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Topological Insulators: a New State of Matter — •Laurens W. Molenkamp — Physikalisches Institut (EP 3), Universität Würzburg, Am Hubland, 97074 Würzburg, Germany — Laureate of the Stern-Gerlach-Medal

Topological insulators are a novel class of materials that exhibit a novel state of matter: while the inside (bulk) of the materials are electrically insulating, their surface is metallic. This effect occurs because the band structure of the materials is topologically different (in a mathematical sense) from the outside world. This talk describes our discovery of this type of behavior while studying the charge transport properties of MBE-grown layers of the narrow-gap semiconductor HgTe.

As a more recent development, we describe how in these layers, a supercurrent is induced by contacting with Nb electrodes. AC investigations show strong evidence for the presence of a gapless Andreev mode in our junctions, a so-called Majorana mode.