**Molecular Machines**

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The construction of machines on the molecular scale is an emerging field in nanotechnology, however, the translation from macroscopic to microscopic is not as facile as one would hope. Macroscopic machine designs rely on parts that obey Newtonian, inertial motion, while single molecules undergo quantum mechanical, quantized motion. As such, we have been working with the synthesis of crystalline molecules that can act as parts of a machine with both moving and non-moving parts—called amphidynamic crystals. Furthermore, these crystals are designed such that their motion can be controlled. The specific molecules that we aim to synthesize are called rotors and are modeled after macroscopic gyroscopes. The specific rotor we are synthesizing consists of a stator connected through a chiral carbon to an aromatic rotator, which can spin freely on its axis. Hopefully, the chirality of the carbon will install a unique environment at any point during a single rotation of the rotator. The slope of barrier to rotation, therefore, should be smaller in one direction relative to that of the other. The resulting asymmetric potential can be interfaced with a periodic perturbation that may result in unidirectional motion, as expected for a Brownian ratchet. Once the rotor has been synthesized, the barrier of rotation of the rotator, and speed of the rotation, will be determined by solid-state NMR spectroscopy.

**Word Count - 220**