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Artificial Cells from Paper

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ABSTRACT

Building simplified in vitro models of complex biological systems is a proven method to study cellular processes quantitatively. Our lab is currently investigating mechanisms for building the cell membrane by fabricating bioinspired giant liposomes from purified lipids. Giant liposomes — through the entrapment of appropriate enzymes, ribosomes, DNA, and cytoskeletal components — can recapitulate complex cellular processes in a simplified geometry. In this talk, I will report on our discovery that drying lipids onto commercially available cellulose paper and then rehydrating the films in aqueous buffers allows rapid formation of giant liposomes. The optimized protocol, which we term PAPYRUS for Paper-Abetted liPid hYdRation in aqUeous Solutions, is general, and can produce liposomes in various aqueous media and at elevated temperatures. We demonstrate easy encapsulation of macromolecules and production of liposomes with membranes of complex compositions. I will close by mapping out the next steps towards building artificial cells from paper, and the progress our lab has made in this area.

BIO:

Anand Bala Subramaniam is an Assistant Professor in Bioengineering in the School of Engineering at the University of California, Merced. Dr. Subramaniam received his PhD degree in Applied Physics from Harvard University in 2011 and engaged in postdoctoral training with George Whitesides from 2011-2014. He is currently an Assistant Professor in Bioengineering at UC Merced (2014-). Among other topics, his lab is currently studying active soft biointerfaces and emergent complexity in soft biological systems. Specific topics include deciphering the effects of polysaccharides on lipid membranes, developing new ways of producing cell mimetic capsules to produce synthetic cells, and using unconventional modalities to develop biosensors.