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Strong Field Coherent Control at the Space-Time Limit[1]

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Strong field coherent control has proven advantageous for control of molecular dynamics largely since it is able to benefit from the advanced Ti-Sapphire technology available at 800 nm wavelength. Although the most popular and versatile of the class of strong field, induced dipole coherent control methods is molecular alignment, related techniques that rely on similar concepts, including torsional control and molecular focusing, have been shown similarly successful. Here we suggest that the strong field approach to will prove yet more advantageous for coherent control of nanoscale material systems. One reason is the naturally available strong field and strong field orientational and translational gradients in nanoscale plasmonic environments, such as light-triggered molecular conduction junctions and tip–molecule–surface systems. Another is the enhancement of the polarizability of molecules adsorbed onto a metal construct as compared to isolated molecules. In the talk, we will combine plasmonics physics with concepts and tools borrowed from coherent control of molecular dynamics with two goals in mind. One is to introduce new function into nanoplasmonics, including ultrafast elements and broken symmetry elements. The second is to develop coherent nanoscale sources and apply them to strong field coherent control of both mechanical motions and electric transport in the nanoscale.

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