Assembly of clicked heterodimeric nanoparticles to create ordered metamaterials. **(Mentor: Jason Hein; co-mentors: Sayantani Ghosh, Linda Hirst)** This project will involve synthesizing organic ligands to effect surface-controlled polymerization on a series of nanoparticle (NPs). These organic ligands will play a dual role, both protecting the NP from aggregation by manipulating surface physical chemical properties (solubility, charge etc.) but also will be designed to cross-link after self-assembly on the NP surface. This process will result in the generation of a organic shell around each NP, providing robust, chemically-tunable environment that will not undergo ligand exchange (Figure 1, **NP3**).

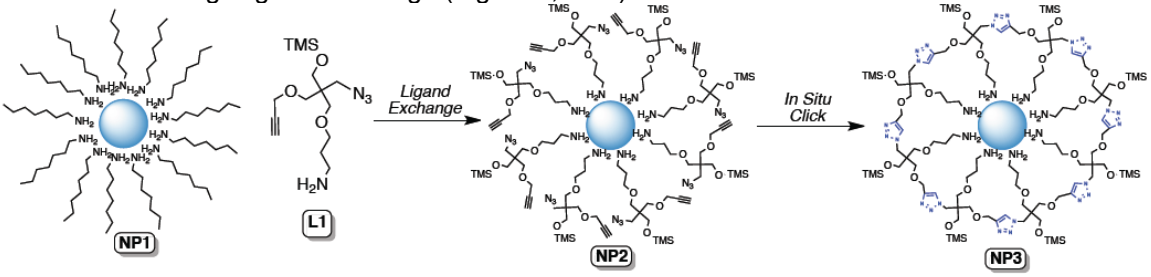

Figure 1: Ligand exchange and surface-controlled polymerization on nanoparticles.

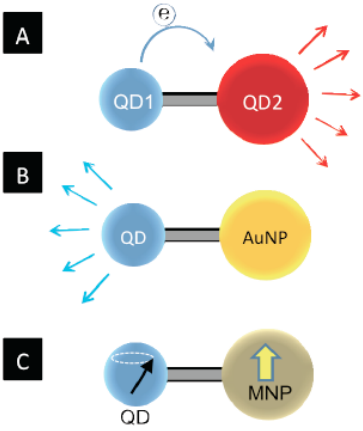

Figure 2: Dimeric NP's

The second goal of this project will be to create a series of different particles (magnetic NP's, quantum dots, gold NP's, etc.) will be covalently linked via the organic shell on each. This will hybrid, dimeric nanoparticles, which will posses unique optical, electronic or magnetic properties based on interaction between he constituent nanoparticles (Figure 2). This project will involve o phases. First, the organic ligand will be synthesized and changed onto the surface of the nanoparticle, where the covalent ganic shell should form. The structure of the ligand will need to be ed to give efficient cross-linking and high-density packing on the rface. In the second phase, the cross-linked shells containing ferently substituted nanoparticles will be coupled to create imeric structures. This phase will include characterization and testing the optical and electronic properties of the dimers, where the linker length and functionality will be varied to optimize particle-particle interactions.