Conferencias Magistrales

"Nanoparticles, SERS and Theory"

Prof. George C. Schatz
Northwestern University
Plenaria Inaugural

Miércoles 3 de octubre, Horario: 9:00-10:00
Auditorio principal de la UPDCE

Bio sketch
George C. Schatz is the Morrison Professor of Chemistry at Northwestern University. He received his undergraduate degree at Clarkson University and Ph D at Caltech. He was a postdoc at MIT, and has been at Northwestern since 1976. Schatz is a member of the National Academy of Sciences, the American Academy of Arts and Sciences, and he has been Editor-in-Chief of the Journal of Physical Chemistry since 2005. Schatz is a theoretician specializing in electronic structure methods, dynamical processes, electrodynamics, and statistical mechanics.

Keywords
Surface enhanced Raman spectroscopy, plasmon, nanoparticle.

Abstract of the conference
Silver and gold nanoparticles have a history that dates to the Roman empire and before, as well as detailed work by Michael Faraday in the 1850s. However these particles have been given new directions in the last 40 years through a number of advances in nanoscience, and especially by the discovery of surface enhanced Raman spectroscopy (SERS) in the 1970s. This talk will provide an overview of these advances, especially as relates to SERS substrates, to single-molecule SERS, and to tip enhanced Raman spectroscopy (TERS). An emphasis in this talk will be on the use of theory to understand the optical properties of plasmonic materials, especially in SERS measurements and applications.

Agradecemos al Centro de Estudios Avanzados (CINVESTAV-Zacatenco) por el apoyo otorgado para la participación del plenarista.

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"Exploring allergy with structural biochemistry: from plant allergens to antibodies"

Dra. Adela Rodríguez, Instituto de Química, UNAM

Jueves 4 de octubre, Horario: 9:00-10:00
Auditorio principal de la UPDCE

Semblanza
Prof. Adela Rodríguez Romero is, since 1986 a reaseacher of the Insitute of Chemistry of the UNAM. She has notoriously participated in the implementation and consolidation of the protein crystalography not only in the UNAM but in the country. Currently she is a full researcher type C and is level 3 of the Conacyt's National Reseach System. Prof. Rodríguez received her Ph.D. in Chemistry from the Autonomous Metropolitan University and was twicely Guest Researcher at the Center for Advanced Research in Biotechnology, NIST, Maryland, USA, where she made her research on antibodies cristalographic studies and enzymes of industrial interest. From 1997 she has been responsible of the National Lab of Structure and Macromolecules- IQ, former University Lab of Proteín Sctucture. As pioneer on protein cristallography in Mexico her research group is focused in diverse projects of structural biology with international impact.

Keywords
Allergy, allergen, antibody, crystallography, epitope, structural biology.

Abstract of the conference
Human type 1 hypersensitivity or allergic diseases, such as rhinitis, are mediated by allergen-specific IgE antibodies produced in susceptible individuals after allergen exposure. IgE antibodies bound to high affinity receptors on the surface of effector cells trigger an allergic response by interacting with recognition sites (conformational epitopes) on the allergen surface. This type of epitopes is important for inhaled allergens, which reach the respiratory system mostly in their original globular structure. An efficient treatment for allergic diseases is specific allergen vaccination; therefore, the development of harmless vaccines would enable a more general use of the treatment. One of the problems that we have addressed is the structural study of allergenic proteins from different sources, such as rubber tree latex, maize and fruits. In general, these proteins participate in the defense mechanisms of plants and they are also involved in cross-reactivity reactions. Knowledge of the three-dimensional structure of these allergens and allergen-antibody complexes facilitates epitope mapping and enables a rational approach to the engineering of molecules with reduced IgE binding. We recently determined the crystal structure of the complex between the Hevea allergen profilin (Hev b 8) and the Fab fragment of an IgE monoclonal antibody at 2.9 Å resolution. We also determined the KD of the complexes IgE-profilin (100 nM) and Fab-profilin (1.7 M) using biolayer interferometry and we found that the KD of the fragment is two orders of magnitude lower than the complete antibody. Moreover, in vitro investigations using the murine IgE and rat basophilic cells showed that binding affinity and dimerization are important to triggering the allergic response. The use of this data can pave the way for the use of recombinant allergens, well characterized natural allergens or antibodies in diagnosis and immunotherapy tools.

Agradecemos al Instituto de Química-UNAM, por el apoyo otorgado para la participación de la plenarista.

"Mesoscale Architectures for Amphidynamic Crystals and Molecular Machines"

Dr. Miguel Ángel García-Garibay
University of California, Los Ángeles

Jueves 4 de octubre, Horario: 15:30-16:30
Auditorio principal de la UPDCE

Bio sketch
Miguel A. Garcia-Garibay received his B.S. degree from the University of Michoacan in Mexico and his Ph.D. from the University of British Columbia in Canada. He was a postdoctoral Fellow at Columbia University in the city of New York before joining the faculty in the Department of Chemistry and Biochemistry at UCLA where he was promoted to full professor. He served as Vice Chair for Education and as chair of the Department and is the current Dean of Physical Sciences. Garcia-Garibay achieved international reputation for work in solid-state organic chemistry, reaction mechanisms, and crystalline molecular machines. He has authored over 210 articles and delivered over 400 lectures worldwide. Among other honors, he is a fellow of the American Association of the Advancement of Science and has been awarded the American Competitiveness and Innovation Fellowship, an NSF Creativity Award, the 2013 Inter-American Photochemical Society Award and the 2015 ACS Cope Scholar Award.

Keywords
molecular machines, dipolar arrays, dendrimers, mesoscale architectures.

Abstract of the conference
Our research group has established the synthetic and analytic infrastructure required to develop a promising new class of materials that operate on the basis of their structurally programmed molecular motion. With a combination of static and rapidly moving, but highly ordered elements, we refer to them as amphidynamic crystals. Amphidynamic crystals can be built with discrete molecular units, supramolecular synthons, extended solids based on metal-organic frameworks, and several other platforms. Among them, molecular rotors are expected to have functions that rely on units designed to rotate or reorient in response to external stimuli, such that they can display induced birefringence, dichroism, second-order non-linear optical responses, and other addressable physical properties. With high order, structurally controlled degrees of freedom, and capable of responding to external stimuli in a predetermined manner, amphidynamic materials are a promising platform for the design of molecular machines. This presentation will illustrate the development of these concepts with a particular emphasis on structures aimed at exploring emergent behavior that arises from dipolar interactions and architectures at the mesoscale.

Agradecemos al grupo de profesores de la FQ-UNAM por el apoyo
otorgado para la participación del plenarista.

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"Una nueva aproximación a la propuesta CTS para la enseñanza de la Química"

Dra. Silvia Porro,
Universidad Nacional de Quilmes (UNQ), Argentina

Viernes 5 de octubre, ***Horario: 8:30-9:30***
Auditorio principal de la UPDCE

Semblanza
Dra. en Bioquímica. Especialista en Docencia en Entornos Virtuales. Profesora Titular del Area Química de la UNQ. Profesora del Doctorado en Educación en Ciencias Experimentales de la Universidad Nacional del Litoral (Argentina). Directora del proyecto de investigación: Educación de las competencias científica, tecnológica y pensamiento crítico mediante la enseñanza de temas de naturaleza de ciencia y tecnología.

Palabras clave
CTS, Naturaleza de la Ciencia, Problemas sociocientíficos.

Resumen
Las siglas CTS (Ciencia-Tecnología-Sociedad) identifican una propuesta educativa que surgió con ese nombre en la década de los años ochenta, con una búsqueda de educación científica interdisciplinaria. Esta propuesta tuvo aciertos y desaciertos, y fue variando a lo largo de los años, tomando diferentes nombres e identificándose de alguna manera con una de las líneas de los estudios sobre Naturaleza de la Ciencia (NOS en inglés). Actualmente, puede emparentarse con la educación en contexto, con la enseñanza a través de problemas sociocientíficos y con la educación científica para la formación de una ciudadanía democrática, entre otros. En la conferencia se hará una revisión de esta nueva aproximación de la propuesta CTS, presentando algunas estrategias de enseñanza de la Química que pueden adaptarse a los diferentes niveles educativos.

Agradecemos al Dr. Ignacio González Martínez, de la UAM-I por el apoyo otorgado para la participación de la plenarista.

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

Dra. Amy Palmer
University of Colorado Boulder

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.