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## Lecturer


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# Playing with Topological Insulators: Superconductivity and Strain Effects


"Topological insulators" are semiconductors characterized by an inverted bulk band gap caused by strong spin-orbit coupling. By analytic continuation, this gap must close at the surface and reopen outside in vacuum where the gap is noninverted (and infinite). The resulting metallic surface states, or topological states, are spin-polarized and span the bulk gap. They carry a surface spin current, largely independent of the details of the surface, which is a feature of strong interest for spintronic applications. This talk will focus on thin films of a prototypical topological insulator $Bi_2Se_3$ that are (1) made superconducting by proximity coupling to a simple superconducting substrate or (2) strained by stretching a flexible plastic film substrate. Angle-resolved photoemission and x-ray diffraction were employed to determine the electronic structure and the lattice structure. A novel "flip-chip" technique was employed to prepare epitaxial films of $Bi_2Se_3$ on the superconducting or flexible plastic substrates. We show how the topological surface states are modified under these conditions. Effects of superconducting pairing, coherence, bulk-surface coupling, and electron-lattice coupling will be discussed.