

## **Molecular Mechanics and Molecular Electronics**

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Very few molecular properties are amenable to study across a broad range of physical environments. One such property is electrochemically driven molecular actuation, and bistable [2]catenanes and [2]rotaxanes provide for ideal molecular systems for investigating this property. These synthetically versatile molecular machines may be incorporated into a number of different environments. Furthermore, the large geometrical and electronic changes that accompany the electrochemically driven molecular motion yield a variety of experimental signatures for quantifying that motion. I will discuss experiments aimed at elucidating the kinetic and thermodynamic parameters of molecular switching in the solution phase, solid-state polymer electrolyte matrices, self-assembled monolayers of electrode surfaces, and molecular switch tunnel junctions. I will then discuss how we have incorporated these molecular mechanical systems into reasonably large-scale circuits ( $>10^4$  devices), patterned at a device density of  $10^{11}$  bits/cm<sup>2</sup>, to demonstrate memory and logic operations.