

Department of Chemistry & Biomolecular Science Clarkson University

Seminar

Friday, April 7, 2023, 3:30 pm, 160 Science Center

ZOOM Link: <https://clarkson.zoom.us/j/98159353740?pwd=a2hPMSt2aDZlVGwwa1RqTjJhYlkyZz09>

Netz Arroyo, Ph.D. (Netzahualcoyotl Arroyo-Currás)

Associate Professor in Pharmacology and Molecular Sciences
Johns Hopkins University School of Medicine

will speak on

Explaining the Decay of Nucleic Acid-based Sensors Under Continuous Voltammetric Interrogation

Abstract:

Nucleic acid-based electrochemical sensors (NBEs) can support continuous and highly selective molecular monitoring in biological fluids, in vitro and in vivo, via affinity-based interactions. Such interactions, enabled by nucleic acid aptamers or antibodies chemically conjugated to the sensor interface, afford a sensing versatility that is not supported by strategies that depend on target-specific reactivity, like enzymatic biocatalysis. Thus, NBEs have significantly expanded the scope of molecules that can be monitored continuously in biological systems. However, despite the great promise of NBEs for the real-time study of dynamic molecular processes, the technology is limited by the lability of the thiol-based monolayers employed for sensor fabrication. Seeking to understand the main drivers of monolayer degradation, we carried out a systematic study of four possible mechanisms of NBEs decay: (i) passive desorption of monolayer elements in undisturbed sensors, (ii) voltage-induced desorption under continuous voltammetric interrogation, (iii) competitive displacement by thiolated molecules naturally present in biofluids like serum, and (iv) protein binding. In this presentation I will discuss our results, which should serve as a mechanistic framework to inspire future development of novel sensor interfaces aiming to specifically eliminate the mechanisms of signal decay.



BIO: Netzahualcoyotl Arroyo-Currás, also known as Netz Arroyo, is an Associate Professor in Pharmacology and Molecular Sciences at Johns Hopkins University School of Medicine. Dr. Arroyo received his Ph.D. in Analytical Chemistry from The University of Texas at Austin under electrochemist Allen J. Bard and was a postdoctoral fellow at University of California Santa Barbara under biophysicist Kevin W. Plaxco. As Assistant Professor, he leads a multidisciplinary research group of four graduate students and two postdoctoral fellows focused on the development of biosensing technologies for real-time molecular monitoring in biological systems. More specifically, research in the Arroyo lab aims to expand our understanding therapeutic transport across biological barriers, develop new diagnostic and drug delivery approaches, and expand therapeutic drug monitoring capabilities via wearable devices.