

Now You See Me: THE SCIENCE OF INVISIBILITY

DISCOVERY

Imagine being invisible, hidden from the world. What would it feel like?

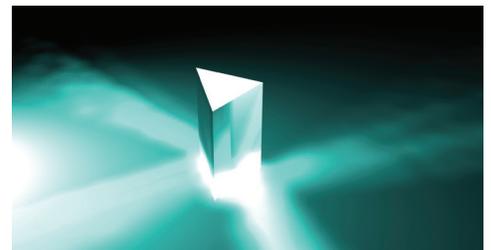
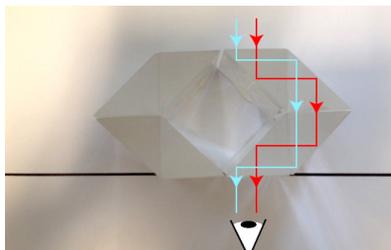
While this might seem like the stuff of science fiction, science is getting closer to making invisibility a reality. For decades, scientists have known a variety of methods for hiding objects and even people.

One of the best-known methods for invisibility involves bending light *around* an object. This can be done by placing triangular prisms around an object in the configuration shown below. The object at the centre becomes invisible.

How does it work? Think of a beam of light entering the prisms shown below from the top of the picture. It passes through the first prism and is incident on its back surface at a 45-degree angle. This is greater than the critical angle of light passing from glass to air, so the light is reflected to the prism's opposite side (i.e., to the right). There, it again hits at a 45-degree angle and is reflected into the next prism, where the process repeats.

Importantly, no ray of light ever reaches the object in the middle. This makes it invisible to anyone looking from outside. Of course, it's not complete invisibility, because you can see the prisms. But it's proof of the underlying concept.

Another technique for invisibility works thanks to projection. Imagine a tree hidden behind a brick wall. If we take video footage of the tree (and its surroundings) and carefully project it onto the wall, then the wall effectively becomes "invisible." This method requires careful attention to angles, lighting, and the type of projection surface.



INNOVATION

A different approach to invisibility is based on something called *metamaterials* – exotic, human-made materials that have amazing properties based on the laws of quantum physics. Some metamaterials, for example, can *bend light*, diverting it around an object. Although this has only been demonstrated on a microscopic scale, it could someday be used to create a Harry Potter-style invisibility cloak!

Invisibility has many potential applications including military "stealth" uses, looking inside the human body for surgery, and helping people safely reverse their cars by making the back seat "invisible."

IMAGINATION

We are just beginning to understand the science and engineering of invisibility, and many new techniques are yet to be discovered. How would you use invisibility? What new invisibility method can you think of?

