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July 3, 2010 - G	UY RAZ, host:							
Butterflies get others, like the gyroids. Thos A new researc ways of devel	their colors in one e morpho butterfly e structures reflect ch from Yale Unive oping faster electro	e of two ways: some o , have microscopic ge t certain colors of ligh rsity suggests these g onic and optical devic	f them, like monarche cometric structures in t much like a rainbov gyroids could help er es. The study was le	s, have pigments. But n their wings called w. ngineers figure out new ed by Richard Prum, an	NPR thanks our spo	nsors Become (
Dr. RICHARD understood sh They were de lineages of bu	PRUM (Ornitholog nape. Actually, we' scribed by mathen itterflies independe	ist, Yale University): <i>A</i> re still trying to wrap o naticians only in the 1 ently.	A gyroid is a really fa our brains around gy 970s, and they have	scinating and poorly roids and what they are. e evolved in at least three				
RAZ: And it's	a shape, basically,	right?			Study Suggests Way To Create New Eg New Methods Could Speed Up Repair C			
Dr. PRUM: Ye one another. I right? And wh gyroid.	ah. It's a Swiss che But those channels at you end up with	Nerves						
RAZ: So why a	are engineers, par	ticularly electronic en	gineers, interested ir	n your research?				
Dr. PRUM: It turns out that all of the electronic gizmos in our lives function by controlling the flow of electricity with gated channels that allow certain frequencies through and not others. So controlling the flow of electrons is at the heart of a lot of technology.					Are 'Functions' And 'Doings' Real In The Adele In The Goldilocks Zone			
A lot of the cu are objects th biologist, I loo hitting the but	tting edge of techr at work in a similar k at these butterflie terfly scale and the	nology right now is the way but by controllin es and I imagine or I s en scattering back to	e development of pho g the flow of light or see the white light tra our eyes as a beauti	otonic devices. And these photons. And so as a ansmitted through the air iful green color.		Science Friday Po		
What that mean through that no controlling the engineering.	ans though to the enaterial. And so, the enaterial. And so, the flow of light, and t	engineer is that greer le way in which these that's a fundamental p	n light is prohibited of butterflies make thei property that is really	r not allowed to transmit ir beautiful colors is by at the cutting edge in	Science Friday is a wee discussion of the lates science, technology, he environment hosted by Visit this podcast's Wel			
RAZ: Well, wh	at are some of the	possibilities?				ę		

Dr. PRUM: One of the fundamental ways in which these sorts of materials might work would be as www.npr.org/templates/transcript/transcript.php?storyId=128014167

Butterflies: Science On The Wing : NPR

the insulation around fiber optic fibers. So imagine if we were communicating in a fiber with pulses of green light. If we surrounded that fiber with material that had the same nanostructure as some of these green butterfly scales, any of the green light that tried to leak out of the fiber would go into a material which cannot transmit that green light. It would bounce it back into the fiber.

So it would act like a perfect insulation to that fiber. There's, of course, lots of engineering working precisely on this question: How do we control the leakage of light out of fiber optics?

RAZ: Which is a problem now?

Dr. PRUM: Which is a problem now, yeah. So we have to put stations between in the middle of the ocean to boost fiber optic signals so that they get all the way across the ocean or all the way across the country without loss.

RAZ: So right now, along the fiber optic cable, light leaks out, you need these boosters to make sure that the signal goes across the ocean. But in theory, if this technology is exploited, it could create insulation that would seal that light inside those cables?

Dr. PRUM: Yeah. And biological systems like butterflies self-assemble these nanostructures. And that's why they're interested in butterflies because, of course, you could machine these things at the nano scale, the side scale of light, in order to make an optical device. It would take a lot of effort. But if you could grow one at exactly the right scale, as butterflies do, you could make these things a lot easier.

RAZ: Absolutely fascinating. That's Richard Prum. He's an ornithologist at Yale University. He joined me from New Haven.

Richard Prum, thank you so much.

Dr. PRUM: Thank you very much.

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Plaintiffs had hoped to be protected from lawsuits from Monsanto if its seed pollinated with theirs.



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Pls come to NY for Livingston Luncheor all fete you properly. @sharmeenochinc to hear your Oscar tale on @npratc

about 7 hours ago

I am sooooooo very happy for you!! @sharmeenochinoy Hope you and your well. Hugs. High fives. Kudos and Kisse

about 7 hours ago

Viola, I hope your garden grows lush wi wonderful scripts featuring strong & not characters that will lead you to the Osca

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17 minutes ago

@nprwatc now moves to central, mtn ar time zones. I'm off next week. Jacki Lyde hosts. thanks all for listening!

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@Newsgirl151 um, no.

about 20 hours ago

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Ever draw a cultural blank when a group

Butterflies: Science On The Wing : NPR

Butterflies are just the coolest. The way they migrate thousands of miles, their colors, their

I certainly agree that this is very exciting work with lots of potential. However, the suggestion that this technology could make fiber optics better because it will "prevent light from leaking out" is complete nonsense. Light doesn't leak out of modern optical fibers. It is confined in the fiber core by a process known as Total Internal Reflection (TIR). As the terms implies, it

is "Total Reflection." All of the light is reflected back into the core. You can't improve on 100.000%. Light does indeed attenuate over long distances of fiber, but not because of "light leakage." The predominant mechanisms that cause light loss are Rayleigh scattering

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contributions to flowers and plants. Beautiful flying flowers. Love'em. Sun Jul 04 2010 11:36:25 GMT-0400 (Eastern Daylight Time)

Sun Jul 04 2010 09:24:51 GMT-0400 (Eastern Daylight Time)



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Mye Flatley (P_U_Wallpaper) wrote:

Penny Lane (crooowww) wrote:

David Goff (MrFiber) wrote:

and absorption by impurities.

of 100km or more.

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Recommend (1)

To GaryFromTexas: Agreed. But is the color in the insects from a diffraction grating effect (like a rainbow) or is it by interference effect (like a soap/oil film)? Sun Jul 04 2010 02:02:07 GMT-0400 (Eastern Daylight Time) Recommend (0) Report abuse

Modern optical fibers have losses below 0.2dB per km allowing unrepeatered transmission



KT (gator2010) wrote:

This doesn't just apply to insects. Generally, blues and greens in bird feathers are "structural colors" as well. Sat Jul 03 2010 21:55:08 GMT-0400 (Eastern Daylight Time) Recommend (2)

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Uncertainty Principle (SchroedingersCat) wrote:

Gary T (GaryFrom Texas) wrote:

Physics lesson: Rainbows and oil slicks produce colors by different mechanisms refraction and interference.

Thanks gary, the guy's comparison of them confused me. I wonder which he meant? I can't really tell by the "swiss cheese" comment. Which is swiss cheese more like, an oil slick or a rainbow? Sounds like something straight out of "Through the looking glass!" Sat Jul 03 2010 12:02:34 GMT-0400 (Eastern Daylight Time) Recommend (3) Report abuse



larry fer (littlefer) wrote:

Wow. It just freaks me out how incredible the evolution of a butterflie wing is. And everything else for that matter. Sat Jul 03 2010 11:42:57 GMT-0400 (Eastern Daylight Time) Recommend (3)

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Gary T (GaryFromTexas) wrote:

Physics lesson: Rainbows and oil slicks produce colors by different mechanisms refraction and interference.

A rainbow does it by refraction as light enters and exits rain drops. This is the same mechanism as a prism separates white light into colors. Sunlight is reflected internally by raindrops. The light is bent entering and exiting the rain drops. Each color of light bends a different amount. The resulting color seen is dependent on the angle of view. Viewers in different positions will see the same colors in different locations.

Butterflies: Science On The Wing : NPR

An oil slick produces colors by interference in thin films. When light enters a thin layer of oil on the surface of water, some light is reflected by the top surface and some light passes through the top surface and then is reflected back by the bottom surface of the very thin layer of oil on water. If the bottom surface reflected wave is in phase with the wave reflected from the top surface, then that wave will be reinforced. If it is out of phase, it will be cancelled. Because the geometry depends on the length of the light wave to determine if it will be added (reinforced) or subtracted (cancelled) as the two reflected light beams combine and different wave lengths are perceived as different colors, the reflected color will vary with the thickness of the film. Therefore, variations in the thickness of an oil film will produce variations in the color of reflected light.

Sat Jul 03 2010 10:33:24 GMT-0400 (Eastern Daylight Time)

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