

## Nano World: Invisibility through nano 2

### BREAKING NEWS

[JitterBugs could turn your keyboard against you](#), 7 minutes ago

[Lock picking child's play at major US computer hackers conference](#), 9 hours ago

[People the Achilles' heel of computer security: hackers, pros](#), 5 hours ago

[Computer hackers get lesson on cloning passport, cash card tags](#), 20 hours ago

[After 10 years, life-on-Mars rebuked](#), August 05, 2006

['Seeing shoes' offer help to blind](#), August 06, 2006

[Microsoft Piracy Check Draws Complaints](#), 20 hours ago

[Online Poker Players Face Legal Issues](#), 20 hours ago

[IBM researchers look beyond silicon technology](#), August 03, 2006

[British high street targets energy-conscious consumers](#), August 06, 2006

### NEWS ARCHIVE

[Archive](#)

[Search](#)

### OTHER LINKS

[Suggest a story idea](#)

Google™

Web  PhysOrg.com

**GLOBALSPEC**  
The Engineering Search Engine™

[Products & Suppliers](#)

Stay on top of your industry news  
at  
**TradePub.com**  
Click for **FREE** subscriptions to popular trade magazines

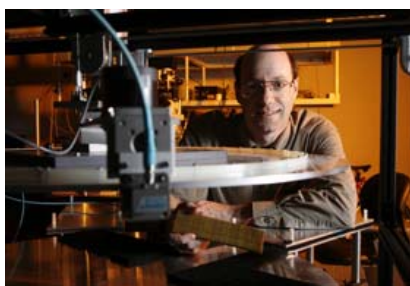
[Print](#) [Email](#) [Blog It](#) Font size: - N +

Sponsored Links (Ads by Google)

**Nano Material Technology** - nano thermal spray is stronger than steel at a fraction of the weight

**Nanotechnology Investment** - New nanotechnology that may reverse aging and treat disease

**Nano/Mems Manufacturing** - Plating, Lithography, ECD, Resist Semiconductor Processing Tools



David R. Smith of Duke's Pratt School of Engineering is one of the invisibility cloak's technological tailors. Credit: Duke Photography

**Invisibility cloaks that bend light might develop using nanotechnology, experts tell UPI's Nano World.**

"There are probably quite a number of useful things you could do with stealth for the military," said researcher John Pendry, a physicist at Imperial College London.

More mundane applications also include hiding obstacles -- "for example, one may wish to put a cloak over the refinery that is blocking your view of the bay," said researcher David Schurig, a physicist at Duke University in Durham, N.C. Moreover, objects invisible to electromagnetic fields are isolated from them as well. "You may want to protect something from [electromagnetic interference](#)," he added.

Cloaking devices may also get designed against electric and [magnetic fields](#) as well, Pendry said. Scientists might also be capable of engineering devices vs. acoustic waves as well. "This in fact would be much simpler," said researcher Ulf Leonhardt, a theoretical physicist at the University of St. Andrews in Scotland. "One could imagine applications against sonar as well as things we can't imagine."

Light is often bent in nature. For instance, mirages form when desert sands heat air that goes on to bend light rays from up above, creating images of the sky that deceive thirsty wanderers as illusions of water, Schurig explained.

The cloaking devices a team of scientists at Imperial College London and Duke University conjectured, along with Leonhardt working independently, do not render items transparent, with light streaming through an object. Nor would these machines simply provide camouflage. Instead, the invisibility the scientists describe would smoothly guide rays of light completely around an item so they proceed along their original trajectory as if nothing were there, hiding the object from sight without producing reflections or shadows. These devices would not require power to work.

Imagine making a hole in space the right size to fit a desired object. "This hole is akin to one that can be opened up in a woven cloth by sticking a pointed object between the threads and compressing the fibers radially outward," Schurig explained. "In essence, the electromagnetic fields are confined to the 'threads of the cloth' and cannot reach an object placed in the 'hole.' Outside the compressed region the 'threads' and the fields are returned to their original paths, undisturbed."

The key ingredients for cloaking devices are compounds known as metamaterials. Metamaterials that deal with light are made of structures smaller than the length of a wave of light -- if the structures were larger, they would scatter the light instead of guide it. Red light has a wavelength of roughly 650 nanometers or billionths of a meter, while blue light has a wavelength of about 475 nanometers. Radio waves, microwaves and infrared waves have longer wavelengths than visible light while ultraviolet rays, X-rays and [gamma rays](#) have shorter ones.

Sponsored Links (Ads by Google)

**Energy For Life**  
With Pulsed Magnetic Fields Only 15 minutes a day!

**Physics Of Plasmas**  
Abstracts from the AIP & APS Physics of Plasmas journal.

**Nanotechnology**  
Free report with rocket stock picks from The Motley Fool.

The individual structures within metamaterials each behave like antennas that send and receive waves. "Their average response altogether dictates how the light will get handled," Pendry said. Both teams reported their findings online May 25 via the journal *Science*.

A significant challenge invisibility cloaks face include the fact that in practice they may end up absorbing or reflecting some of the light they bend, making cloaked objects perhaps resemble dark glass, though a good enough metamaterial could reduce such imperfections, Pendry said. In addition, it would be "very hard" to get them working against more than a very narrow range of wavelengths, said researcher David Smith, a physicist and electrical engineer at Duke University.

"It is highly doubtful, at least from what we understand currently, that we could make a cloak that would operate over all wavelengths," Smith said.

The first practical cloaking devices will likely operate against the invisible parts of the spectrum of light that possess fairly long wavelengths, such as microwaves, simply because the structures making up such a cloak will be easier to make. "You can imagine if there was some building at Heathrow Airport distorting radar waves, you might want to cloak the building," Pendry said.

As scientists miniaturize the operational features of cloaking devices to the scale of nanometers, they could prove capable of bending

#### User rating

**4.7** out of 5 after **72** total votes  
**Would you recommend this story?**

Not at all - **1 2 3 4 5** - Highly

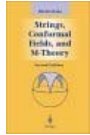


[An Introduction To Black Holes, Info...](#)

Leonard Susskind  
 Best Price \$12.41  
 or Buy New \$14.00



[Privacy Information](#)



[Strings, Conformal Fields, and M-The...](#)

Michio Kaku  
 Best Price \$44.98  
 or Buy New \$65.01



[Privacy Information](#)

appropriately shorter wavelengths of light, including those in the visible range. Both research teams point out materials incorporating nano-pillars of gold have emerged in the last year that could operate against visible light.

"These are very intriguing results that make you ask how well will they work," said optical physicist Greg Gbur at the University of North Carolina at Charlotte. "In principle, you really can't make it perfectly invisible, and then things might start bouncing off or sticking on like dust. But as Leonhardt pointed out, you can probably make it nearly invisible, very well hidden. The jury's still out."

Copyright 2006 by United Press International

There is a discussion of this news at PhysOrgForum entitled: **INVISIBILITY THROUGH NANO-TECHNOLOGY**

There are **11 replies** in that topic. The last post was on 26-Jul-2006  
 The first 5 posts are :

**On 26-May-2006 by plakhapate**

<http://www.physorg.com/news67787896.html>

In fairy tales we have several stories where sudden disappearance was totally unbelievable.

But with nanotechnology it is possible.

This invention will make lot of changes which we never thought of.

P.J.LAKHAPATE  
 plakhapate@rediffmail.com

**On 26-May-2006 by holoman**

Holographic Stealth Camouflage

Colossal Storage talked about metamaterials and pos/neg refractive materials in 2003 on their website.

"3D Holographic Programmable Camouflage Coatings , specialty-coating applications, and Programmable Holographic Stealth Photonic Invisibility"

<http://www.colossalstorage.net/colossal12.htm>

**On 27-May-2006 by Guest**

If the object is invisible to the outside world, the outside world is invisible to the object. Think about the paths of the light rays again. Some protection.

**On 27-May-2006 by arne**

who said u had to be entirely invisible... just cover everything but the eyes.  
 Only a few square centimetres is a lot harder to spot then a whole person...

**On 27-May-2006 by board member here**

How do you know that there are creatures in nature, that already employ light bending technologies, but not as most humans understand it?

[Read all 11 posts](#)

[Reply / Comment](#)

### **Relevant stories**

- [Earliest hominid: Not a hominid at all?](#) , June 19, 2006
- [In Brief: Hawaii notes flaws in Kauai dams](#) , May 21, 2006
- [Study highlights role of hit-and-run collisions in planet formation](#) , January 11, 2006
- [Unified physics theory explains animals' running, flying and swimming](#) , December 30, 2005
- [A new face for physics](#) , September 21, 2005
- [Study Shows Shoplifters More Readily Identified By Behavior, Not Race](#) , August 11, 2005
- [Study Shows Big Game Hunters, Not Climate Change, Killed Off Sloths](#) , August 04, 2005
- [Well dig yields centuries-old artifacts](#) , July 26, 2006

[top](#) | [Home](#) | [Search](#) | [PDA version](#) | [Links](#) | [Contact us](#) | [Add headlines to our site](#)

© PhysOrg.com 2003-2006  
[Privacy Policy](#) | [Terms of Use](#)

**PHYSORG.COM**