Yale Institute for Nanoscience and Quantum Engineering

Friday, January 20, 2012

12:00 to 1:00 p.m.

MASON LAB ROOM 211

Light lunch will be served at 11:45 a.m.

Associate Professor Hong Tang

Department of Electrical Engineering
School of Engineering & Applied Science, Yale University

" Molding photons in dielectric waveguides and crystals"

Photonic waveguides and crystals are widely used to localize light and enhance light-matter interactions. They are also key components in integrated photonic circuits for a variety of applications. In this talk, we show how to engineer dielectric nanostructure to achieve low-loss waveguiding and ultra-high quality factor cavities in various material systems. With tools enabled by YINQE, we have developed processes that produce photonic crystal nanocavities with optical quality factor exceeding 1,000,000. We demonstrate that full exploitation of these novel photonic nanostructures will lead to efficient photon generation, manipulation and detection on a chip platform, which facilitates our on-going efforts in enhancing photon-mechanics, photon-spin and photon-photon interactions.

Professor W. Mark Saltzman

Department of Biomedical Engineering
School of Engineering & Applied Science, Yale University

"Highly penetrative nanocarriers loaded with drugs targeted to resistant cells improve treatment of brain tumors"

Current therapy for malignant brain tumors, such as glioblastoma multiforme (GBM), is insufficient, with nearly universal recurrence. Available drug therapies are unsuccessful because they fail to penetrate through the region of the brain containing tumor cells and they fail to kill the cells most responsible for tumor development and therapy resistance, brain cancer stem cells (BCSCs). To address these challenges, we combined two major advances in technology: 1) brain-penetrating polymeric nanoparticles that can be loaded with drugs and are optimized for intracranial convection-enhanced delivery (CED); and 2) re-purposed, FDA-approved compounds, which were identified through library screening to target BSCSs. Using fluorescence imaging and positron emission tomography (PET), we demonstrate that brain-penetrating nanoparticles can be delivered intracranially to large volumes in both rat and pig. We identified several FDA-approved agents that potently inhibit proliferation and self-renewal of BCSCs. When loaded into brain-penetrating nanoparticles and administered by CED, one of these agents significantly increased survival in rats bearing BCSC-derived xenografts. This new approach to controlled delivery in the brain should have a significant impact on treatment of GBM and suggests new routes for drug and gene delivery to treat other diseases of the CNS.