



AVVISO DI SEMINARIO

Il giorno 26 ottobre alle ore 12:00

in Aula seminari Lorenzo Stella

La Prof.ssa Devleena Samanta

*Department of Chemistry, The University of Texas at Austin,
Austin, Texas 78712, USA*

*The University of Texas at Austin Cancer Research Center, Austin,
Texas 78712, USA*

Texas Materials Institute, Austin, Texas 78712, USA

terrà un seminario dal titolo

Engineering DNA-Based Tools for Chemical and Biological Sensing

Proponenti: Prof.ssa Simona Ranallo

Engineering DNA-Based Tools for Chemical and Biological Sensing

Many diseases are currently diagnosed by measuring the abundance or concentration of specific biomolecules associated with pathological states. However, for many conditions - including cancer, neurodegeneration, and infectious diseases - it is the *activity* of these molecules, not merely their presence, that drives disease progression. To address this gap, our lab is developing DNA-based molecular tools that directly measure biochemical activity. DNA is an ideal material for these tools due to its high programmability, biocompatibility, and capacity for highly sensitive and multiplexed sensing. We have created DNA-peptide nanostructures that detect enzymatic activity in clinical samples with up to 100-fold greater sensitivity than conventional assays. The broader goal of this work is to establish a new framework for classifying cells based on molecular function rather than abundance. This activity-based approach could reveal previously unrecognized functional subtypes in heterogeneous diseases like cancer and guide the development of more precise, targeted therapies. Beyond sensing, we are also designing DNA-based systems to actively control molecular function in real time. For example, we have engineered single-molecule DNA devices that undergo conformational changes in response to specific, user-defined chemical signals. These structural shifts enable reversible switching of enzyme activity without requiring genetic modification or chemical conjugation. By providing programmable control over when and where enzymes are active, these systems offer powerful capabilities for targeted therapeutics, smart drug delivery, and synthetic biology. Together, these technologies demonstrate the potential of DNA nanotechnology to both measure and manipulate chemical activity in living systems, opening new directions for diagnostics, treatment, and cellular engineering.