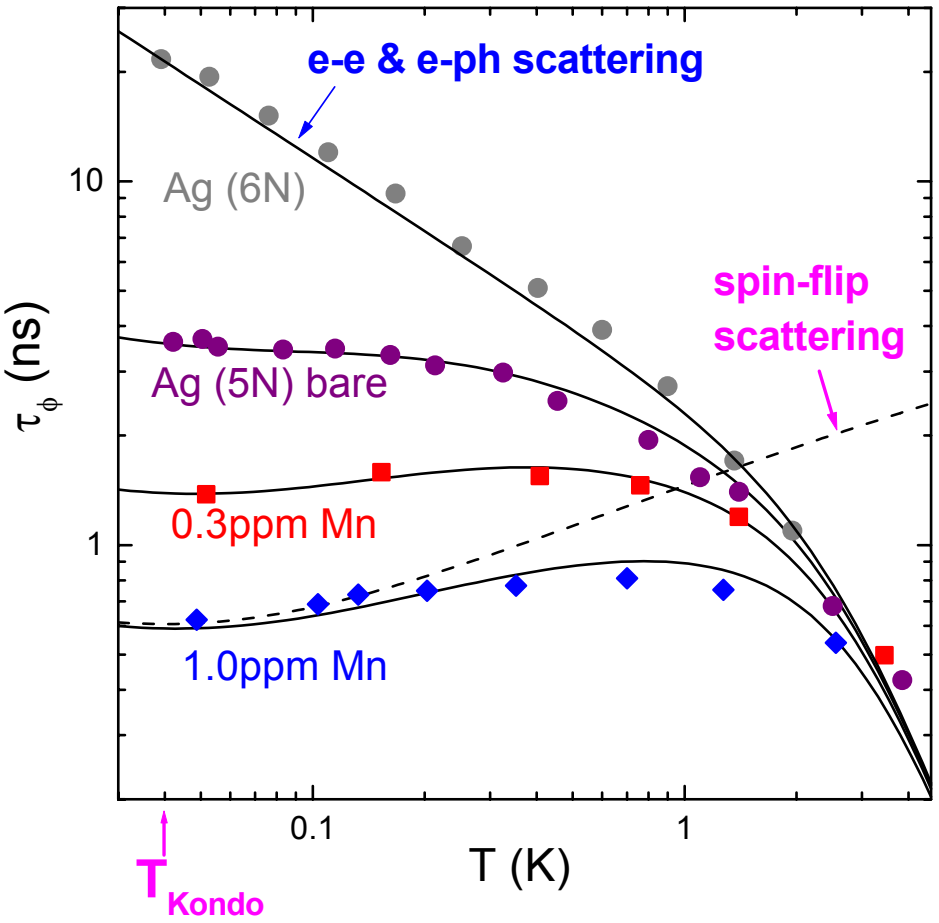
Quantum Coherence of Electrons in Metals

Norman Birge, Michigan State University, DMR-0104178

Quantum coherence of electrons in metals leads to a number of remarkable properties. Understanding the sources of decoherence is important for applications of quantum-coherent phenomena in quantum computing and all nanosciences. Dilute magnetic impurities, even at concentrations less than 1 part per million, are often the dominant source of decoherence in noble metals. The figure shows the coherence time in four silver samples with different concentrations of manganese purities. The solid lines show that the data are consistent with theoretical predictions for the scattering rates due to the impurities and to electron-electron interactions.



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Education: The physical principles and experimental techniques developed in mesoscopic physics are crucial to the future development and applications of nanosciences.

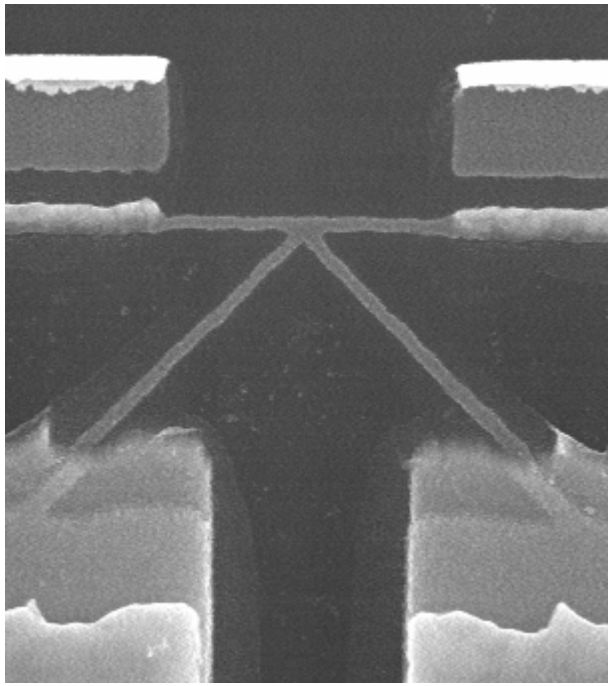
Current graduate students: Michael Crosser, Ion Moraru, Gassem Al-Zoubi

Recent graduates: Charles Moreau, Jian Huang

Recent undergrads: Kevin Dolan, Charles Wallace, John Lighthall

Recent post-doc: Frederic Pierre

Outreach: The PI participates in the annual “Science Day at the Mall” and the Michigan Science Olympiad.



Electron microscopic picture of a sample consisting of superconducting lead-bismuth and normal silver parts for experiments on the superconducting proximity effect. The two metals are deposited at different angles through a suspended mask without breaking vacuum, to achieve a clean interface between them.