Remote Induced Magnetism in a Normal Metal coupled to a Superconductor/Ferromagnet Heterostructure

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COLLABORATION — Integrating superconductors (S) into ferromagnetic (F) heterostructures has revealed a rich area of novel physics and led to the development of superconducting spintronics. Of particular interest is the prototypical device, the S spin valve. In this work we use neutron and muon techniques to study the local magnetic profile in such a device, looking for an induced magnetism expected at the S/F interface. Instead we observe an additional unexpected moment arising neither in the S nor F layers, but in the normal metal cap\textsuperscript{1}. The magnetisation is always antiparallel to the direction of an applied field (to align the F layers) and appears at the onset of superconductivity, increasing in strength with decreasing temperature. The profile of this induced moment is inconsistent with any known or predicted phenomena. What is particularly remarkable is that there is no applied current or temperature gradients meaning the effect manifests in equilibrium.

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