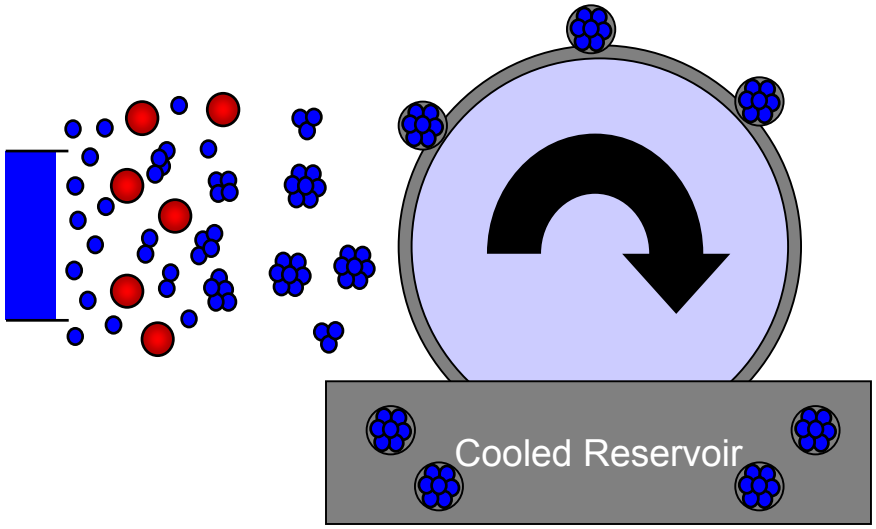
Magnetic Particles for Biomedical Applications

Diandra Leslie-Pelecky, University of Nebraska

MRSEC, DMR-0213808

High-school physics teacher Michelle Strand and undergrads Ray Lemoine and Shaina Remboldt designed and constructed a new system to deposit nanoscale magnetic particles directly into a liquid. The new system allows fine control over particle size through the use of surfactant coating. The magnetic nanoparticles will be used for drug delivery and magnetic imaging applications.

In addition to the summer research, MRSEC faculty visit Michelle's high school classes to talk about nanoscale science.



Spin Transport in Ferromagnetic Nanocontacts

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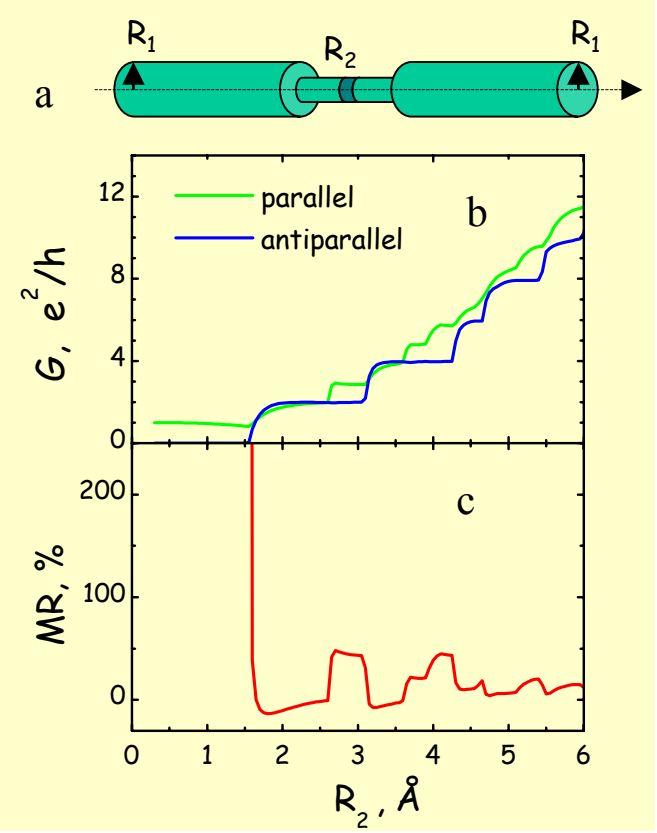
Electronic conduction in nanoscale magnetic structures promises a revolution in electronics and computing through the emerging field of "spintronics". Using quantum theory we investigate spin-dependent electronic transport in magnetic nanocontacts. We emphasize the fact that in atomic-size ferromagnetic contacts it is possible to achieve the conductance value of e^2/h, which implies a fully spin-polarized electronic current. In particular, we show that the presence of a non-magnetic region in the nanocontact separating two ferromagnetic electrodes can lead to a conduction blockade resulting in very large values of magnetoresistance.

Appl. Phys. Lett. ***83****, 3534 (2003).*



Segmented nanowire representing a nanoconstriction with a non-magnetic region in blue (a). Conductance for parallel and antiparallel magnetization in the nanowire (b) and magnetoresistance (c) as a function of radius R_2.