Self-assembly refers to the spontaneous generation of nano or microscale structures by surfactants, polymers, or nanoparticles. This field has become popular in recent years partly due to its close connections with biological systems. Current research in this area is largely focused on the synthesis of new building blocks for generating novel assemblies. In our lab, we have chosen instead to work with “old” (existing) molecules and nanoparticles, which are usually of low-cost and often commercially available. This talk will show that old building blocks can still be exploited in many new ways.

Two types of systems will be discussed in this talk. The first is our work on “photo-rheological” fluids, which are fluids that can be switched from water-like to gel-like states upon irradiation with light. We have developed low-cost fluids based either on micelles (JACS, 2007, 129, 1553) or nanoparticles (JACS, 2009, 131, 7135). Next, we will discuss our work with sticky biopolymers (“Nano-Velcro”), which transform solutions of vesicles or biological cells into stiff gels (Langmuir, 2005, 21, 26). The latter work has been extended to biological cells, including blood, with a goal of creating low-cost but effective hemostatic dressings.