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Materials Research News

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Research News and Features (External Sources) [\[Archives\]](#)

Nanotemplates: Large reusable nanotemplates created
([Science - Editor's Choice](#))
The formation of transferable and reusable TiO₂ "nanobowl" templates is reported. The nanotemplate films could be used to create a regular array of 100-nm gold dots, spaced 500 nm apart.
[*Nano. Lett.*, 10.1021/nl051389x (2005)]
(9.16.2005)

Drug Delivery: Microcapsules self-rupture without external triggers
([Nature Materials Update](#))
Currently, microcapsules used for drug delivery typically rupture in response to an external trigger. New Microcapsules have been developed that burst without external stimuli in response to the pressure that builds up inside.
[*De Geest B. G. et al. Adv. Mater.* (Published online 16 August 2005)]
(9.15.2005)

Drug Delivery: Targeted drug delivery using microbubbles and ultrasound
([NIBIB, NIH](#))
A new technique that uses ultrasound and drug-laden "microbubbles" to deliver concentrated chemotherapy drugs to the inner lining of blood vessels is being developed. Ultrasound has been used to guide tiny gas bubbles filled with

Research News (MRS Staff/Reporters) [\[Archives\]](#)

Nanocrystals: Ag₂Se Nanocrystals Grown with Well-Defined Shapes
[*Reported by Sarbajit Banerjee*]
(8.19.05)

Nanorods: Synthesis Process of CdS Nanorods Produces Dominant Cubic Phase
[*Reported by Fengting Xu*]
(8.19.05)

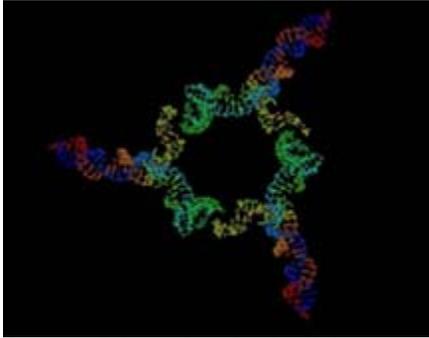
Research News from the MRS Bulletin (August 2005 Issue)

Nanoporous silica improves reflectivity of dielectric mirror; 3D defect structures in Opal-photonic crystals; Si nanowires for coherent single-charge transport; Protein-mineral interface structure in bone; PRINTing of shape-specific nanobiomaterials; UV + titania photocatalyst kills bacteria in flowing air; All-solid-state laser yields orange, yellow and green light; Cross-linked nanostructures from block copolymers; Single-molecule spectroscopy of organic dye nanoparticles; Optical limiting in aqueous suspensions of CNTs; Catalytic asymmetric procedure enables synthesis of pheromones

Research News from the MRS Bulletin (July 2005 Issue)

Direct surface patterning by solid-state electrochemical micromachining; Hydrophobicity

fluorescent dye to a particular site, and then bursts of ultrasound can fragment the bubbles and spray their contents onto diseased tissue. (9.15.05)



Courtesy Peixuan Guo, Purdue Univ.

Drug Delivery: RNA nanotechnology used to treat cancer

(Purdue University)

Researchers have used RNA nanoparticles, assembled from three short pieces of ribonucleic acid, to carry anticancer therapeutic agents directly to infected cells. The nanoparticles have been tested successfully against cancer growth in mice and lab-grown human cells. (9.14.2005)

Nanostructures: ZnO nanohelix structure developed

(Eurekalert)

A zinc oxide nanostructure that resembles the helical configuration of DNA has been produced. Based on a superlattice composed of alternating single-crystal "stripes", the nanohelices get their shape from twisting forces created by a small mismatch between the stripes.

[Gao et al., *Science*, Vol 309, Issue 5741, 1700-1704, 9 September 2005]

(9.12.2005)

Magnetic Liquid: Novel material may demonstrate 'liquid' magnetic state

(Eurekalert)

A novel material, nickel gallium sulfide (NiGa₂S₄), that may demonstrate a highly unusual "liquid" magnetic state at extremely low temperatures has been discovered. A "liquid" magnetic state occurs when magnetic spins fluctuate in a disorderedly, fluid-like arrangement that does not produce an overall magnetic force. (9.12.2005)

Quantum Dots: Rapid one-pot syntheses developed for quantum dots

(State University of New York at Buffalo)

Efficient and highly scalable new chemical synthesis methods have been developed for the

of lotus leaves; Zeolite-coated optical fibers as chemical vapor sensors; Highly ordered isoporous membranes; Ice as resist for patterning nanostructures; CNT arrays in freely suspended flexible films; CNTs for multi-beam X-ray source

Research News from the MRS Bulletin

(June 2005 Issue)

Organic photodiodes deposited on newspaper; Al-based tunnel junctions form solid-state refrigerator; Gold nanoshells used for molecular imaging in live cells; Hybrid photoelectrodes for solar water splitting; Distribution of nanoparticles in photopolymer controlled holographically; Sequential synthesis of colloidal type-II core/shell CdTe/CdSe semiconductor nanocrystals; Visualization of broadband surface plasmons; Raman techniques for single-molecule detection of biomolecules; Cell membranes integrated into CNT devices

Nanotubes: Transition Metal-decorated Carbon Nanotubes Could be a High-Capacity Hydrogen Storage Medium

[Reported by Kinson Kam]

(5.26.05)

Research News from the MRS Bulletin

(May 2005 Issue)

Lasing activity of rare-earth-doped bromide materials; Biochemical synthesis of protein-based thermoplastic elastomers; Si₃N₄ nanobelts grown by pyrolysis of polyureasilazane with iron catalyst; Doped PMMA used for 3D multilayered optical memory; Nanopipettes and nanoparticles enable detection of single DNA molecules; Novel hexaferrites show potential for microwave applications; Glass penetration used to repair cracks in alumina

Research News from the MRS Bulletin

(April 2005 Issue)

Magnetic field strengthens NiAl-Cr(Mo)-Hf alloy; Synthesis of supramolecular isomers; Metalorganic gel for porous organic polymer template; Tungsten nanoparticles in silica enhance nonvolatile memory; Transparent, highly oriented hydroxyapatite; Highly ductile bulk metallic glass foam

Perovskite Ceramics: A Single-Step Calcination Process To Fabricate Dielectric Perovskite Ceramics Subdivided in Steps Successfully Describes the Reaction Mechanism

[Reported by Siari Sosa]

(3.7.05)

production of quantum dots. one method enables the preparation of robust, water-dispersible quantum dots for bioimaging, while the other one allows for the preparation of organically soluble quantum dots ready to be sequestered into a polymer host.
(9.12.2005)

Nanotubes: Nanotube-based torsion pendulum demonstrated
([Nature Materials Update](#))

A torsion pendulum, in which an object attached to a rod swings back and forth by the twisting of the rod, has been constructed from a single carbon nanotube. A 500 nm metal block was attached to the midpoint of a single-walled carbon nanotube (SWNT), acting as a torsion spring.

[[Science](#) **309**, 1539–1541 (2005)]
(9.9.2005)

Nanotubes: Birth of a nanotube
([Nature Materials Update](#))

New molecular dynamics simulations show exactly how nanotube structures 'self-assemble' from individual carbon atoms on metallic nanoparticle catalysts.

[[Phys. Rev. Lett.](#) **95**, 096103 (2005)]
(9.9.2005)

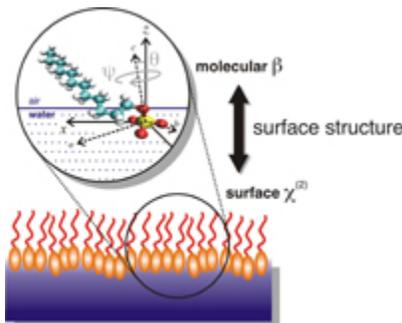


Courtesy Mirjam E. Leunissen/Nature

Colloids: Ionic colloidal crystals of oppositely charged particles formed
([PhysicsWeb](#))

Artificial crystals made of colloidal particles have been created that could be used to explore the behaviour of ordinary ionic crystals. The team discovered a number of new crystal structures with the system.

[[Mirjam E. Leunissen et al.](#), *Nature*, **437** 235 (2005)]
(9.8.05)



Courtesy Dennis Hore, University of Oregon

Surfactants: General approach developed for determining molecular orientation at isotropic

Quantum Dots: InAs/GaAs Quantum-Dot Low-Loss Saturable Absorbers for Diode-Pumped Passively Q-Switched Nd-Doped 1.3- μm Lasers
[*Reported by Tao Xu*]
(3.7.05)

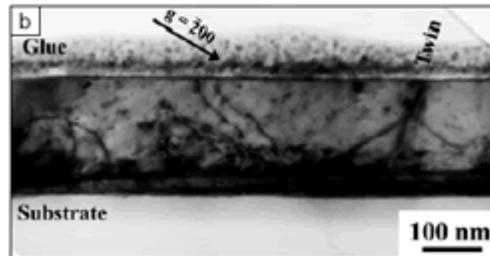
Research News from the MRS Bulletin
(March 2005 Issue)

Fluorescent silica particles approach brightness of quantum dots; Microbatteries assembled from single-particle anodes and cathodes; Damage to DNA by quantum dots; Gamma irradiation enables template-free synthesis of polyaniline nanofibers; Room-temperature nanoimprinting enables fabrication of 1-D laser; Far-field Raman scattering reveals surface plasmons of gold nanoparticle arrays

Research News from the MRS Bulletin
(February 2005 Issue)

Optical limiting displayed by polymer films with Ag nanoparticles grown *in situ*; Nanotubes fluoresce within biological cells; CuO nanotube arrays using MOCVD with template; Silicalite-1 self-supported micromembrane separates propane/nitrogen mixtures; Heavy-Fermion materials properties demystified; Zigzag-shaped magnetic films; Rapid fabrication of porous SOFC electrodes; Quantum dots in silica aerogels

Research News from the MRS Bulletin
(January 2005 Issue)



Fatigue properties of nanoscale Cu films; Resolution optical tomography for imaging biological tissues; Direct methanol-air fuel cell with nanoporous proton-conducting membrane; Cu nanowires broken into nanospheres; Composite cathode with boroxine ring developed for all-solid-polymer lithium cell

Research News from the MRS Bulletin
(December 2004 Issue)

Laser manipulated iron applied to nanofabrication; High-contrast imaging of semiconductor chips; Nanoprint lithography and self assembly combined for protein nanopatterning; Optical waveguiding in CdS nanowires; Structurally ordered polymer

surfaces

([EurekaAlert](#))

A general method to determine the orientation of surfactant molecules on an isotropic surface has been developed. These are the first studies to determine the detailed orientation of such molecules at the water surface, using a unique combination of laser-based experiments and computer modeling that involves all atoms.

[[J. Phys. Chem. B](#), 109 (35), 16846 -16851, 2005]

(9.8.05)

Conservation: Organic bath slows disintegration of old manuscripts

([Nature News](#))

A new method to slow the disintegration of old manuscripts has been developed. It involves bathing papers in an organic solution doped with alkali compounds and antioxidants. These help to tie up atoms of copper and other metals in the ink that may eat the paper away. It is the first successful treatment that is not water-based.

(9.7.05)

Nanotubes: Currents in suspended nanotubes measured

([Physics News Update](#))

The first electrical measurements of currents flowing under high voltage through single-walled carbon nanotubes suspended like miniature power lines have been carried out. It was discovered that in suspended form a micron-scale-long nanotube could carry about 5 micro-amps of current, whereas lying in the plane of a substrate the same tube can carry about 25 micro-amps.

(9.7.05)

Nanoscience: "Bowtie Nanoantenna" forms 20 nm wide optical spot

([Stanford University](#))

A "bowtie nanoantenna," a device that can compress ordinary light waves into an intense optical spot only 20 nanometers wide, has been developed. The device consists of two triangular pieces of gold, each about 75 nanometers long, whose tips face each other in the shape of a miniature bowtie.

(9.6.05)

Filtration: Bacteria packaged to eliminate perchlorate

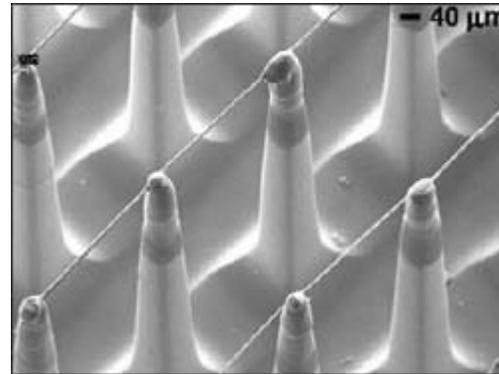
([Nature News](#))

Perchlorate, an ingredient of rocket fuel and fireworks, has seeped into many drinking-water sources around the world. A system has now been developed that uses bacteria that feed on hydrogen gas and perchlorate to produce water

electrolytes; Spin separation achieved in GaAs heterostructure; Nanoporous structures by electrodeposition.

Research News from the MRS Bulletin

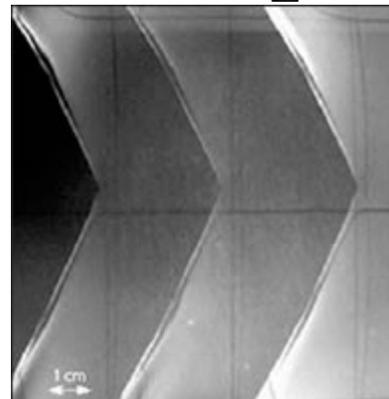
(November 2004 Issue) 



Triangular diode controls magnetic domain wall movement; Photochromic bands in functionalized semiconducting SWNTs; WS₂ nanotubes for Li storage; Suspended micro- and nanostructures by direct drawing of polymer fibers; Centrifugal force to fabricate reticulated porous ceramics; Miniature fuel cell with a porous Si layer as a catalyst support layer; Bacteria use "Molecular Lasso" to cop copper

Research News from the MRS Bulletin

(October 2004 Issue) 



Silica-coated SWNTs form unique nanostructures; Novel liquid-crystal phases formed with introduction of chirality; High-strength reticulated porous ceramics; Cracks in rubber propagate faster than the speed of sound; F-containing molecules serve as structure-directing agents in synthesis of molecular sieves; Flame-spraying technique yields aluminate bulk glasses and nanoceramics; Composite polymer-carbon nanotubes function as optoelectronic memory devices

Low-Temperature Sol-Gel Processing of Oriented PBT Thin Films

and chloride, thereby eliminating perchlorate.
(9.6.05)

Nanoparticles: New mechanism for nanoparticle growth in nanocomposites found
(Georgia Inst. Technology)

A surprising new mechanism by which polymer materials used in nanocomposites control the growth of particles has been discovered. A strong relationship was found between the chemical reactivity of the polymer and the size and shape of resulting nanoparticles.
(9.1.05)

Nanoparticles: 'Nanospheres' block pain of sensitive teeth
(EurekaAlert)

Preliminary research shows that nanospheres of hydroxyapatite could be a long term solution or cure for sensitive teeth. The nanospheres occupy channels in dentine thereby preventing triggering of nerve endings.
(9.1.05)

Nanotubes: Electron-microscopy reveals life and death of nanotube devices
(Nature Physics)

A new report presents a sequence of electron microscope images that follow the evolution and breakdown of a multi-walled carbon nanotube as an electrical current is passed through it. The results also demonstrate how nanotubes conduct electricity through their cross-sectional structure.
[*Appl. Phys. Lett.* **87**, 083103 doi:10.1063/1.2012529 (2005)]
(8.31.05)

Electronic Disorder: Dopant disorder modifies the superconducting state
(Nature Materials Update)

High-temperature superconductors are commonly doped with oxygen to induce and modify their superconducting behaviour. Researchers have now observed a correlation between the location of the oxygen dopants within the crystal, and the variation in the strength of the superconducting state across the sample.

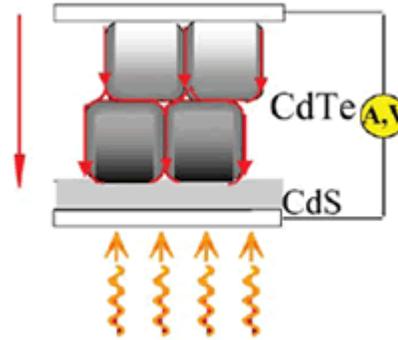
[*Science* **309**, 1048–1052 (2005)]
(8.31.05)

Superconductors: Superconductivity demonstrated in bulk graphite intercalation compound, CaC_6
(PhysicsWeb)

Bulk quantities of a graphite intercalation compound superconductor CaC_6 have been

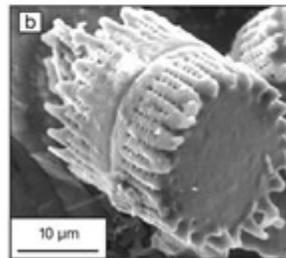
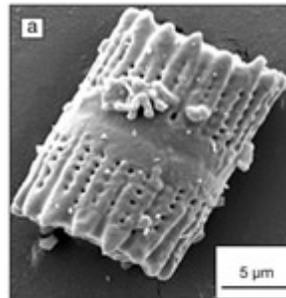
[Reported by Andy Francis]

Research News from the MRS Bulletin
(September 2004 Issue) 



Orientation of protein determined in quantum dot-bioconjugate assembly; Surface plasmons for high-density nanolithography; Defects in solar-cell materials enhance efficiency; Large-scale synthesis of nearly monodisperse Au and Ag nanoparticles; High purity and controllable growth of $\text{Mg}_2\text{B}_2\text{O}_5$ nanowires; DNA Recognition by charge transfer across nanocrystalline metal Oxide/DNA interfaces

Research News from the MRS Bulletin
(August 2004 Issue) 



Structural amorphous Fe-alloys and steels; Conductance in single DNA molecules measured directly; Diatoms as scaffolds for 3D polymeric structures; C_{60} -based organic diodes; Engineering protein hydrogels to promote cell

made using a new synthesis method. The technique involves heating pyrolytic graphite with a molten lithium-calcium alloy at 350°C under an atmosphere of argon for 10 days. [*App. Phys. Lett.* **95**, 087003 (2005)] (8.31.05)

Nanoparticles: Nanoparticles coating eliminates fogging of windows (PhysOrg)

A coating consisting of alternating layers of silica nanoparticles and a polymer, polyallylamine hydrochloride, prevents fogging of surfaces by making them super-hydrophilic. (8.30.05)

Spectroscopy: Ultrafast 2-D infrared technique probes dynamics of fast chemical exchange (Chemical & Engineering News)

Chemical-exchange reactions are too fast to study directly via traditional methods. Now, an ultrafast infrared analog of a routine nuclear magnetic resonance (NMR) spectroscopy experiment has been shown to be able to perform measurements of chemical exchange in real time. (8.29.05)

Molecular Machines: Molecular motors push liquid droplets uphill (New Scientist)

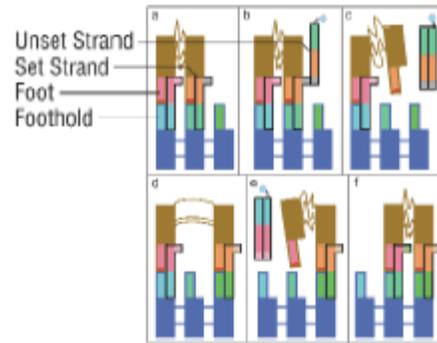
Researchers have created light sensitive "nano-shuttles". By controlling UV light hitting the molecules, it was possible to manipulate an oily drop of liquid and push it up an incline of 12°. (8.29.05)

Diamond Nanorods: Aggregated diamond nanorods are the densest, least compressible form of carbon (PhysicsWeb)

A material that is harder than diamond has been created by subjecting carbon-60 molecules to very high pressures. The new form of carbon, known as aggregated diamond nanorods, has a modulus of 491 GPa, compared with 442 GPa for conventional diamond. [*App. Phys. Lett.* **87**, 083106] (8.26.05)

Superconductivity: Magnetic field-induced superconductivity discovered (PhysicsWeb)

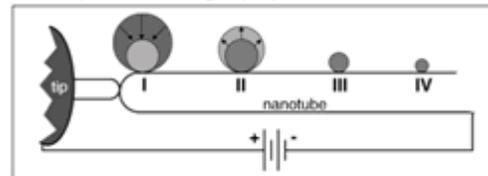
A metal, uranium rhodium germanium (URhGe), that becomes a superconductor in the presence of an extremely strong field above 8 Tesla has been discovered. Strong magnetic fields typically destroy superconducting properties.



growth

Research News from the MRS Bulletin (July 2004 Issue)

Controllable biped walking device constructed from DNA; Sintering Bi₂O₃-coated ZnO yields high-quality ceramics; Bandgap of semiconducting nanotubes shrinks in high magnetic fields; α-SiALON ceramics with high transparency; Nanostructured biosensors by nanosphere lithography



Research News from the MRS Bulletin (June 2004 Issue)

Carbon nanotubes used as nanoscale mass conveyors; Magnetic nanoparticles assembly by manipulation of magnetotactic bacteria; Circular photonic crystals allow for isotropic photonic bandgap; Garnet/SOI magneto-optical devices fabricated by direct wafer bonding; Vertical InP nanowire arrays by nanoprnt lithography

Research News from the MRS Bulletin (May 2004 Issue)

Optical amplification in a first-generation dendritic organic semiconductor; Nanopatterning on a biocompatible polymer film using UV embossing; Simulation of Spin-MOSFET; Layered ZnDS nanocomposites; Carbon-nanotube formation observed *is-situ*; Selective drilling of thermal barrier coatings

Research News from the MRS Bulletin (April 2004 Issue)

High-speed Si optical modulator; Individual virus particles weighed; Lasing in ZnS nanoribbons; Polymeric micro-resonators; New form of matter - fermionic condensate - created; Tunable superhydrophobic surfaces; Molecules self-

[[Science](#), 309, 1343]
(8.26.05)

Nanofluidic Transistors: Ions feel the field effect

([Physical Review Focus](#))

A fluid-based transistor has been created by chemically modifying a silicon nanotube. The device can conduct either positively or negatively charged ions dissolved in solution. The voltage on a "gate" electrode controls the rate of ion flow through the water-filled tube.

(8.25.05)

Biosynthesis: Bacteria are key to 'green' plastics, drugs

([Bio.com](#))

A genetically modified form of the bacteria *E. coli* that metabolizes glucose and produces almost pure succinate has been developed. Succinate is a key ingredient of many plastics, drugs, solvents and food additives.

(8.24.05)

Ice: Room-temperature ice in an electric field demonstrated

([Physics News Update](#))

Using an STM, room temperature freezing of water has been observed at a much lower field than expected of only 10^6 V/m.

[[Choi et al.](#), Physical Review Letters, 19 August 2005]

(8.24.05)

Microprinting: New microdisplacement printing technique allows for highly precise placement of molecules

(Penn. State University)

A new microdisplacement printing technique uses a self-assembled-monolayer film to keep stamped molecules in place on the surface during microcontact printing.

(8.23.05)

Quasicrystals: 3-D quasicrystals used to control light

(Princeton University)

A 3-dimensional model of a quasicrystal made from polymer rods was used to test whether such structures could be useful for controlling the path of light.

(8.23.05)

Biomimetics: Beetle-inspired adhesive micro-switch developed

(Cornell University)

A micro-switch that uses water droplets for bonding, mimicking a palm-beetle's leaf-clinging

assembled on nanowire FETs

Research News from the MRS Bulletin

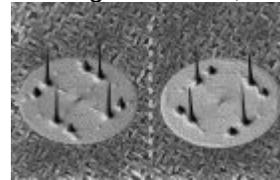
(March 2004 Issue) 

Thermally assisted magnetic recording; 3D direct writing of structures using femtosecond laser; Organic photodetectors; Tungsten electrodes for poly-Si TFTs; *In situ* TEM for observing carbon nanofiber growth; Stationary light pulses

Research News from the MRS Bulletin

(February 2004 Issue) 

Mimicing color diffraction of butterfly wings; Green-emitting lanthanoid nanocrystals; Proton-irradiation-induced magnetic ordering in graphite; Luminescent CdS nanoparticles nanorings; Light-emitting transistors; Nuclear spin tomography



Research News from the MRS Bulletin

(January 2004 Issue) 

AFM reveals "missing" graphite surface atoms; Pyro-electric effects in amorphous BaTiO₃; Photocatalysis in C-doped TiO₂; Micromirrors using micro-origami; Chiral surfaces through electrodeposition; Photosensitive membrane by molecular imprinting; Tandem OLEDs

[MORE >>>>](#)

technique, has been developed. A water droplet moves to the top or bottom of a flat plate surface based on charging.
(8.23.05)

Nanotubes: Clear, conductive nanotube sheets produced at high speed
([Nature News](#))

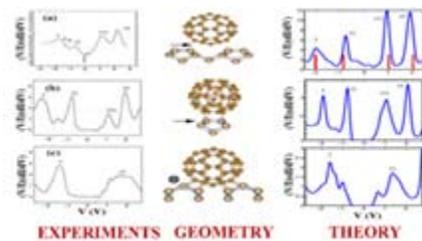
A new technique now allows for arge, transparent sheets of carbon nanotubes to be produced at very high speeds. Up to ten metres of nanoribbon can be produced every minute. [*Science*, 309. 1215 - 1219 (2005)]
(8.19.05)

Nanotubes: Nanotubes make perfect diodes
([PhysicsWeb](#))

The best-ever p-n junction diode from a carbon nanotube has been developed. The current-voltage characteristics of the device exhibit an "ideality factor" of one, which is the maximum possible value for any diode. [*Appl. Phys. Lett.* 87 073101]
(8.19.05)

Electronic Skin: Prototype electronic skin for robots developed
([Science Now](#))

A prototype electronic skin has been created that may one day help robots sense pressure and temperature, helping them to operate independent of human control. The skin is made from a network of sensors formed from conducting, semiconducting and insulating organic films.
(8.19.05)



Courtesy Purdue Univ.

Molecular Electronics: Theory identifies contact effects in electronic conduction in molecular electronic devices
([Purdue University](#))

A nanotech simulation tool has been developed that shows how current flows between silicon atoms and individual molecules. The new simulation tool was used to see precisely how electrical conductivity changes depending on how molecules are connected to silicon. This will help researchers design molecular electronic devices.

(8.18.05)

Hydrogels: Hydrogel releases drug in two steps
([Chemical & Engineering News](#))

A hydrogel-drug system has been developed that relies on the consecutive action of two trigger mechanisms to release a drug has the potential to target specific sites within the body. The triggers are a stimulus that converts the gel into a solution and an enzyme that cleaves the hydrogelator-drug link.

(8.18.05)

Photonic Crystals: First 3-D photonic quasicrystals formed; Photonic band-gap structure accelerates electrons
([PhysicsWeb](#))

Photonic crystals are proving to be a remarkably fertile area of research. Recently, the first three-dimensional photonic quasicrystals were created. Separately, a photonic band-gap structure was used to accelerate electrons.

[[Nature](#) 436, 993]

[[Phys. Rev. Lett.](#) 95, 074801]

(8.18.05)

Nanotubes: Carbon nanotubes made to stick like a gecko's foot
([EurekaAlert](#))

A densely packed carpet of carbon nanotubes that functions like an artificial gecko foot--but with 200 times the gecko foot's gripping power has been demonstrated..

(8.16.05)

Emulsifiers: Natural spore particles are efficient emulsifiers
([Nature Materials Update](#))

Researcher report the use of a naturally occurring particle, the spore of the evergreen club moss, *Lycopodium clavatum*, as an effective emulsifier. It was found that these spores with an average diameter of 31 μm preferentially form oil-in-water emulsions, and are efficient for oils of different polarity.

[[Langmuir](#) published online 4 August 2005]

(8.16.05)

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