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COULOMB BLOCKADE EFFECTS IN MESOSCOPIC ELECTRONIC DEVICES

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In our research, we aim to examine the Coulomb blockade, where all electron current is suppressed below a (tunable) threshold voltage. This thresholding effect occurs because of the energy required for charging individual nanoparticles, and so our devices can become sensitive to single-electron transport between droplets. In our approach, two liquid-metal (gadolinium) droplets, which are coated with a monolayer of ligand-stabilized (gold) nanoparticles, were brought into contact. They do not coalesce but instead remain separated by the nanoparticles assembled at the interface. Micrometer-scale Ga droplets coated with nanoparticles were fabricated using ultrasonication and then deposited on substrates with patterned interdigitated electrodes, to form mesoscopic electronic devices. Right now, we working to lower the threshold voltage, and hope to eventually produce gated devices (self-assembling single-electron transistors).