

University of Wisconsin-Milwaukee

**Dept. of Physics**  
**COLLOQUIUM**

*Tip-induced Superconductivity*

**Goutam Sheet**

Dept. of Physical Sciences,  
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(IISER) – Mohali, India

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**2:30 PM**

**Lubar Hall -- S 230**

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It has been recently observed that certain novel phases of matter, like superconductivity, emerge at mesoscopic interfaces between elemental metals and topologically nontrivial systems such as topological insulators and topological Dirac and Weyl semimetals. In this talk, I will review some of our published results on such mesoscopic superconducting phases with special emphasis on tip-induced superconductivity (TISC). A TISC phase is known to emerge under the point of contact between a sharp tip of a (non-superconducting) normal metal and a material with topologically non-trivial band structure. Since the superconducting volume fraction in a TISC is extremely small, traditional bulk characterization tools such as regular transport and magnetization measurements fail to detect such a phase. I will highlight how probing Andreev reflection at such mesoscopic point contacts (a quantum process through which a normal current is converted into a supercurrent in a normal metal-superconductor interface) can help us detect and understand the fundamental physics of TISC.

**References**

- [1] L. Aggarwal, A. Gaurav, G. S. Thakur, Z. Haque, A. K Ganguli and G. Sheet, *Nature materials* **15**, 32 (2016).
- [2] L. Aggarwal, S. Gayen, S. Das, R. Kumar, V. Süß, C. Felser, C. Shekhar and G. Sheet, *Nature Communications* **8**, 13974 (2017)
- [3] S. Das, L. Aggarwal, S. Roychowdhury, M. Aslam, S. Gayen, K. Biswas and G. Sheet, *Applied physics Letters* **109**, 13 (2016).