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(I) Scanning near-field optical microscopy: from physics to spectroscopic applications

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In our presentation, we will offer an overview of aperture-type scanning near field optical microscopy (SNOM) –a family of nano-optical imaging techniques derived from scanning probe microscopy which are capable of subwavelength resolution, and the development of three dimensional (3D) SNOM methods undertaken by our group to locally image the distribution of the electromagnetic radiation in the proximity of nanoparticles and nano-objects. We will discuss a few applications in which we took advantage of 3D-SNOM to design specific optical nanosystems for light harvesting. Specific case studies that will be presented include the design of plasmonic thin-film solar cells enhanced by random arrays of copper nanoparticles, and the use of 3D-SNOM for characterizing evanescent waveguides self-assembled from of copper nanoparticles assembled on thin films of graphene. In the final part of our talk, we will we present near-field scanning thermoreflectance imaging (NeSTRI), a new pump-probe technique invented in our group, in which an aperture-type SNOM is used to contactlessly determine the thermal conductivity of inhomogeneous thin films at the nanoscale. These examples well represent the versatility of SNOM imaging and its potential for designing an even wider family of nano-optical devices.

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