Manipulating light, heat and forces at the nanoscale with metallic nanoparticles

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Metallic nanoparticles present resonant collective motion of their electrons at optical frequencies known as plasmon resonances. These resonances present 6 main characteristics which depend strongly on the composition, shape, size and near environment of the nanoparticles:

- Spectral response
- Enhanced absorption
- Enhanced scattering
- Near field distribution around the nanoparticle
- Photonic mode density distribution around the nanoparticle
- Characteristic angular pattern

Controlling these characteristics enables the use of NPs for attractive applications to manipulate light, heat and forces at the nanoscale.

In this talk I will present the basic physics of the plasmon resonances of nanoparticles and explain how their properties can be combined to produce optical nano-antennas for single molecules, sensors for biomolecular recognition, nanoscopic sources of heat for local thermodynamic experiments, modulatable fluorescent probes, and functional nanoparticle circuits.

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