"Quantitative imaging of zinc ions reveals new roles of zinc in biology"

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Viernes 5 de octubre, Horario: 17:00-18:00
Auditorio principal de la UPDCE

Bio sketch
B.A. in Biophysical Chemistry from Dartmouth College, Ph.D. in Chemistry from Stanford University, NIH postdoctoral fellow in the lab of Nobel laureate Roger Tsien at University of California San Diego, moved to University of Colorado Department of Chemistry and Biochemistry and BioFrontiers Institute in 2005 to initiate independent lab. Recipient of NSF CAREER Award and NIH Director's Pioneer Award.

Keywords
metal, zinc, fluorescent sensor, cell imaging, homeostasis.

Abstract of the conference
Fluorescent tools have launched biological research into a new realm of understanding of cellular processes and dynamics at the single-cell level. These tools are enabling characterization of stochasticity and heterogeneity exhibited by biological systems, which could not adequately be probed by techniques that rely on bulk analysis of populations of cells. Fluorescent sensors are increasingly providing insight into the "dark matter" of the cellular milieu: small molecules, secondary metabolites, metals, and ions. One of the great promises of such sensors is the ability to quantify cellular signals in precise locations with high temporal resolution. Yet this is coupled with the challenge of how to ensure that sensors are not perturbing the underlying biology and the need to systematically measure hundreds of individual cells over time. This talk will highlight our efforts to develop genetically encoded FRET-based sensors for quantitative mapping of zinc ions in cells. I will discuss approaches for defining whether sensors perturb cellular ions, and the specific challenges associated with quantifying ions in cellular organelles. Finally, I will discuss our efforts at systematic quantitative analysis of long-term imaging of ions during the cell cycle to highlight the need for sophisticated image analysis algorithms. These studies have revealed that zinc is dynamic over the course of the cell cycle and plays an important role in the proliferation-quiescence cell fate decision.
Agradecemos a la American Chemical Society por el apoyo otorgado para la participación de la plenarista.