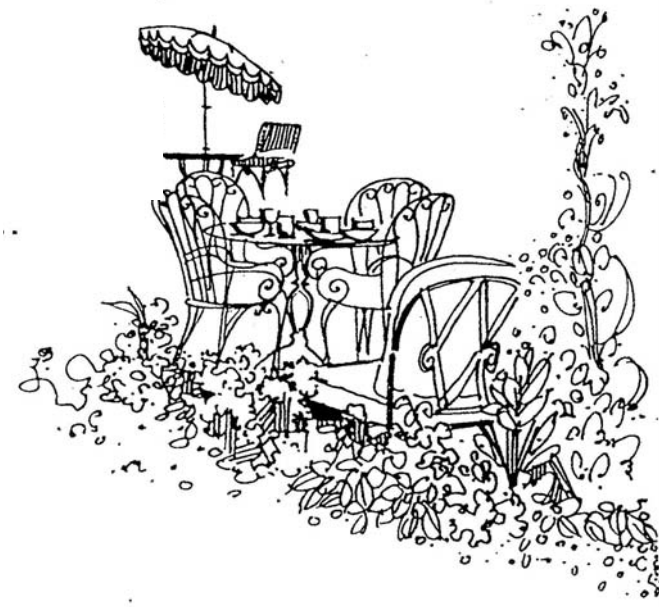
Chez Pierre

Presents ...

Monday, September 29, 2008
12:00pm
MIT Room 4-331



Mehmet Fatih Yanik

Massachusetts Institute of Technology

"On-chip in vivo screening of whole animals at sub-cellular resolution"

In recent years, the advantages of using small invertebrate animals as model systems for human diseases have become increasingly apparent, and have resulted in two Nobel Prizes in Physiology and Medicine in 2002 and 2006 for the discoveries made in the nematode C. elegans. The availability of a wide array of species-specific genetic techniques, along with the animal's transparency, and its ability to grow in minute volumes make C. elegans an extremely versatile model organism. However, since the first studies in the early 1960s, little has changed in how scientists manipulate this multi-cellular organism. As a result, in vivo high-throughput screens at cellular or sub-cellular resolution cannot be currently performed. We present key technologies for complex high-throughput whole-animal genetic and drug screens at sub-cellular resolution. We demonstrate high-speed microfluidic sorters, which isolate and immobilize single awake animals in well-defined geometries for high-throughput in vivo imaging and manipulation of phenotypic features at sub-cellular resolution using femtosecond laser microsurgery. We show integrated chips containing multiple addressable incubation chambers for exposure of individual animals to biochemical compounds and high-resolution time-lapse imaging of many animals on a single chip without the need for anesthesia. We show devices for delivery of compound libraries in standard multi-well plates to microfluidic devices and also for rapid dispensing of screened animals into multi-well plates. These technologies allow all types of high-throughput in vivo assays on small-animals at sub-cellular resolution including mutagenesis, RNAi and compound screens, as well as high-throughput in vivo neural degeneration and regeneration studies.