Bio-inspired Artifical Cilia Sensors Using Magnetic Nanowires

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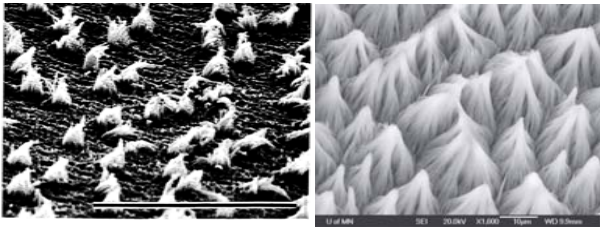
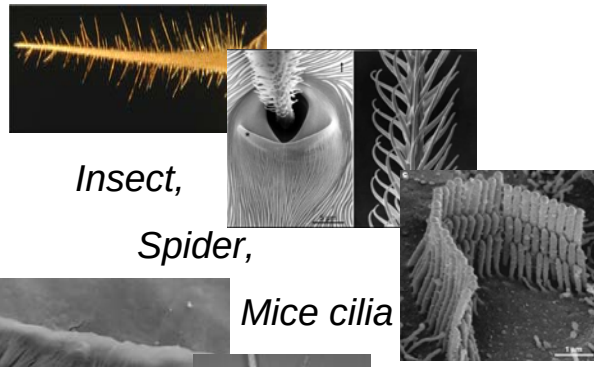
MOTIVATION:

Cilia are employed in nature for sensing sound, fluid flow, gravity, touch, & other stimuli



SEM images of fish saccular hair cells and our nanowires

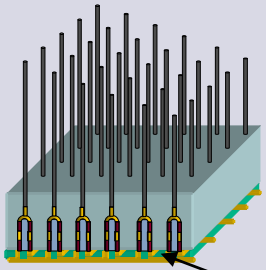


Insect,

Spider,

Mice cilia

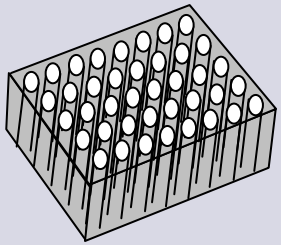
MAIN ACHIEVEMENT:

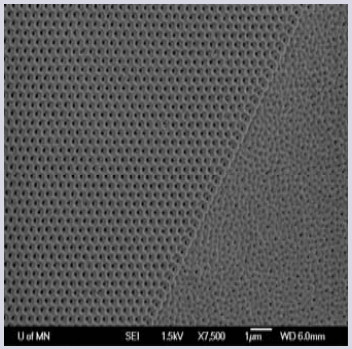


Use magnetic nanowires to mimic cilia in order to enable nanoscale sensing of a broad range of stimuli, especially acoustic and flow.

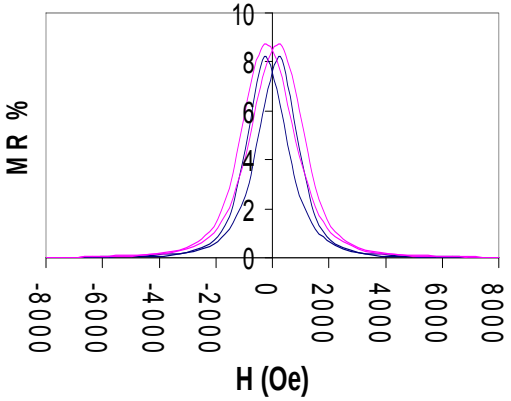
HOW IT WORKS:

Magnetic nanowires are grown into nanoporous templates. Magnetic sensors are also grown into the bases of the pores. The templates are then etched away and the cilia are free to move. When the cilia are stimulated by flow or by a vibration, a change in magnetic flux is detected by the sensors.

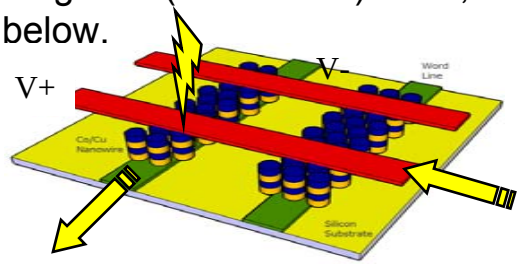




Schematic/top view: nanoporous templates



The nanowire bases are composed of Co/Cu multilayers whose resistance changes in response to a change in magnetic field, shown above. A simple array of these sensors can also be used in magnetic (nonvolatile) RAM, below.



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