



www.WorldVision.org

Tens of thousands need your help!  
**Help earthquake survivor  
 in South Asia.** [donate now!](#)

« NAVIGATION »

**NEWS**

- Bio/Medicine
- Chemicals
- Defense
- Drug Delivery
- Education
- Electronics
- Energy
- Events
- Grants
- Industry
- Investment
- Litigation
- Materials
- MEMS
- Nanotubes
- Optics
- Partnership
- Patent
- Products
- Quantum dots
- Research
- Smart Dust
- Software
- Space
- Whitepaper

**BOOKS**

**COMPANIES**

**EVENTS**

- Browse by Month
- Current Shows
- Previous Shows
- Submit Events

**FEEDBACK**

**ADVERTISE**

**LINK TO US**

[XML](#) [RSS](#)

« PARTNERS »

Become A Nanotechwire  
Partner



Nano Science and Technology  
Institute



National Nanotechnology  
Initiative



Nanotechnology at Zyvex

« NEWSLETTER »

your email here

[SUBSCRIBE](#)

9/27/2004 10:05:52 PM

## Harvard Scientists Find Nanowires Capable Of Detecting Individual Viruses

Harvard University scientists have found that ultra-thin silicon wires can be used to electrically detect the presence of single viruses, in real time, with near-perfect selectivity. These nanowire detectors can also differentiate among viruses with great precision, suggesting that the technique could be scaled up to create miniature arrays easily capable of sensing thousands of different viruses.

The work was reported in the most recent issue of the Proceedings of the National Academy of Sciences.

"Viruses are among the most important causes of human disease and are of increasing concern as possible agents of biowarfare and bioterrorism," says author Charles M. Lieber, Mark Hyman Jr. Professor of Chemistry in Harvard's Faculty of Arts and Sciences. "Our work shows that nanoscale silicon wires can be configured as ultra-sensitive detectors that turn on or off in the presence of a single virus. The capabilities of nanowire detectors, which could be fashioned into arrays capable of detecting literally thousands of different viruses, could usher in a new era for diagnostics, biosafety, and response to viral outbreaks."

Lieber and his colleagues merged nanowires conducting a small current with antibody receptors for certain key domains of viruses -- such as agglutinin in the influenza A virus. When an individual virus came into contact with a receptor, it sparked a momentary, telltale change in conductance that gave a clear indication of the virus's presence. Simultaneous electrical and optical measurements using fluorescently labeled influenza A confirmed that these conductance changes corresponded to binding and unbinding of single viruses from nanowire devices.

In addition to influenza A, the Lieber group tested nanowire arrays outfitted with receptors specific to paramyxovirus and adenovirus. The researchers found the detectors could differentiate among the three viruses both because of the specific receptors used to snag them and because each virus binds to its receptor for a characteristic length of time before dislodging -- leaving only a minuscule risk of a false positive reading.

"The fact that a nanowire array can detect a single virus means that this technology is the ultimate in sensitivity," Lieber says. "Our results also show that these devices are able to distinguish among viruses with nearly perfect selectivity."

While there are many ways for researchers to assay viruses, most are laborious and appropriate only in laboratory settings. The use of nanowires provides immediate verification of a given virus's presence without any specialized biochemical manipulation.

Lieber says nanowire arrays could be scaled up not only to detect many

« GET LISTED »

- [submit company](#)
- [submit news](#)
- [submit events](#)
- [advertise here](#)

« EVENTS »

**13th Foresight  
Conference on  
Advanced  
Nanotechnology**  
 Advancing Beneficial  
Nanotechnology:  
Focusing on the  
Cutting Edge

**The Sixth Dartmouth**

« SEARCH »

SEARCH

different viruses, but also to detect common strains as well as variants genetically engineered by would-be bioterrorists. By making an array sensitive to numerous domains of a given virus, the chances of even a modified virus escaping detection would be very low.

In a clinical setting, the extreme sensitivity of nanowire arrays means they could detect viral infection at very early stages, when the immune system is still able to suppress virus populations. It's at this stage of viral activity that symptoms often begin to appear, but with viruses still present in limited numbers, they can be difficult to detect and treat.

The nanowire arrays detect viruses suspended in fluids, whether bodily or otherwise. Lieber says that any anti-bioterror device built around nanowires' virus-detecting capabilities would most likely marry the technology with a microfluidic apparatus that would draw in air, suspend any airborne particles in a liquid, and then run this solution past the nanowire array.

Lieber's co-authors are Fernando Patolsky, Gengfeng Zheng, Oliver Hayden, Melike Lakadamyali, and Xiaowei Zhuang, all of Harvard's departments of chemistry and chemical biology, physics, and Division of Engineering and Applied Sciences. The work was supported by the Defense Advanced Research Projects Agency, National Cancer Institute, Ellison Medical Foundation, Office of Naval Research, and Searle Scholar Program.

#### Other Headlines from [Harvard University](#) ...

- [Harvard Scientists Find Nanowires Capable Of Detecting Individual Viruses](#)
- [Harvard Scientists Create High-speed Integrated Nanowire Circuits](#)
- [Nanowires can detect molecular signs of cancer, Harvard scientists find](#)

#### More [Bio/Medicine](#) Headlines ...

- [Arrowhead Accelerates Capital Contribution to Insert Therapeutics as Nanotechnology Cancer Drug Heads toward Human Clinical Trials](#)
- [National Cancer Institute Announces Major Commitment to Nanotechnology for Cancer Research](#)
- [Nanowires can detect molecular signs of cancer, Harvard scientists find](#)
- [Stealth Nano Particles to Target Tumors](#)
- [Novel "lipoplex" nanoparticle will get first human test treating advanced solid cancer](#)

#### Featured Deal



Shop For  
PDAs

#### Palm Zire 72 Special Edition Handheld Products

Palm OS OS, 32 MB Installed memory, 16-bit (64k colors), Transflective Color TFT, 320 x 320 Resolution, MP3 Player, Built-in Digi...



\$249.99

[Buy it at TigerDirect.com](#)



\$249.99

[Buy it at Gateway](#)



\$237.49

[Buy it at Amazon](#)



\$179.99

[Buy it at Overstock.com](#)



\$216.00

[Buy it at BuyDig.com](#)

19 Store Offers from \$180-\$399

FEEDBACK

#### Nanomaterials Symposium

One-day symposium at Dartmouth on nanomaterials consisting of six internationally-recognized invited speakers.

#### International Congress of Nanotechnology (ICNT) 2005

ICNT is the premier international conference, which covers a comprehensive spectrum of the emerging field of Nanotechnology

#### Nanoscience & Nanotechnology

Nanotechnology is an enabling technology, with high potential impact on virtually all fields of mankind activity (industrial, health-related, biomedical, environmental, economy, politics, etc.), yielding high expectations for a solution to the main needs of society, although having to address open issues with respect to its sustainability and compatibility.

#### - More Events