DEPARTMENT OF **CHEMICAL & ENVIRONMENTAL ENGINEERING**

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FRIDAY **JAN 27, 2012**
9:30 - 10:30 AM
WCH 205/206

ENGINEERED BIOTIC/ABIOTIC MATERIALS AND INTERFACES FOR UNDERSTANDING AND CONTROLLING BIOLOGY AND DISEASE

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 through cellular response pathways such as the high osmolarity glycerol pathway observed in yeast along with protein-directed silica mineralization. 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. The association of silica with cellular interfaces has been further explored in recent work, where we have discovered conditions in which mammalian cells direct silica deposition in a self-limiting process that creates a precise nm-thick replica of their complete external and internal structures and preserves - to a degree – biofunctionality as assessed by enzymatic activity. 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.