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'Anti-laser' built for first time

19:00 17 February 2011 by Jeff Hecht

An anti-laser – which absorbs light rather than emitting it – has been built for the first time.

A laser shines by producing a cascade of photons that bounce around inside a light-amplifying material before exiting from one or both ends. In 2010, Douglas Stone at Yale University and colleagues devised a way to reverse the process, with a material that absorbs rather than amplifies light.

The researchers calculated that if they used a light-absorbing material like silicon, then at certain wavelengths, two identical laser beams shone directly at each other would cancel out inside the material.

Now, a team led by Hui Cao of Yale has done just that using a 110-micrometre-wide slab of silicon.

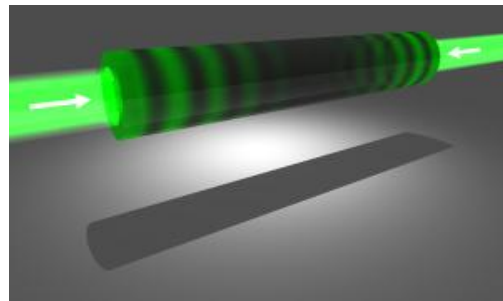
The researchers chose the wavelength of the laser light so that light waves hitting the outside of the slab from the laser beams were in just the right phase with the waves transmitted through the material to trap the light inside the slab.

The silicon absorbed 99.4 per cent of near-infrared light with a wavelength of 998.5 nanometres, turning it into heat. "Theory and experiment matched very well," says Stone. "We couldn't have expected to do any better."

Future computers may use light to transmit signals efficiently between their chip processors. Anti-lasers could be used to modulate the intensity of that light, or to convert light signals into electrical form for on-chip processing, the researchers say.

Journal reference: Science, vol 331, p 889

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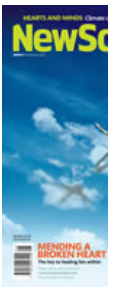
In an anti-laser, or coherent perfect absorber, the outgoing laser beams are replaced by incoming ones, and light flows into a light-absorbing material instead of out of a light-amplifying one (Image: Science/AAAS)

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The Rube Goldberg Way

Mon Feb 21 16:11:23 GMT 2011 by **Frederick**

So the device captures light and converts it into heat. Gee whiz. There are scores of ways to do this: all you have to do is shine the laser into an absorbing medium.

The method described here offers no advantage over a regular absorbing medium (a piece of glass tinted with black particulate, for instance, or just a cavity in a charcoal block). On the other hand it offers two significant disadvantages: 1). it will only capture efficiently laser light at the precise wavelength it was designed for, and 2). it needs to be illuminated from both sides with precise alignment and phase matching.

So, essentially, it is a Rube Goldberg machine to do what a simple cavity would do as well or better.

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The Rube Goldberg Way

Tue Feb 22 01:08:10 GMT 2011 by **Brendt**

I think you missed one point. This would allow for switching - just turn off one of the lasers and the other transmits through. this allows for controlled darkening at high switching speeds, and absolute essential if it is to be used in a future optical computer.

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The Rube Goldberg Way

Tue Feb 22 10:48:37 GMT 2011 by **Frederick**

"just turn off one of the lasers and the other transmits through"

That would work if the switching laser was off to the side--but unfortunately it has to be head-on. Also, the switching laser must be of the same type and strength as the laser being switched, so there's no amplification. You have to switch off / dim the switching laser in the first place in order to switch off / dim the identical switched laser. There is no gain, and no point.

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possible explanation, says **Robert Garisto**

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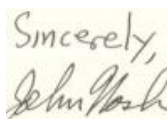
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The Rube Goldberg WayTue Feb 22 10:52:54 GMT 2011 by **Freederick**

P.S. It's essentially a logic gate for carrying out the identity operation. Not very useful, right?

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The Rube Goldberg WayTue Feb 22 13:40:43 GMT 2011 by **Freederick**

P.P.S. Grrr... the NOT operation actually--my bad. Still, it doesn't change my point.

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The Rube Goldberg WayTue Feb 22 14:46:03 GMT 2011 by **Oji**

If it is a NOT operation, then that is 50% of the components required to build any combinatorial logic function!

I think you are being unnecessarily harsh on a piece of new research. Who knows what it might lead to? (Including, perhaps, nothing)

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The Rube Goldberg WayWed Feb 23 10:38:19 GMT 2011 by **Oji**

Actually, wouldn't it be an XOR function?

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