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Plasmonic Forces in Nanoscale Metal Clusters PHILIP BATSON, Rutgers University, USA, ALEJANDRO REYES-CORONADO, Donostia International Physics Center, Spain, RUBEN BARRERA, Universidad Nacional Autonoma de Mexico, Mexico, PEDRO ECHENIQUE, JAVIER AIZPURUA, Donostia International Physics Center, Spain — Passage of keV-energy electrons near nanometer-sized metal clusters is known to transfer energy from the electron to the clusters by excitation of surface plasmons. In groups of clusters, these plasmon modes couple, producing inter-cluster forces which favor coalescence. A single cluster is also expected to experience a smaller, attractive, force in the presence of a passing electron from simple image charge considerations. Detailed calculations that evaluate the Maxwell Force Tensor for plasmonic modes confirm this for large impact parameters, but for small impact parameters, comparable or less than the cluster diameter, the plasmonic force becomes repulsive. We have verified this behavior experimentally, using a sub-Angstrom electron beam at 120 KeV to move nano-scale Au clusters, discovering a weak attractive motion for large impact parameters and a stronger, repulsive motion for small impact parameters. We will present this finding and suggest physical reasons for this non-intuitive behavior.

Philip Batson
Rutgers University

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