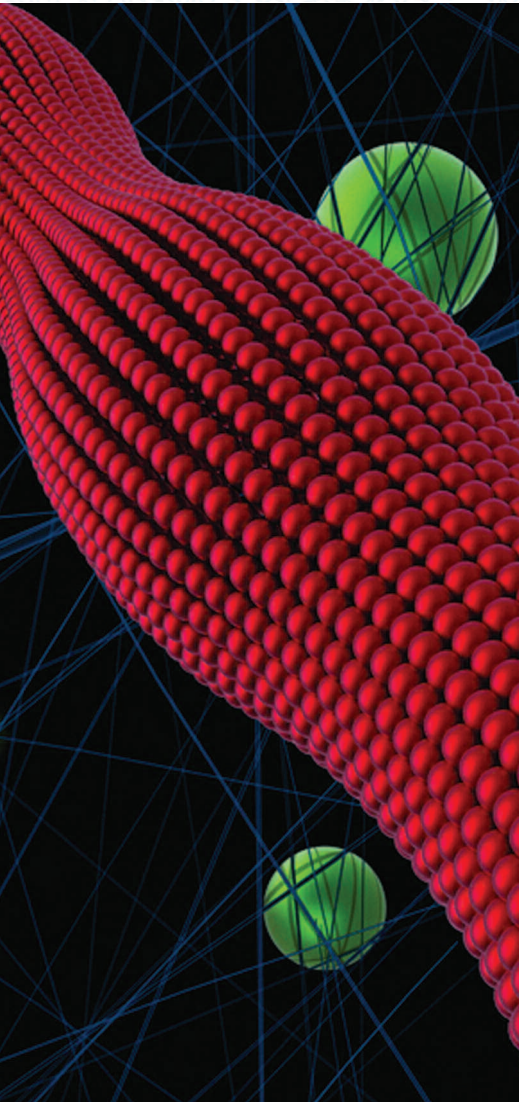
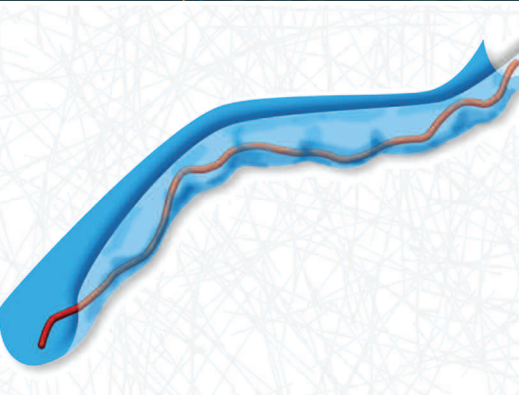
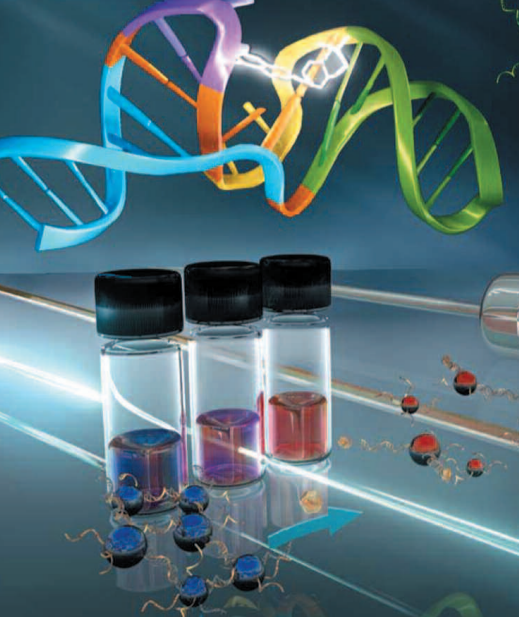


# Bioengineering Research



**Beckman Institute**

FOR ADVANCED SCIENCE AND TECHNOLOGY



## Bioengineering Research

**B**iological engineering, or bioengineering, applies engineering principles in areas of biology, especially in the medical field, but also for industrial and scientific research purposes. At the Beckman Institute, bioengineering research lines may include man-made systems inspired by biology, or use biological components in engineered technologies, or result in biological or medical applications. It is an exciting area that is transforming the worlds of medicine, industry, and science with applications like biosensors for detecting toxins and technologies that can probe and manipulate at the molecular scale.

**Yi Lu** combines biology, chemistry, and materials to create real-world medical, industrial, and home use technologies. Biosensors such as a colorimetric dipstick sensor for detecting toxins like lead in paint are just one example of the many potential applications.

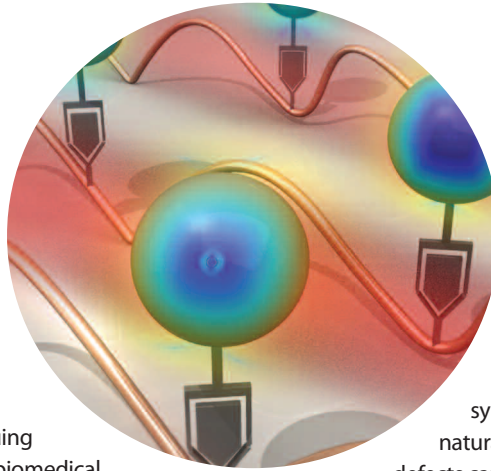
**Rohit Bhargava** created an intriguing new class of molecular probes for biomedical research called nanoLAMPs (Nano-Layered Metal-dielectric Particles) that can measure multiple molecules simultaneously with a high degree of accuracy and reliability. The nanoLAMPs can contain different reporter molecules for biomedical imaging without dyes.

**Ning Wang** and **Min-Feng Yu** developed a nanoneedle that can penetrate the membrane of a living cell for the targeted delivery of one or more molecules into the cytoplasm. The technology could be used to deliver tiny materials, and as an electrochemical probe, and as an optical biosensor, useful for studying biological processes and properties of living cells at the molecular level.

**Kenneth Suslick** uses colorimetric sensors to create "electronic nose" technologies that have shown the ability to accurately distinguish between 20 different toxic chemical vapors and between 10 different varieties of coffee.

**Steve Granick** harnesses the power of self-assembling structures based on Janus spheres (tiny latex spheres that attract water on one hemisphere and repel it on the other) for creating small-scale structures such as lattices that could be used as so-called smart materials, or in filters.

**Kenneth Watkin** led a project that created a battlefield helmet modified to include "smart" nanotechnology sensors that record the effects of blast injuries in real time, giving first responders information on the brain's response to the injury, as well as factors like changes in heart rate and oxygen in the blood.



**Iwona Jasiuk** uses biology as an inspiration for creating composite materials that can be used as artificial bone that will also spur bone tissue growth and eventual replacement for damaged or missing bone. **Amy Wagoner Johnson** modifies a ceramic material to fashion synthetic bone replacement for natural bone in large and complex defects caused by injury or disease.

**Douglas Jones** developed an underwater pressure sensor that could be used for navigation and detection in underwater vehicles. Patterned after the hair-like sensors fish use to detect pressure changes and water movement around them, the underwater sensor would be especially useful in murky waters with low visibility.

**Jont Allen** studies how humans decode basic speech sounds, and how that ability deteriorates through cochlear hearing loss due to factors like aging or noise trauma, in order to advance hearing aid technology. Allen uses computer modeling of the cochlear toward understanding the problems of signal processing in the hearing impaired.

**Charissa Lansing** studies how people select and integrate visual and auditory information for language processing, working toward development of a real-time voice-driven avatar, and for advancing hearing aid technology.

**Peter Wang** focuses on the role signaling molecules play in cell motility and migration, using fluorescence microscopy techniques such as fluorescent, genetically-encoded reporters to visualize dynamics like signaling activity and to quantify molecular structure and sub-cellular location..

**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 in speech.