

The Optical Society of Southern California invites its members and friends to our  
**Annual Corporate Member Appreciation Event Featuring**

a presentation on:

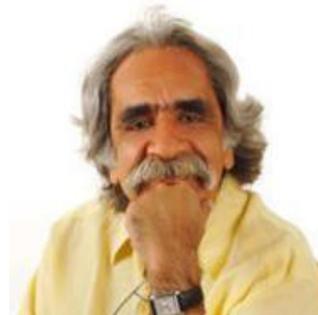
## **Molecular Vibrations Imaged for the First Time.**

**Professor V. Ara Apkarian,**

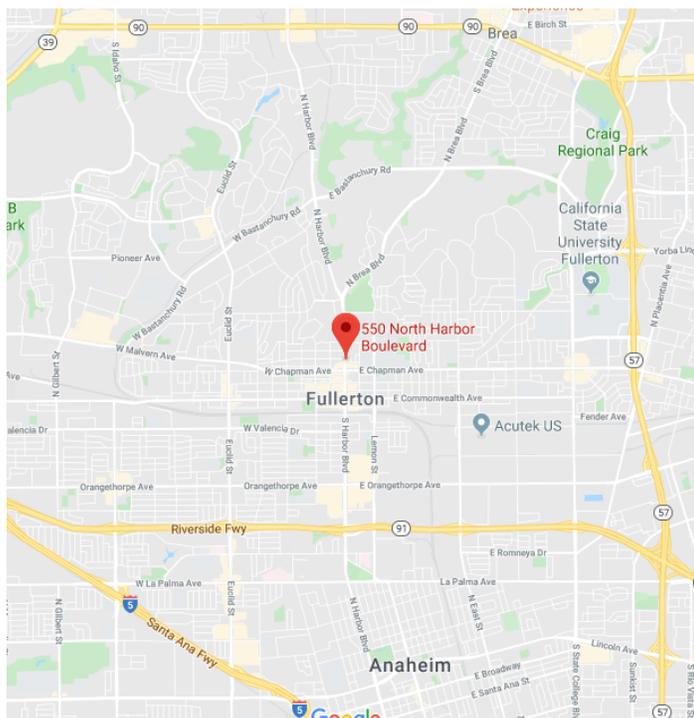
**Director of UC Irvine's Center for Chemistry at the Space-Time Limit (CaSTL)**

**Abstract:** The internal vibrations of molecules drive the structural transformations that underpin chemistry and cellular function. While vibrational frequencies are measured by spectroscopy, the normal modes of motion are inferred through theory because their visualization would require microscopy with ångström-scale spatial resolution—nearly three orders of magnitude smaller than the diffraction limit in optics. Using a metallic tip to focus light and taking advantage of the surface-enhanced Raman effect to amplify the signal from individual molecules, tip-enhanced Raman spectromicroscopy (TER-SM) reaches the requisite sub-molecular spatial resolution, confirming that light can be confined in picocavities and anticipating the direct visualization of molecular vibrations. Here, by using TER-SM at the precisely controllable junction of a cryogenic ultrahigh-vacuum scanning tunneling microscope, we show that ångström-scale resolution is attained at subatomic separation between the tip atom and a molecule in the quantum tunneling regime of plasmons. We record vibrational spectra within a single molecule, obtain images of normal modes and atomically parse the intramolecular charges and currents driven by vibrations. Our analysis provides a paradigm for optics in the atomistic near-field.

**About our Speaker:** V. Ara Apkarian is a Professor of Chemical Physics at UCI and Director of the NSF Center for Chemical Innovation on Chemistry at the Space-Time Limit (2007-present). He holds B.S. and Ph.D. degrees in Chemistry from USC and Northwestern, respectively. Following a postdoctoral fellowship in Cornell, he joined the Chemistry faculty at UCI in 1983. He has served as Department Chair (2004-2007) and as the founding co-Director of the Chemical and Materials Physics (ChAMP) program at UCI (1997-2000).



***OSSC Corporate Members are invited to sign up for exhibit space!***



**Wednesday, December 11th, 2019**

Reception & Corporate Member exhibits: 6:00 pm  
(no host bar)

**Dinner: 7:00 pm; Talk: 8:00 pm**

Meal: Pasta, Chicken or Meat Lasagna

Members: \$35 by Dec. 7, \$40 after

Non-Members: \$40 by Dec. 7, \$45 after

(OSSC Student Members \$10 by Dec. 7, \$20 after)

**Attend the Talk for Free by Registering**

**Venue: [Angelo's and Vinci's](#)**

550 N Harbor Blvd, Fullerton, CA, 92832

714-879-4022

**On-line Registration: [www.oss.org](http://www.oss.org)**

Or Contact: Alex Small

Events@oss.org, 240-672-7639

Corporate members can reserve exhibit  
tables during online registration.