School of Physics
Trinity College Dublin

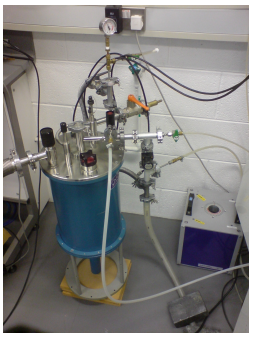
Research project in **Magnetism & Spin Electronics**

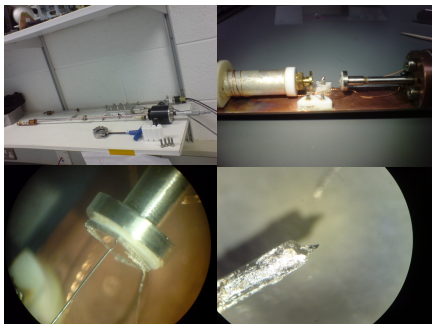
Development of High-Field Point Contact Andreev Reflection Methodology

Research supervisor: Dr. Plamen Stamenov
Magnetism & Spin Electronics

Scientific Background / Current Research

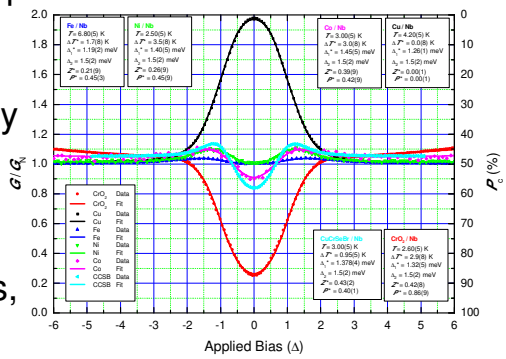
Point Contact Andreev Reflection (PCAR) is a method for determination of the *magnitude of the electron spin polarisation* close to the Fermi level in magnetic metals and degenerate semiconductors – a parameter of *critical importance* for their applications in spin electronic devices. The experiments involve the accurate measurements of the low-temperature differential conductance of *superconductor – metal* junctions and the determination of the characteristic current conversion at the interface (from Cooper pairs to normal quasi-electrons).



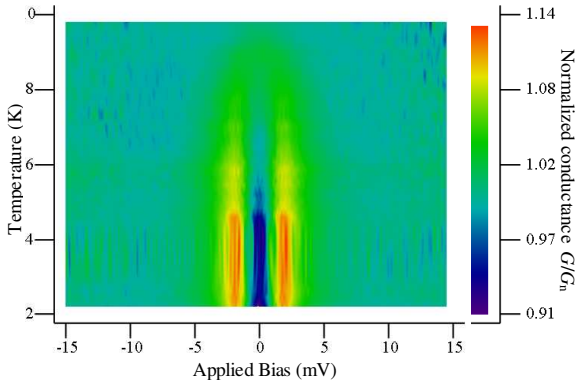


Project

The project will involve the construction of a new experimental setup, similar to the one shown on the right, for use in high magnetic fields (up to 14 Tesla); the development of theoretical understanding and modelling (fitting) tools for the experimental observations; and the measurement of spin-polarisation in a variety of novel materials, such as CoPt, FePd, Mn_3Ga, Mn_2Ga, Tm, and Gd, among others, with its sign.



Our "Textbook" examples of PCAR spectra.



Temperature evolution of the PCAR spectrum for bulk polycrystalline thulium. The data is gathered for ~ 1 minute.

Funding

Funding for this project has been approved and is available through the School of Physics, TCD. Prospective students can also apply for funding through the IRCSET, EMBARK initiative 2011 *(by Wednesday 16th February at 5.00 pm (GMT/ UTC) 2011).*

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More information / References

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• I. I. Mazin, A. A. Golubov, and B. Nadgorny, *Journ. Appl. Phys.* **89**, 7576 (2001).
• G. T.Woods, R. J. Soulen, I. Mazin, B. Nadgorny, M. S. Osofsky, J. Sanders, H. Srikanth, W. F. Egelho, and R. Datla, *Phys. Rev. B* **70**, 154416 (2004).

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