**Frontiers in Supramolecular Design of Materials**

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The most powerful functions of materials in the living world emerge from self-assembly of molecules through highly specific noncovalent connections programmed by their primary covalent structures. The use of this bio-inspired strategy, aided by current computational advances, can create transformative soft materials. Research in our laboratory focuses on self-assembling supramolecular materials with potential impact for renewable energy, sustainability, and advanced medicine. This lecture will discuss work on materials inspired by the photosynthetic machinery of green plants that can harvest light to produce fuels for sustainable energy systems, and others in which biomolecular structures are used to program assembly in water of technologically useful structures such as ferroelectric phases. Dynamic robotic materials will also be discussed which exhibit life-like properties to effectively transduce different types of energy into mechanical actuation and locomotion of objects. The final topic will be supramolecular biomaterials that mimic extracellular matrices with unprecedented bioactivity to regenerate tissues. In this area the lecture will report on a recent breakthrough demonstrating that tuned *supramolecular motion* in self-assembling biomaterials can reverse paralysis by repairing the brain and the spinal cord.