniques that work in real time, give cellular level views of disease progression, and allow for more accurate diagnosis and assessment. Recent Beckman research lines have been aimed at developing multiple modalities for imaging breast cancer, including genomic imaging for detection of the different stages of the disease, and creating methods that can perform molecular scale imaging. Some of the cancer diagnosis and treatment techniques developed at Beckman can also be applied to other types of cancer, such as prostate cancer, and to other diseases. These methods are being developed for diagnosis, assessment, and even for treatment, such as with techniques that are part of targeted drug delivery systems.

All of the Beckman researchers working in these research lines have a common goal of improving the lives of patients or those seeking diagnosis through faster, more accurate, and less invasive methods for fighting cancer.

Rohit Bhargava is developing a systems pathology approach to prostate cancer diagnosis and assessment that uses infrared spectroscopic imaging. The automated method uses infrared light to measure the chemical composition of tissues and changes that correlate with aggressive disease; it's an approach that could tell which prostate cells have the potential to cause life-threatening cancer. Postdoctoral researcher **Michael Walsh** works closely with Bhargava, as they seek to incorporate chemical information from a tumor in imaging diagnosis methods in order to make predictions about future cancer growth.



Stephen Boppart developed a technique using optical coherence tomography (OCT) for real-time non-invasive or minimally invasive imaging of breast cancer cells. The method proved successful in clinical trials at Carle Foundation Hospital in Urbana as a real-time diagnostic tool for assessing tumor margins in breast tissue.

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. Their research involves ultrasound-tissue interactions, with a focus on applying quantitative ultrasound (QUS) imaging methods to detection and diagnosis, and to distinguish malignant tumors from benign ones such as a mammary tumor called fibro adenoma.

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. His research seeks to optimize diagnostic capabilities for different types of examinations and for different patient's physiologies.

Kenneth Watkin has fashioned nanoparticle carriers that can be used to target specific areas of the body for drug delivery using imaging technologies such as ultrasound. When a bi-layer sphere containing the drug compound reaches the target area, an ultrasonic pulse causes the drugs to be released at the specific target area.

Yi Lu is leading a project that seeks to create a novel, highly specific approach to nanoscale medicine that focuses on metastatic cancers. By combining aptamer (molecules that bind to a specific target molecule) targeting technologies and biophysics they are developing target-responsive liposome systems for effective drug controlled delivery and intracellular trafficking.

Peter Wang focuses on the role signaling molecules play in cell motility and migration, using fluorescence microscopy techniques like fluorescent, genetically-encoded reporters to visualize dynamics such as signaling activity, and to quantify molecular structure and sub-cellular location. Using these and other approaches, Wang can monitor and manipulate target proteins in live cells, and develop accurate imaging assays for early cancer detection.

Gabriel Popescu develops novel optical imaging techniques based on light scattering, interferometry, and microscopy to quantify structure and dynamics of cells and tissues. His group, which collaborates with Provena Hospital in Urbana, has developed a cancer blood screening technique that uses interferometry to automatically characterize blood cells.