UNIVERSITY OF CALIFORNIA, IRVINE

Department of Materials Science and Engineering

Dynamic Self-Assembly of Encapsulated DNA Scaffolds

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Zoom: **https://uci.zoom.us/j/93523874547?pwd=bXRGd3BwMFJWSHY3WGZDaGRucCt0dz09**

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Abstract: Biological cells adapt, replicate, and self-repair in ways that are unmatched by man-made devices. These processes are enabled by the interplay of receptors, gene networks, and self-assembling cytoskeletal scaffolds. Taking inspiration from this architecture, we follow a reductionist approach to build synthetic materials by interconnecting nucleic acid components with the capacity to sense, compute, and self-assemble. Nucleic acids are versatile molecules whose interactions and kinetic behaviors can be rationally designed from their sequence content; further, they are relevant in a number of native and engineered cellular pathways, as well as in biomedical and nanotechnology applications. I will illustrate our approach with two examples. The first is the construction of self-assembling DNA scaffolds that can be programmed to respond to environmental inputs and to canonical molecular signal generators such as pulse generators and oscillators. The second is the encapsulation of these dynamic scaffolds in droplets serving as a mimic of cellular compartments. I will stress how mathematical modeling and quantitative characterization can help identify design principles, guide experiments, and explain observed phenomena.

Bio: Elisa Franco is an Associate Professor in Mechanical & Aerospace Engineering and Bioengieering at UCLA. She received a Ph.D. in Control and Dynamical Systems from the California Institute of Technology in 2011, as well as a Ph.D. in Automation and a Laurea degree in Power Systems Engineering from the University of Trieste, Italy. Prof. Franco's research interests are in the areas of biological feedback and DNA/RNA nanotechnology, with focus on design, modeling, and synthesis of circuits and responsive materials using nucleic acids and proteins. She is the recipient of an NSF CAREER award, the Hellman Fellowship, and the Rose Hill Innovator award.