



MOUNT CARMEL COLLEGE, AUTONOMOUS

DEPARTMENT OF ELECTRONICS

**CARMELTRONICS**

NANOSCIENCE AND NANOELECTRONICS

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**The Inside Story:**

**Page 1:**

Love Found In Nanotechnology!!  
Cyborg Beetle

**Page 2:**

Nanotechnology In Food  
Nano from Waste  
Nano Optical Switch

**Page 3:**

Nature Inspired Nanostructure  
Nanobots  
Sterilizing Spray  
Skin For Prosthetic Limbs

**Page 4:**

Fun Zone&Facts

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**LOVE FOUND IN NANOTECHNOLOGY!!**

Got a "little crush" on someone this Valentine's Day? Maybe you've been hit by a little arrow belonging to this cupid made from carbon nanotubes by Brigham Young University physics students.

You don't have to be a science lover to be amazed at how they build on such a small scale. First, they put a pattern of microscopic iron "seeds" onto a plate. A blast of heated gas causes a miniature forest of carbon nanotubes to spring up. Each nanotube measures about 20 atoms across and is 99 percent air and while love is in the air, both love and the nano-cupid are fragile.



The researchers can design and produce filters with higher precision than other methods. Their process makes equally-sized holes that are about one-tenth the circumference of a human hair and unlike other micro-filters, the holes are evenly spaced throughout the filter.

It can find applications in the area of compressed gases like oxygen in the areas of health care, mining operations or scuba diving and compressed gas systems can generate particles that need to be filtered out.

-JOYCE JOSEPH

II MSc. NANOSCIENCE & TECHNOLOGY

**CYBORG BEETLE**

Advances in microelectronics is making yesterday's science fiction into tomorrow's future inventions. Scientists at the University of California have implanted beetles with miniaturized electronics that allows the insects to be controlled. The flying beetles receive wireless signals from a mobile transmitter that controls the insect. Varying impulses trigger an appropriate response from the beetle so that it flies according to its handler. The insect can be made to take-off, land, hover, or follow a given flight path. Further advances with nanobots and miniaturization will allow heat sensors and cameras to be embedded into the bugs. The insect could then be used for surveillance or search and rescue missions.

-R.SWATHI

I MSc. ELECTRONICS

*"Nanotechnology is an idea that most people simply didn't believe ."*

- Ralph Merkle





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### NANOTECHNOLOGY IN FOOD

Nanotechnologists are hoping that nanotechnology will transform the entire food industry by bringing about changes in the production, processing, packaging, transportation and consumption of food. Usage of nanotechnology in these processes ensures safety of food products, creates a healthy food culture and enhances the nutritional quality of foods. Smart food packaging systems can be developed using nanotechnology that in turn increases the shelf-life of food products by developing active antifungal and antimicrobial surfaces, improving heat-resistance and mechanical properties, modifying the permeation behavior of foils and detecting and signaling biochemical and microbiological changes.

A number of companies have started to develop Smart Packaging systems - one such company is Bayer Polymers, who developed the Durethan KU2-2601 packaging film whose key purpose is to prevent drying of food content and protect the food content from oxygen and moisture. This packaging film is made from a number of silicate nanoparticles.

Nanocapsules are added into food products in order to deliver nutrients and nanoparticles when added to food increase the absorption of nutrients. Biodelivery Sciences International, developed coiled nanoparticles called nanococheates that deliver nutrients and omega fatty acids to cells without causing any changes to the taste and color of food.

BHARGAVI REDDY  
I M.Sc NANOSCIENCE & TECHNOLOGY

### RADAR THAT RECOGNISES US FROM THE WAY WE WALK

The future Internet of Things, with its intuitive applications, will operate based on a broad stream of data supplied by sensors placed everywhere. One example of such a sensor is radar, a simplified version of which is already used in high-end automobiles to enable the vehicle to take over a number of tasks from the driver. Nowadays radars are manufactured using specific SiGe (silicon-germanium) technology. The resulting sensors are rather large and expensive, which makes them unsuited for unobtrusive integration into applications such as self-driving cars or drones. Here the radar chips are developed based on CMOS technology that offers far greater performance at much lower power consumption with additional features and capabilities, such as capable of distinguishing pedestrians from cyclists or identifying individuals from the way they walk.



-THULASIPRIYA A.  
II MSC.NANOSCIENCE & TECHNOLOGY

### WORLD'S SMALLEST INTEGRATED OPTICAL SWITCH

Juerg Leuthold, Professor of Photonics and Communications and his team have developed the world's smallest integrated optical switch. They include modulators that are electrical switches that rapidly turn on or off a laser signal, based on the frequency of the received electrical signals. The research team have now gone to the next level and created the smallest optical modulator ever developed. This modulator is so small that the component functions at the level of individual atoms. The switch is based on the voltage-induced displacement of one or more silver atoms in the narrow gap between a silver and a platinum plate. A short circuit is developed between platinum and silver plates, allowing the flow of electricity between them. As a result of this the loop hole closes and the switch moves from an "on" to "off" state or vice versa.

-VASUDHA CHANDRASHEKAR  
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### NO MORE CLEANING WINDOWS - NATURE INSPIRED NANO - STRUCTURES

A revolutionary new type of smart window could cut window-cleaning costs in tall buildings while reducing heating bills and boosting worker productivity. Developed by UCL (University College London) with support from the Engineering and Physical Sciences Research Council (EPSRC), prototype samples confirm that the glass can deliver three key benefits: Self-cleaning, Energy-saving, Anti-glare. Here nanostructure materials has been combined with a thermochromic coating. The bio-inspired nanostructure amplifies the thermochromics properties of the coating and the net result is a self-cleaning, highly performing smart window. The project is an example of how investing in excellent research drives innovations could deliver both energy savings and cost reductions.

-TRUPTI BALIGA B.  
III BSc. CME

### AN INSIGHT ABOUT NANOBOTS IN DRUG DELIVERY SYSTEM

Emerging methodologies for formulation of nondrug delivery systems include newer versions of the top-down and bottom-up approaches. Additionally allied technologies such as atomization and pressurization have also come in to play to facilitate the preparation of Nano technological (drug carriers/capsule) carriers. These novel technologies offer advantages by eliminating the usage of toxic cationic polymers and chemical tethers further replacing them with simple yet effective hydrogen bonding.



They exist in these forms, namely, Nanomaterials like fullerenes, carbon nanotubes and Nanomedicines like self-assembled monolayer and DNA nanotechnologies, Nano electronics

-SRI CHARANI.NITTA  
II MSc. ELECTRONICS

### ARTIFICIAL SKIN FOR PROSTHETIC LIMBS CAN SENSE A GRAIN OF SALT

One of the many challenges of adjusting to life with a prosthetic limb is that the new limb lacks sensation; adding a sense of touch could make controlling prosthetic limbs easier and more natural - but that's a challenge for engineers. Benjamin C. K. Tee and his colleagues from Stanford University have developed a receptor system called Digital Tactile System which could one day give prosthetic limbs artificial skin with a sense of touch. They are sensitive to the same range of pressure as human skin. Using carbon nanotubes, his team had previously developed a very sensitive pressure sensor that was also flexible enough to use in artificial skin. Now they just needed the sensors to turn pressure into a digital signal to neurons in the brain



DIFact can sense when something is resting against the sensor, but not when something brushes past it. As of now the sensors rely on battery power, but researchers are working on a rechargeable battery that would be incorporated into the artificial limb.

-SAHANA R  
I MSc. ELECTRONICS

### STERILIZING SPRAY

This latest science invention is a spray-on invisible thin glass coating that sterilizes, protects and strengthens surfaces. A liquid coating invented at the Saarbrücken Institute for New Materials, Turkey is a flexible and breathable spray-on glass film. The special glass coating known as "SiO<sub>2</sub> ultra-thin layering" protects practically any surface against water, UV radiation, dirt, heat, acid, stains, mildew, fungus, bacteria and viruses. Trials by food processing plants in Germany have concluded that surfaces coated with liquid glass only need hot water for cleaning. In fact, the coating provided higher levels of sterility than surfaces cleaned with bleach or other chemicals. The investment opportunities for this latest science invention seem endless - buildings, vehicles, appliances, clothing etc. can have dirt and germ free surfaces without using toxic coatings or chemicals.

-SHRUTHI RAMAKRISHNAN  
II MSc. ELECTRONICS





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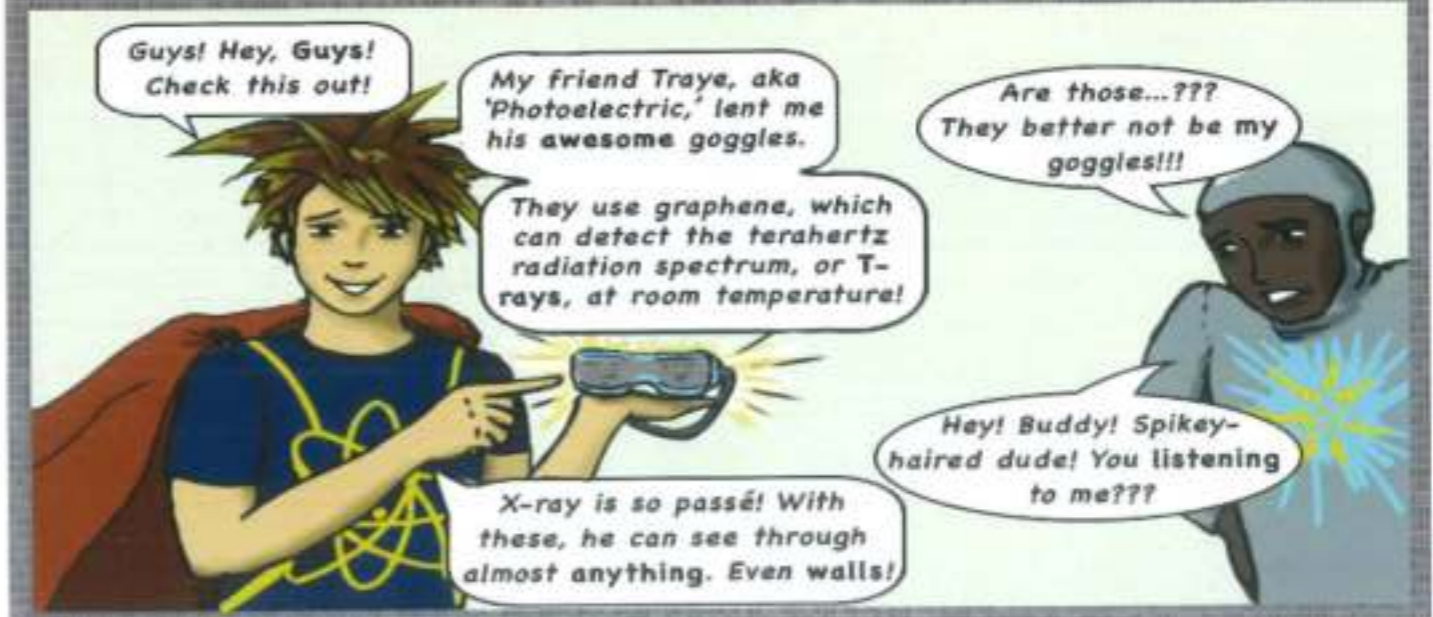
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### FACTS ABOUT NANOTECHNOLOGY.

Lin Wang, co-inventor of the jacket, envisions a shirt that charges your cell phone as you scroll or an implanted device for measuring blood pressure that's powered by your own heartbeat.

Yale researchers have created plastic nanospheres that encapsulate proteins called cytokines, which stimulate the immune system's killer T-cells. An injection of those spheres could help fight disease and infection.

fluorescent nanoparticle that glows inside the body, making it easier to image tumours and organ damage.

eloped nanosize vesicles called nanosomes. They are used to transport active ingredients such as pure Vitamin E through the skin.

-NEHA CHAUHAN  
MSc.ELECTRONICS