

Pillar of Invisibility

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While we are a long way off from the lightweight, high-performance, magical cloak of Harry Potter, Muggle physicists have been busy designing ways to make invisibility possible.

A recent theoretical analysis of a column-shaped invisibility cloak, by a collaboration of researchers from Sweden and China, showed that a cloak made to ideal specifications could render an object (or wizard) hidden inside perfectly invisible. However, even slight deviations from these specifications will cause the invisibility to break down.

The researchers analyzed the properties of a simulated tube of special metamaterials (manmade materials with intricate, microscopic structures) that can force light to follow a specified path. With the ideal wall thickness, the tube would flawlessly guide light around the inner chamber, rendering the wizard inside invisible. You could walk about, unaware of the cloaked wizard's presence, unless you unceremoniously slam yourself into a pillar that looks like nothing but empty air.

The wizard, who would be unable to see anything outside of the invisibility cloak, could reveal himself by deconstructing the cloak a layer at a time. Imagine if he could wave his wand and remove a layer from the inside of the column, leaving it the same diameter on the outside but making that inner chamber a little larger.

With the inner layer removed, the wizard would appear as a thin line, and the background would be slightly distorted. As more of the inside is removed, the wizard would become more apparent and the background

would become more distorted. Physicists haven't yet worked out exactly how these distortions would appear to human eyes.

In any case, the collaboration's theoretical study affirms that the ideal column design will allow for perfect invisibility, if metamaterials can be made to the right specifications.

Citation: Zhichao Ruan, Min Yan, Curtis W. Neff, and Min Qiu, *Physical Review Letters* (forthcoming article)

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