Integrating Nanotechnology with Cell Biology and Neuroscience

INCBN IGERT Seminar

Monday, 11 October 2010, 2:30 pm

Speaker: Jeff Brinker
Professor, Dept. of Chemical and Nuclear Engineering, UNM Fellow, Sandia National Labs.

Engineered Biotic/Abiotic Materials and Interfaces for Understanding and Controlling Biology

In recent work we have shown that yeast, bacterial, and mammalian cells, when introduced into self-assembling solutions of phospholipids and soluble silica, serve as living colloids directing the formation of unique biotic/abiotic interfaces and architectures. The result is a lipid-associated cellular interface coherently incorporated within a surrounding lipid-templated silica nanostructure. This structure preserves cell viability under externally desiccating conditions, allowing probing of the behavior of individual cells for the first time under conditions of complete chemical and physical isolation. Using multi-photon protein lithography, we have developed alternative strategies to entrap cells and have created arbitrary 3D protein scaffolds that direct silica deposition to form diatom-like structures with feature sizes spanning millimeters to tens of nanometers. Turning these lipid-associated silica nanostructures inside out, we have also recently explored lipid bilayers supported on mesoporous silica nanoparticles (aka ‘protocells’) as a new nanoparticle delivery agent, allowing the targeted delivery of arbitrary cargo to arbitrary cancer with unprecedented specificity. Compared to current liposomal delivery agents, protocells show a million-fold greater killing efficacy.