

## The Chiral Induced Spin Selectivity Effect (CISS)

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### Abstract

Living organisms rely on chiral molecules, such as nucleic acids and proteins. A chiral molecule is not superimposable on its mirror image, also known as its enantiomer, just like our right hand cannot be superimposed on our left hand. Organisms contain only one enantiomeric form of a molecule, a selectivity that has prevailed through evolution. We claim that the chiral induced spin selectivity (CISS) effect can explain why enantiomeric purity might provide an advantage in biology. CISS is an electronic phenomenon in which electron transmission through chiral molecules depends on the direction of the electron spin, a quantum mechanical property associated with its magnetic moment. Thus charge displacement and transmission in chiral molecules generates a spin-polarized electron distribution. This effect; enhance electron transfer in proteins, enable nano metric charge separation, and explain biorecognition [1].

From the application point, by utilizing the CISS effect we realized a magnet less spin based, nano magnetic optical and electrical memory [2,3,4,5]. The presented technology has the potential to overcome the limitations of other magnetic-based memory technologies to allow fabricating inexpensive, high-density universal and embedded memory-on-chip devices [6] (figure 1).

Using similar effects, we have demonstrated that magnetic ferromagnetic surfaces can supply a simple generic way to separate between two enantiomers. Achieving enantiopurity is of great importance to many industrial fields. This enantiospecific interaction is controlled by surface magnetization and the chirality of oligopeptides, oligonucleotides, and amino acids [7].

In my talk I will present the CISS effect and its importance, both for applications and basic science. I will also point to open questions regarding the CISS.

### References

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### Figures

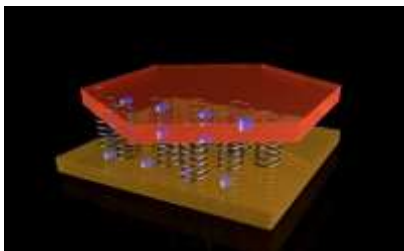


Figure 1: Using the CISS effect a single ferromagnetic nanoplatelet, along with Au contacts and chiral molecules, is sufficient to function as a memory device.