Spring 2026 Colloquium
Materials Department

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Materials Science & Engineering

Georgia Institute of Technology

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11:00 am | ESB 1001

Shining a Light on DNA Aptamer Discovery

As a recognition-based macromolecular material, DNA presents advantageous composition structure-property relationships. DNA aptamers can, in principle, achieve target binding specificity and affinity comparable to antibodies; however, their discovery remains slow and labor-intensive. The traditional aptamer discovery or screening platform called Systematic Evolution of Ligands by Exponential Enrichment (SELEX) typically relies on employing a random sequence library to undergo repeated cycles of target binding; harsh elution conditions to dissociate oligonucleotide target complexes; and oligonucleotide amplification to continuously enrich the candidate population with "winners" from prior screening cycles. To address limitations in evolution-based aptamer screening, the Milam group developed an alternative, competition-driven aptamer screening platform called Competition-Enhanced Ligand Selection (CompELS) using designer libraries and gentler enzyme-based DNA elution. To elucidate key parameters governing selection outcomes, the effects of evolution-based vs. competition-driven screening strategies and library design were evaluated in separate parallel aptamer selection studies using a model protein target called mCherry. These results successfully demonstrated a streamlined aptamer selection methodology that accelerates aptamer discovery by integrating CompELS, rational library design, and enzymatic elution.

Bio

Valeria Tohver Milam received her B.S. in Materials Science and Engineering with Honors from the University of Florida. She specialized in metallurgy and also received a minor in Portuguese. For her doctoral studies at the University of Illinois, Urbana-Champaign, she explored the phase behavior, structure and properties of nanoparticle-microsphere suspensions and reported a novel colloidal stabilization mechanism called nanoparticle "haloing." Her postdoctoral work at the University of Pennsylvania focused on DNA-mediated colloidal assembly. She joined the faculty at the Georgia Institute of Technology in July 2004 as an assistant professor in the School of Materials Science & Engineering and was promoted to associate professor in July 2011. At Georgia Tech her research efforts have focused on oligonucleotides as enabling macromolecular materials and probes in isothermal colloidal assembly-disassembly schemes and high throughput oligonucleotide detection. Her more recent efforts explore DNA as biomimetic ligands that bind in a specific and strong, yet noncovalent manner to non nucleotide targets. Her honors include a Georgia Cancer Coalition Distinguished Scholar Award, CETL/BP Teaching Award, AFRL Summer Faculty Fellowship, 3M Nontenured Faculty Award, NSF CAREER Award, MSE Faculty Fellowship, and NSF Mid-Career Advancement Award.

https://www.materials.ucsb.edu/events/valeria-tohver-milam-georgia-institute-technology

Hosted by Angela Pitenis & Omar Saleh.