

# D I S T I N G U I S H E D L E C T U R E

## THE INTERSECTION OF NANOTECHNOLOGY AND HEALTHCARE:

### *From Nano Neuro Knitting to Immediate Hemostasis to Crystal Clear Surgery*



## Rutledge Ellis-Behnke, PhD

*Associate Director of Technology Transfer and Associate Professor, University of Hong Kong*

**November 20, 2008**

**11:00 a.m.**

Room 163, Research I

**Rutledge Ellis-Behnke** is Associate Director of the Technology Transfer Office at the University of Hong Kong, as well as Associate Professor in the Department of Anatomy at the Li Ka Shing Faculty of Medicine and the Key Lab for Brain and Cognitive Sciences. He is also a Research Scientist in the Brain and Cognitive Sciences department at MIT. His primary interest is using nanobiotechnology to reconnect disconnected parts of the central nervous system. *Technology Review* named his nanotechnology discoveries one of the "Top 10 Emerging Technologies of 2007."

Dr. Ellis-Behnke received his PhD in Neuroscience from MIT and BS from Rutgers University. He is also a graduate of the Harvard Business School's International Senior Manager's Program. He is a Fellow and Founding Board Member of the American Academy of Nanomedicine, and Associate Editor of Neurology for the journal *Nanomedicine*.

Nanotechnology is often associated with materials fabrication, microelectronics and microfluidics, but the intersection of nanotechnology and healthcare is rapidly taking center stage. While nano biomedicine has led to wildly futuristic promises, it has also presented real breakthroughs in drug research and development, as well as in the field of diagnostics. Two different breakthroughs will be discussed, each representing a significant nanobiomedical advance that holds great promise for treating human conditions in the foreseeable future.

**Using nanotechnology to repair the brain.** In order to achieve axonal regeneration after injury in the central nervous system, several formidable barriers must be overcome. Using the mammalian visual system as a model, we showed that a designed self-assembling peptide nanofiber scaffold created a permissive environment not only for axons to regenerate through the site of an acute injury, but also to knit the brain tissue together. By overcoming some of the barriers to CNS axon regeneration previously thought to be nearly impenetrable, it allowed functional recovery, demonstrated by the return of lost vision.

**Using nanotechnology to stop bleeding in less than 15 seconds.** Hemostasis is a major problem after trauma and during surgery; as much as 50% of surgical time can be spent packing wounds to reduce or control bleeding. We show that hemostasis can be achieved in less than 15 seconds, using a self-assembling peptide that establishes a nanofiber barrier incorporating it into the surrounding tissue to form an extracellular matrix. This is the first time that nanotechnology has been used to stop bleeding in animal models without relying on heat, pressure, platelet activation, adhesion, or desiccation.



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