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Plasmonics, a hot topic in nanophotonics

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The recent observation that certain metallic nanoparticles possess plasmon resonances that depend very sensitively on the shape of the nanostructure has led us to a fundamentally new understanding of the plasmon resonances supported by metals of various geometries. This picture- "plasmon hybridization," reveals that the collective electronic resonances in metallic nanostructures are mesoscopic analogs of the wave functions of simple atoms and molecules, interacting in a manner that is analogous to hybridization in molecular orbital theory. The plasmon hybridization picture can be applied to an entire family of plasmonic nanostructures of various geometries, such as spherical shells, or "nanoshells," offset shells, or "nanoeggs," spheroidal structures "nanorice," nanopaticle aggregates, and finite nanoparticles interacting with extended substrates such as metallic films or nanowires. The new theoretical insight gained through this approach provides an important conceptual foundation for the development of new plasmonic structures that can serve as surface plasmon resonance (SPR) sensors and as substrates for surface enhanced spectroscopies such as surface enhanced Raman scattering (SERS) or surface enhanced infrared absorption spectroscopy (SEIRA) and sub wavelength plasmonic waveguides.