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### **Spin-dependent tunneling effects in magnetic tunnel junctions**

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It has long been known that current extracted from magnetic electrodes through ultra thin oxide tunnel barriers is spin polarized. This current gives rise to two important properties: tunneling magnetoresistance (TMR) when the tunnel barrier is sandwiched between two thin magnetic electrodes and, spin momentum transfer, which can be used to manipulate the magnetic state of the magnetic electrodes. In the first part of my talk I show how the structure of thin CoFe layers can be made amorphous by simply sandwiching them between two amorphous layers, one of them the tunnel barrier. No glass forming elements are needed. By slightly changing the thickness of these layers or by heating them above their glass transition temperature they become crystalline. Surprisingly, the TMR of the amorphous structure is significantly higher than of its crystalline counterpart. The tunneling anisotropic magnetoresistance, which has complex voltage dependence, is also discussed. In the second part of my talk I discuss the microwave emission spectrum from magnetic tunnel junctions induced by spin torque from spin polarized dc current passed through the device. We show that the spectrum is very sensitive to small variations in device structures, even in those devices which exhibit similarly high TMR ( $\sim 120\%$ ) and which have similar resistance-area products ( $\sim 4-10 \Omega\mu\text{m}^2$ ). We speculate that these variations are due to non-uniform spatial magnetic excitation arising from inhomogeneous current flow through the tunnel barrier. [In collaboration with Xin Jiang, M. Hayashi, Rai Moriya, Brian Hughes, Teya Topuria, Phil Rice, and Stuart S.P. Parkin]

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