Notre Dame Science
Department of Physics

TRANSPORT THROUGH ANDREEV BOUND STATES IN A SUPERCONDUCTOR-QUANTUM DOT-GRAPHENE SYSTEM

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Transport through normal metal-superconductor junctions occurs via Andreev reflection, whereby a low-energy electron from the normal metal is reflected as a hole at the N-S interface, and a Cooper pair is injected into the superconductor. In confined geometries, this process gives rise to discrete Andreev bound states (ABS) in the metal. ABS enable the transport of supercurrents through non-superconducting materials and have recently been proposed as a means of realizing solid-state qubits. However, although many measurements have invoked ABS to explain the existence of supercurrents, it has previously been difficult to directly probe individual ABS. In this talk, I will discuss measurements of superconductor-quantum dot-graphene devices that allow for the direct measurement of individual ABS. In this case, the ABS form when the discrete quantum dot levels are proximity-coupled to the superconducting contact. Due to the low density of states of graphene and the sensitivity of the quantum dot levels to an applied gate voltage, the ABS spectra are narrow, can be tuned to zero energy via gate voltage, and show a striking pattern in transport measurements.

Condensed Matter Seminar

All interested persons are cordially invited to attend.