

APS/I3

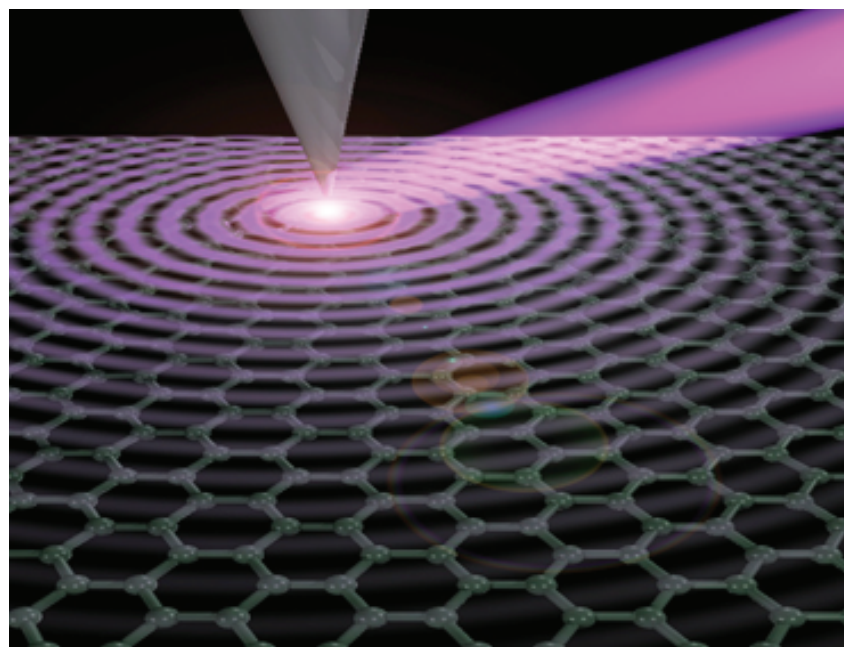
Joint Colloquium

Dmitri N. Basov

Quantum Materials:

Insights from Near Field Nano-Optics

In 1944 Hans Bethe reported on “the diffraction of electromagnetic radiation by a hole small compared with the wave-length” [Physical Review 66, 163 (1944)]. This seminal paper was among the early precursors to a new and vibrant area of research: near field nano-optics. I will discuss recent nano-optical experiments on quantum materials including: transition metal oxides undergoing the insulator to metal transition and graphene. Central to the nano-optical exploration of quantum materials is the notion of polaritons: hybrid light matter modes that are omnipresent in polarizable media. Infrared nano-optics allows one to directly image polaritonic standing waves [Science 343, 1125 (2014), Nature Materials 14, 1217 (2015)] yielding rich insights into the electronic phenomena of the host material supporting polaritons [Science 354, 195 (2016)]. I will give a progress report on the search for the role of the Berry phase in the properties of graphene via polaritonic imaging [Nature Photonics 10, 244 (2016)]. In a parallel development, we harnessed near field optics to uncover the elusive electronic and magnetic phases that occur only at the nano-scale in the vicinity of the insulator to metal transition in correlated oxides [Nature Physics 13, 80 (2017) and Nature Materials 15, 956 (2016)].



Dmitri N. Basov (Ph.D. 1991) is a Higgins professor in the Department of Physics at Columbia University [<http://infrared.cni.columbia.edu>]. He has served as a professor (1997-2016) and Chair (2010-2015) of Physics, University of California, San Diego. Research interests include: physics of quantum materials, superconductivity, two-dimensional materials, infrared nano-optics. Prizes and awards: Sloan Fellowship (1999), Genzel Prize (2014), Humboldt research award (2009), Frank Isakson Prize, American Physical Society (2012), Moore Investigator (2014).

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