Are DNA spintronics possible?
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A "spintronic" material is an electrical conductor that makes use of a spin blockade to control electron flow. In ferromagnetic materials, like those containing iron, cobalt or nickel, the Fermi level contains contributions from ions in both low-spin and high-spin electron configurations. The current flow can be controlled by a spin-flip via an applied magnetic field as shown in Figure 4.

Designing electrical components using M-DNA requires a detailed understanding of its electron transport, and more advanced materials such as spintronics require an equally detailed understanding of its spin-crossover properties. For a material to function as a spintronic device, the device must have more than one possible electronic spin distribution, and the high-energy spin configuration must be relatively robust, which means that the spin relaxation time must be much longer than the electron transfer time.

By calculating the optimized geometries and harmonic frequencies of DNA metallized with nickel (Ni-GC) it is possible to predict its spin-relaxation rate using the model defined by Hauser *et at.* If the spin is robust enough, it can be used as a spintronic device in the future. If the spin relaxation is too short, modifications such as a different metal (Fe instead of Ni) or a different base-pair can be suggested.

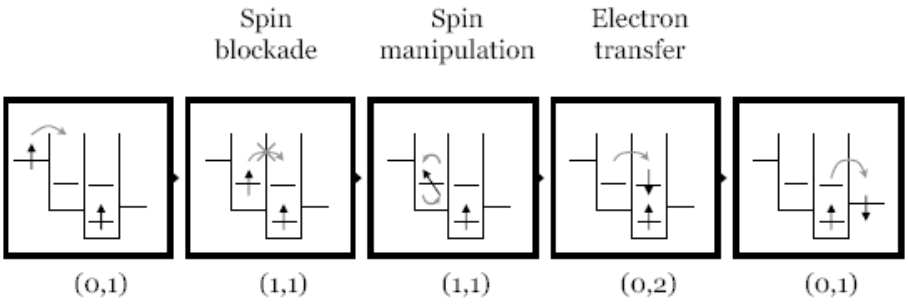

Figure 4: Transport cycle in the spin blockade