



Using Graphene to Study Superconductivity (New Tricks for an Old Dog)

Superconductors are materials that can have zero electrical resistance. They are thus of great interest for applications such as power transmission and energy storage. While the fundamental physics of standard superconductors has now been understood for over 50 years, questions remain about what happens when superconductors are coupled to other materials. For example, it was known that superconducting carriers could be transmitted through a normal metal, but the spectroscopy of the individual modes had not been measured. Graphene, a single atomic layer of carbon which has only recently been isolated for electrical measurements, is also of great interest for fundamental studies and applications. In this talk, I will discuss the new physics that emerges when “superlative” materials such as superconductors and graphene are put together in hybrid structures. In particular, I will show how the creation of a superconductor-nanoparticle-graphene sandwich structure enables a direct measurement of individual superconducting modes. Our measurements show that the spectra of these modes are sharp and tunable. These results may improve the understanding of how superconductivity is transmitted in materials, and may also be relevant to novel computing devices.

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