

## UC SAN DIEGO NANOENGINEERING SEMINAR

*Wednesday, March 14, 2018*

*Seminar Presentation: 11:00am - 12:00pm*

**ASML Conference Center (SME 248)**

### *“Gold Nanocrystals: Physics, Chemistry, Biology, and Ecology”*

#### **Catherine Murphy**

*Professor, Department of Chemistry  
Larry R. Faulkner Endowed Chair in Chemistry  
University of Illinois at Urbana-Champaign*

**Abstract:** Gold nanocrystals of controlled size and shape have tunable optical properties that enable new science. Upon illumination with resonant light, these gold nanocrystals generate plasmons (coherent oscillations of conduction band electrons). These plasmons, in turn, can produce local electric fields and heat. In this talk I will discuss four short stories about gold nanocrystals and their plasmons. In “Physics” we will discuss how molecules experience the local electric field provided by illuminated plasmonic nanorods. In “Chemistry” we will discuss how the surface chemistry of the nanocrystals can be tuned with both hard and soft shells, and how the particular chemistry at the surface dictates molecular function. In “Biology” I will discuss how these nanocrystals interact with biological fluids and living cells; and in “Ecology” I will discuss how these nanoparticles are distributed in an estuarine ecosystem as a function of surface chemistry.

**Biosketch:** Catherine Murphy is the Larry R. Faulkner Endowed Chair in Chemistry at the University of Illinois at Urbana-Champaign (UIUC). She earned two B.S. degrees from UIUC in 1986, one in chemistry and one in biochemistry, while conducting undergraduate research with T. B. Rauchfuss. She obtained her Ph.D. in 1990 at the University of Wisconsin, Madison, under the direction of A. B. Ellis. From 1990-1993 she was an NSF and then an NIH postdoctoral fellow in the laboratory of J. K. Barton at the California Institute of Technology. Professor Murphy started her independent career at the University of South Carolina’s Department of Chemistry and Biochemistry in 1993, and rose through the ranks there, ultimately becoming the Guy F. Lipscomb Professor of Chemistry in 2002. In 2009 she returned to UIUC in her present position. Her research interests include the synthesis, surface chemistry, optical properties, biological applications and environmental implications of colloidal metal nanocrystals, especially gold. She is the winner of the 2011 Inorganic Nanoscience Award from the American Chemical Society’s Division of Inorganic Chemistry, was named a 2011 Fellow of the American Chemical Society, a 2014 Fellow of the Royal Society of Chemistry, and a 2017 Fellow of the Materials Research Society. She won the Carol Tyler Award from the International Precious Metals Institute in 2013, and the Transformational Research and Excellence in Education (TREE) Award from the Research Corporation for Scientific Advancement in 2015. In 2015 she was elected to the U.S. National Academy of Sciences. In addition to her research, she is well-known to the chemistry community as the Deputy Editor of the *Journal of Physical Chemistry C* (2011-present) and as a co-author of the best-selling general chemistry textbook *Chemistry: the Central Science*, from the 10<sup>th</sup> to the current 14<sup>th</sup> editions.