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Optical Microchip Breakthrough In Canada?

Posted by [timothy](#) on Saturday May 27, @06:38AM

from the it's-**never*-a-good-time-to-buy-a-computer* dept.
[J](#) writes: "*The [Toronto Star](#) has [This Article](#) on their Web site about method to "trap light." Since they call it a break-through to making an optical system it implies that light can be stored in a type of memory. I hope that this implies light-using logical gates.*" While this sounds like one more Holy Grail Found! announcement, the work that professors [Ozin](#) and [John](#) (mentioned in article) have done makes it sound like they're no slouches in the photonics or nanotech departments.



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- 5/30
- [apache](#)
- 5/31 (10)
- [askslashdot](#)
- 1/27
- [awards](#)
- 5/30
- [books](#)
- 5/26
- [bsd](#)
- 5/31
- [features](#)
- 5/31
- [interviews](#)
- 5/30
- [radio](#)
- 5/30
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Optical Microchip? (Score:1)

by [Stskeeps](#) (stskeeps@spam.tspre.org) on Saturday May 27, @06:45AM EDT ([#2](#)) ([User Info](#))

This is actually quite a revolution - try imagine CPUs running on the speed of light? gives a couple of ideas about the Future -Sts

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- [Re:Optical Microchip?](#) by Nanaki_Seto (Score:1) Saturday May 27, @08:36AM EDT
- [2 replies](#) beneath your current threshold.

Now that we have the what,what about the how? (Score:3, Funny)

by [Glowing Fish](#) ([mnoelharris@\(onmaps\)uswest.net](mailto:mnoelharris@(onmaps)uswest.net)) on Saturday May 27, @06:48AM EDT ([#5](#)) ([User Info](#)) <http://www.users.uswest.net/~mnoelharris>

This article was pretty sparse on technical details...all it said that there was some kind of silicon material coating microscopic bubbles in opals. So is the way that they store a piece of information by trapping the little photons in the bubbles, where they bounce around a

few hundred trillion times, until they are allowed to go free?

I feel sorry for those poor photons, trapped in their little opal bubble cages.

On the other hand, if they ever built a server out of these...we could /. it. We haven't slashdotted a precious stone yet.

Enh

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- [Re:Now that we have the what,what about the how?](#) by Tei'ehm Teuw (Score:1) Saturday May 27, @08:36AM EDT
 - [Re:Now that we have the what,what about the how?](#) by Not Your Average PHB (Score:1) Saturday May 27, @08:41AM EDT
 - [Don't you see](#) by the_other_one (Score:2) Saturday May 27, @10:05AM EDT
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- [Opal definition](#) by b_pretender (Score:2) Saturday May 27, @10:26AM EDT
 - [Silicon IS a precious stone](#) by sparkmanC (Score:1) Saturday May 27, @03:12PM EDT
 - [I stand corrected...](#) by b_pretender (Score:1) Saturday May 27, @03:45PM EDT
- [Here's the scoop: I worked with Ozin](#) by Anonymous Coward (Score:2) Saturday May 27, @11:17AM EDT
 - [1 reply beneath your current threshold.](#)

but everybody knows... (Score:1, Funny)

by sam.powell on Saturday May 27, @06:56AM EDT ([#7](#))

([User Info](#)) <http://come.to/thepicarchive>

But everyone knows the best way to transmit data is through bio-neural gel packs, cus they organise data so well. *And as for processing it?* well, duh! no trapping photons, you simply put a big Itanium bugger inside a low-level subspace field... allowing the electrons to move faster. Some people, eh?

--

you have to laugh when you give advice like this: 'its frozen? try and ignore it... forcibly closing IE can take down the OS'

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Why is optical even that great? (Score:1)

by Ibag on Saturday May 27, @07:00AM EDT ([#9](#))

([User Info](#))

Photons travel at the speed of light. Electrons travel at the speed of light. The speed of a system should not depend on which of these are used. Is there something I am missing? Are there intricacies to the matter which make opticle better? Would one method produce less heat than the other? Or is it all hype because its just something new that people can have optimism about? If children can ask, then so can I: Why?

Ibag

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Re:Why is optical even that great? (Score:4, Insightful)

by [Glowing Fish](#) (mnoelharris@(onmaps)uswest.net) on Saturday May 27, @07:07AM EDT (#14)

(User Info) <http://www.users.uswest.net/~mnoelharris>

Electrons don't travel at the speed of light, they have mass and therefore they travel slightly slower than the speed of light. In practice, an electron is 10-30% as fast as an electron.

Also, since photons do not possess charge, they can not be interfered with by any kind of static electricity, magnetic fields, etc. Their signal stays truer.

Enh

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- [Re:Why is optical even that great?](#) by MrShiny (Score:1) Saturday May 27, @07:22AM EDT
- [Re:Why is optical even that great?](#) by Nanaki_Seto (Score:2) Saturday May 27, @08:49AM EDT
- [Re:Why is optical even that great?](#) by Dust Puppy (Score:3) Saturday May 27, @08:50AM EDT
- [Re:Why is optical even that great?](#) by Asic Eng (Score:1) Saturday May 27, @10:58PM EDT
- [Re:Why is optical even that great?](#) by Doctor K (Score:1) Sunday May 28, @12:38AM EDT
- [Electron mass doesn't matter](#) by p3d0 (Score:1) Sunday May 28, @02:28AM EDT
- [2 replies](#) beneath your current threshold.
- [Re:Why is optical even that great?](#) by patrick_jones (Score:1) Saturday May 27, @07:07AM EDT
- [Re:Why is optical even that great?](#) by sam.powell (Score:1) Saturday May 27, @07:10AM EDT
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- [Re:Why is optical even that great?](#) by Mr_Dyqik (Score:2) Saturday May 27, @07:17AM EDT
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- [Re:Why is optical even that great?](#) by puppet10 (Score:2) Saturday May 27, @08:38AM EDT
 - [Re:Why is optical even that great?](#) by Nanaki_Seto (Score:1) Saturday May 27, @08:43AM EDT
 - [Re:Why is optical even that great?](#) by puppet10 (Score:2) Saturday May 27, @09:15AM EDT
- [Re:Why is optical even that great?](#) by Ian-K (Score:3) Saturday May 27, @09:02AM EDT
- [Re:Why is optical even that great?](#) by GreatUnknown (Score:1) Saturday May 27, @10:16AM EDT
 - [Re:Why is optical even that great?](#) by Vagatech (Score:1) Saturday May 27, @12:09PM EDT
- [Re:Why is optical even that great?](#) by LAN-Mind (Score:1) Saturday May 27, @11:25AM EDT
- [2 replies](#) beneath your current threshold.

Yay nature. (Score:1)

by [Morbid Curiosity](#) (dibrom @inet.net.nz) on Saturday May 27, @07:06AM EDT (#13)
(User Info)

Interesting to see another possible technique to exploit a natural physical structure for our processing needs. It'll be interesting to see if there are any other mineral deposits out there that will contribute to our computers in the future -- anyone have a favourite mineral they'd like to bet on?

If this technique does become feasible for processing, does anyone have any idea what theoretical limits there might be to speed of processing? First generation devices are probably likely to be little better (if any) than existing silicon-based ones, but then silicon is quite mature tech, nowadays.

--- [My EMail address is not a halogen - reversal required.]

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- [Re: Yay nature.](#) by Glytch (Score:1) Monday May 29, @10:49AM EDT

Where do we go from here? (Score:1)

by Tei'ehm Teuw on Saturday May 27, @08:29AM EDT ([#29](#))

([User Info](#))

A spokesman for the institute said John, Ozin and a student of Ozin, Emmanuel Chomski, hold the intellectual property rights to the development.

"Clearly, every major corporation in the world is looking at this," Ozin said. "The question is, where do we go from here?"

GPL.

.

Take all good things in moderation, including moderation.

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Wishful thinking (Score:5, Interesting)

by KIngo on Saturday May 27, @08:54AM EDT ([#40](#))

([User Info](#))

Material research has a strong component of wishful thinking and future projections. So many things don't work out because of a few insurmountable details. You need strong sources of motivation to pursue the dire road to success.

In their reasoning and justification of their work, these guys live at least 10 years into the future all the time. The referenced article was probably written by someone who took all their statements at face value. It looks to me as if they still have a long way to go. That's not meant to diminish their merits - these scientists are certainly top notch researchers and their results are truly very impressive. I just don't think they have delivered an *imminent disruptive technology*.

It's commonly accepted that the existence of a laboratory setup does not guarantee the technological and economical viability of any particular solution in the real world. I would start preparing for an *imminent disruptive technology* if a successful prototype system did exist. Yet, I don't have the feeling that there are even useful laboratory setups of the presented kinds of photonic devices. It rather looks like *promising basic research*.

As for the *all photonics* claim, I think the notion should be scaled down a little to be less

prone to misunderstanding. To many people, it sounds like *all photons, no electrons*. I don't believe there is such a thing within our technological reach. Photons are bosons and interact *extremely* weakly. That's not a very good basis for a computing device. Fortunately, photons can be converted into excited states of *electrons* which are fermions, interact in many ways, and can be used to produce logic gates.

That leaves us with a possible extension of the present use of photonic devices from lines of communication between nodes on a network to nano-lines of communication between old-fashioned electronic gates. And that's certainly not going to happen very soon. So, sorry my friends, no reason to get all excited.

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- [Re:Wishful thinking](#) by Code Archeologist (Score:1) Saturday May 27, @10:19AM EDT
 - [Re:Wishful thinking](#) by grunkhead (Score:1) Monday May 29, @11:39AM EDT
- [Re:Wishful thinking](#) by grunkhead (Score:1) Monday May 29, @11:32AM EDT
- [1 reply beneath your current threshold.](#)

Breaking the bonds of ignorance (Score:3, Informative)
by Nanaki_Seto on Saturday May 27, @08:59AM EDT ([#41](#))
([User Info](#))

A quick physics lesson. Many people here seem to think it's the speed of the the particle that is important: it isn't it's the ability to change the frequency and amplitude in a given ammount of time. These changes are what carry data.

electron drift: in average high conducting wire and given a good sized (120v) voltage, this speed is roughly 1m/10min. Not exactly something to transfer data with eh?

EM pulse speed in a wire: $2.997 * 10^8$ m/s > EMPS > $2.997 * 10^7$ m/s. The frequency can be changed quite easily and quickly

Photon speed: Depends on the medum, but $2.997*10^8$ >= PS > $2.997 * 10^7$ m/s (note this low is an estimate, it might go down to 10^6 , but definetly not lower. The frequency of group of photons can change much easier and quicker than that of a EMPS caused by a series of electrons lollygagging in a wire.

This oscillation is what gives them the data transfer speed. This isn't quantum physics, it is taught in the second course of intro physics (not conceptual, but actual) in colleg. Also known as the first E&M course

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We need a review by one of their peers (Score:4, Informative)
by ckedge on Saturday May 27, @09:39AM EDT ([#47](#))
([User Info](#))

Oooh, I'm impressed. Slashdot already has links to the homepages of the two main subjects of the story of interest. Within which details of what is likely being talked of in the Toronto Star article can be found. I wish I had noticed that before I did all that searching.

Anyways, you'll notice that the publications start back in the early 90's. The 'new' thing

they've discovered together might be what is talked about [here](#), and is more clearly described [here](#) and [here](#) (Sajeev John's page contained links to this stuff...).

It's just a new way of making something that's been researched for the [past 10 years](#), [photonic band gap materials](#).

I haven't seen anything yet to tell us if this is such a better way of making this class of material that it counts as a 'revolution'. We have to find someone who knows a lot more about the current state of the art in creating photonic band gap materials and get this person to analyze this new method and it's results, to tell us if it's a significant advance, or what it's advantages are.

AKA: More peer review please.

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- [Re:We need a review by one of their peers](#) by greendog (Score:2) Saturday May 27, @12:42PM EDT

Not speed, but space. (Score:3, Interesting)
by Spankophile on Saturday May 27, @09:40AM EDT ([#48](#))
([User Info](#)) <http://www.livingslim.com>

I was always under the impression that the big advantage light would have over electricity would be in the size of the circuits.

With current chip technology, people have estimated all sorts of physical limits to how small we can make chips because of interference and such. Two wires (or etched copper or whatever) have to be physically seperated - but you can have two beams of light cross at a point and it wouldn't affect either "wire." In fact, it would seem that you could have two photon channels in completely oposity directions, but sharing the same space, and it would still be alright.

The advantage would come from being able to make insanely small chips, or chips the size we have now with a LOT more stuff on 'em.

--Me

I have a sig, and this statement is false.

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- [Re:Not speed, but space.](#) by Doctor K (Score:1) Saturday May 27, @11:00PM EDT
- [Re:Not speed, but space.](#) by foghorn19 (Score:1) Sunday May 28, @09:08AM EDT

..but. (Score:1)
by [SETY](#) ([k81s|REMOVE-THIS|@unb.edu](#)) on Saturday May 27, @10:22AM EDT ([#57](#))
([User Info](#))

No one get too horny, there is still lots of work to do. Yes it hot, but....

Thats just my opionon after hearing a talk by the student mentioned in the article. That was a couple of months ago, so maybe somethings changed.....

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Photon Localization and Photon Band Gaps (Score:1)by belrick on Saturday May 27, @11:09AM EDT ([#59](#))[\(User Info\)](#) <http://members.home.net/belrick/>

Try [Sajeev's homepage](#) and read about Photon Localization and Photon Band Gaps. He invented the theory that in certain disordered systems band gaps can exist for light, meaning that it does not propagate and is trapped/localized.

Prof. John was on my thesis committee but my work was on other stuff.

[[Reply to This](#) | [Parent](#)]**Photonics..** (Score:3, Interesting)by physics-boy on Saturday May 27, @11:13AM EDT ([#61](#))[\(User Info\)](#)

I'm dissappointed with the lack of technical detail in the article. I'm still trying to figure out what is so novel about this. There has been an awful lot of work done for years now on trapping and guiding light. The big issue is efficiency.

The most promising technology I have seen for photonic computing is guiding along defects of a photonic band-gap in a photonic crystal.

This is

lossless guiding!!! Thats right, no photons can escape! This research is lead by Joannopoulos at MIT <http://ab-initio.mit.edu/photons>

Pretty

interesting possibilities since a photonic crystal restricts photons of a given wavelength range from propagating throught the material. A defect in the 'crystal' allows the forbidden light to be guided along the defect without leaking into the bulk. Light can even be guided around right angles without loss.

So we have the pipes, now we need the light equivalent of transisters. But thats coming.

Jeremy

[[Reply to This](#) | [Parent](#)]**'Light of Other Days' / slow glass** (Score:2, Interesting)by [Szplug](#) (jdonner0@SeeMySig.net) on Saturday May 27, @11:16AM EDT ([#63](#))[\(User Info\)](#)

There's a Sci - Fi story about a similar thing, glass with such complicated transitions that it takes years for light to pass from one side of a pane to the other. So people leave it near beaches, forests, mountains for years, then sell it to city dwellers. Good story.

-- earthlink

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- [Re:'Light of Other Days' / slow glass](#) by quietlysubversive (Score:1) Saturday May 27, @12:54PM EDT
 - [Re:'Light of Other Days' / slow glass](#) by bugg (Score:1) Saturday May 27, @01:17PM EDT
 - [...by Bob Shaw \(nt\)](#) by Szplug (Score:1) Saturday May 27, @05:32PM EDT

Heat, electron speed, etc (Score:3, Informative)

by bauble on Saturday May 27, @11:27AM EDT (#66)

[\(User Info\)](#)

I just wanted to address a couple of issues that seem to come up repeatedly (and sometimes incorrectly).

Heat: It's not obvious that optical computers would not have the heating problems the electron-based ones have. Sure, it wouldn't be based on the same mechanism (resistance), but you still have the problem of absorption. The same process by which the sun heats up your car in the afternoon would be a problem here.

Any time you shine light through something, some of it is transmitted, some is scattered and some is absorbed. The last two will cause signal losses and absorption will cause heating.

Heating may not be the biggest hurdle, but it will still be an issue.

Electron vs Photon speed: As a number of people have pointed out, wires do not carry signal at the speed of the electrons. A good (medium level) analogy to understand this is marbles in a plastic tube.

Let's say I have 100ft of plastic tubing full of marbles. We decide that every second, I'm gonna push a marble in my end (1) or I'm not (0). That's a 1bps data rate. Now, the speed at which the *data* travels is 100ft divided by the time between when I push on a marble and when one falls out the other end. Obviously, that's gonna be pretty fast.

The point is that the *bit* gets from one end of the tube very quickly even though any given *marble will take a long time to get from one end to the other. Similarly, the electrons can carry information faster than they actually move.*

(Disclaimer: This analogy is correct only in the sense of this last paragraph. I am not claiming otherwise)

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Article with more details. (Score:2)

by Christopher Thomas on Saturday May 27, @01:15PM EDT (#71)

[\(User Info\)](#)

Here is an article with more details on the work being done:

<http://newsbytes.com/pubNews/00/149716.html>

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What's Really Going On Here? (Score:1)by [lahosken](#) (hey@lahosken.spam-francisco.ca.us) on Saturday May 27, @01:25PM EDT (#74)[\(User Info\)](#) <http://www.lahosken.san-francisco.ca.us/>

When those scientific types want to impress me with the gravitational scariness of a Black Hole, they always stress that not even light can escape.

How do we know that these so-called "Photonic" scientists aren't actually creating black holes with the intention of destroying the world? Has anyone checked to make sure that

they aren't under alien mind-control?

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more details (Score:5, Informative)

by [cjmilne](#) (cmilne@NOSPAM.lphys.chem.utoronto.ca) on Saturday May 27, @02:15PM EDT (#75)

([User Info](#)) <http://lphys.chem.utoronto.ca>

So the Star's article is completely devoid of details - it's a newspaper ! I'll add a few more details so people can get as much information about this topic as they want. First and foremost the latest issue of [Nature](#) has an article entitled "Photonics: Opal appeal" specifically about this breakthrough (subscription required). The catch phrase used is a "three-dimensional photonic bandgap material". The team that's accomplished this is a bit more international then indicated so far, consisting of a [Spanish team](#) making the opal template, [Geoff Ozin's](#) group filling the lattices & then dissolving the template, [Henry VanDriel's](#) group performing the laser experiments, and [Sajeev John's group](#) providing the theory framework.

For those of you who just want pretty pictures, [here](#) are some images of the opals.

Here's the [ultimate resource](#) for photonic bandgap materials.

So that should give you more then enough to visit & read. Basically what these materials do is prevent propagation of light of a specific frequency in 3-dimensions. The 'bandgap' of the light can be controlled during the fabrication process allowing these things to block different frequencies. So you could imagine placing one of these materials into an optical fibre & selectively blocking one of the data streams but allowing all others to pass through unimpeded. The current breakthrough is twofold, first these aren't imaginary, they've been made & tested and they aren't decades removed from insertion into optical networks, they're months or years from it, second, this is the first example of a 3D PBG material, previous versions have generally been 2D. One of the neater experiments performed involved putting liquid crystals into the opal holes & then by putting an electric field across the liquid crystals, controlling the transmission through the crystal. A variable transmission photonic bandgap device. Light is fast, electrons are slow, an all optical network would be blazingly fast & these devices bring us a step closer to making that happen.

CJM

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implies that light can be stored (Score:1)

by SRuyle on Saturday May 27, @02:22PM EDT (#76)

([User Info](#))

This is a relatively simple thing to do. Take your ronco flashlight out in the front yard, point it up at the sky, and in morse code, tap out "hello world". Write down the time you did it. Your message is now "stored" in a physical medium. All you need to do to retrieve it, is to calculate how far its traveled, and go stand in front of it to read it. Same principle applies if using a fiber loop instead of pointing it straight up. Yes, you will need to refresh the signal now and then. ok. means for doing so has been in steady use for 40 years. Steve Ruyle

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I have only one question: (Score:2, Funny)
 by netrat on Saturday May 27, @08:37PM EDT (#81)
[\(User Info\)](#) <http://www.freespeechfunhouse.com>

How will this affect my toilet?

I know what you're thinking, but this is NOT a troll, it is a legitamit question, and I don't think that people quite realize how much of a breakthrough mirochip-toilet technology can be.

Just imagine the possibilities:

You'll have to use your hands to flush ever again! The whole defecation process will be completely automated. All you'll have to do is sit and squeeze, your toilet will do the rest for you.

Imagine a toilet that talks to you AS your feces drop into it. Well with recent AI and microchip advances (such as this one) you can!

Toilet: Looks like your having some trouble there, bob, would you like some jet-streams?

Bob: THANKS! TOILET! That would be great!!!

Another implementation of smart-toilet technology would be a medical one. Your toilet would examen your stool for toxins and other abnormalities, and catch potentially diseases before it's too late!

And lastly you'll never have to stop playing Quake when nature calls , EVER AGAIN! Because your smart-toilet will have a built in keyboard and monitor, you can finnally play quake AND defecate AT THE SAME TIME!!

Isn't technology wonderful?

"i'd rather stay a child, and keep my self-respect, if being an adult means being like you!"
 -Jello Biafra

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UW and USC developed this two months ago? (Score:1)
 by Zoyd on Saturday May 27, @09:49PM EDT (#82)
[\(User Info\)](#)

United Press International, April 7, 2000 p1008097u1944
 Optical microchips promise speedy communications.
 Full Text: COPYRIGHT 2000 United Press International

WASHINGTON, April 6 (UPI)

Scientists at the University of Washington and University of Southern California have developed an experimental optical microchip that can run up to 10 times faster than the speediest electronic devices today.

They say the higher speed and capacity of the new devices could potentially revolutionize telecommunications, data processing, sensing and display technologies. An article on the device appears in the April 7 issue of Science.

The devices, called polymeric electro-optic modulators or "opto-chips," translate electrical signals such as those used by televisions, computers, telephones and radar, into optical or light signals at rates up to 100 billion bytes per second, or 100 gigabytes.

Although the devices are microscopic in size, they can achieve information-processing speeds up to 10 times faster than current electronic devices, and have a greater bandwidth to transmit more information more quickly. The devices also require a fraction of a volt of electricity to operate, or less than one-sixth the electricity needed by today's electro-optic crystals.

The new modulators bridge the current world of electronics and the coming world of much faster, optical devices by translating electrical signals from a computer or other electronic device into optical signals for speedier information transmission. At the receiving end of the transmission, another modulator will turn the optical signal into an electrical signal for use by a computer or other electronic device.

"Optoelectronics will be the technology of the 21st century, just like electronics was the technology of the 20th century," Larry Dalton, a professor of chemistry at both the University of Washington and the University of Southern California, and co-author of the Science paper, told United Press International.

Dalton added that he doesn't expect optical-only devices to be in wide use any time soon. But there will be a move to hybrid optical and electronic, or optoelectronic, devices that will prevail for a long time. The new modulator, he said, can be used with today's electronic devices, so it is not necessary to spend a lot of time reengineering them.

Dalton said the real breakthrough was in creating a new material that doesn't impede the speed of light transmissions at the frequencies required for high-speed communications. Dalton and his colleagues changed the shape of organic molecules called chromophores to decrease electrical field noise. The chromophores were embedded into a polymer matrix to form the modulator.

Other researchers have previously tried to exploit the speed chromophores allow, but they ran into problems controlling the interactions between the electrical fields of the chromophores that sapped their efficiency. Dalton said he changed the shape of the chromophores from elliptical to cylindrical so there was less interference.

"This is the highest speed demonstrated today," said Ray Chen, a research scientist at the University of Texas at Austin's Microelectronics Research Center. Chen expects the technology to find its way into military, security and business applications within five years.

He added, "In this millennium, from 2000 to 2020, the engine driving the economy will be optical technology. Dalton's work provides a good vehicle to approach fast optical speeds."

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Re:Overclocking Joy (Score:1)

by Mr Koffee on Saturday May 27, @06:50AM EDT ([#6](#))

([User Info](#))

Well...

Something went wrong.

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Re:Oh, I almost missed the joke on this one (Score:1)

by [Katravax](#) (tking at mmcable dot com) on Saturday May 27, @07:40AM EDT ([#23](#))

([User Info](#))

Good-natured ribbing, that's all. I'm in the USA, and our neighbors to the North get almost no credit for some of the Insanely Great things created or produced there. So, I was just teasing... and wondering how long after this thing becomes a production-line reality that everyone would just assume it was a product of the USA...

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Amen (Score:1)

by [NRAdude](#) (devnull@slashdot.org) on Sunday May 28, @02:04AM EDT ([#87](#))

([User Info](#))

There is no better way to end a prayer... in Jesus' name, Amen. I have no fear but fear for God. That is why there is still hope to return to a better country, united by good people. The moderators of slashdot.org are kinda strange. I have seen pornographic posts receive "score: 3 funny" when they should've been "score -1: offtopic" I get bad moderation simply because I have they keyword "NRA" in my userID. I have put together a theory that the people with moderation privileges on slashdot.org are not good people.

--Want to know what a seagull tastes like? It is somewhere between Bald Eagle and White Rhinoceros.

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Even if you're on the right track, you'll get run over if you just sit there. -- Will Rogers

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