E-NEWSLETTER
ISSUE 10
April 2008

# SMART.mat

Smart Materials, Surfaces and Structures Network

## FUNDING OPPORTUNITIES

FP7 is the short name for the Seventh Framework Programme for Research and Technological Development. This is the EU's main instrument
for funding research in Europe and it will run from 2007-2013. FP7 is also designed to respond to Europe's employment needs, competitiveness and quality of life
***Details***

## CONFERENCE DATES

**Bio-inspired Complex Networks in Science and Technology from Topology to Structure and Dynamics**
International Workshop and Seminar
14 April - 9 May, 2008
Dresden, Germany
***Details***

**Structural Health Monitoring Seminar**
7 May 2008
National Physical Laboratory, UK
***Details***

**3rd International Conference Smart Materials, Structures and Systems**
8-13 June 2008
Acireale, Sicily, Italy
***Details***

**Air Travel Experience - A Smart Future**
12th June 2008
IOM3, London
***Further details to follow***

**4th European Workshop on Structural Health Monitoring**
2-4 July 2008
Krakow, Poland
***Details***

## Geckos Inspire

**Gecko lizards inspire 'Spiderman gloves'**
Prototype "Spiderman gloves" that will enable window cleaners to scale walls, robots to scurry across ceilings and rock climbers to hang about could be ready in three years. There is no need to be of an arachnid persuasion but simply make like the gecko instead, given the lizards uncanny ability to run up walls and across ceilings on its five toed feet. ***Details Details***


**Gecko inspired waterproof adhesive bandage**
Surgeons are preparing for the day they can repair their patients with a waterproof adhesive bandage that is inspired by the clingy feet of gecko lizards. The team that devised the "gecko bandage" hope to start human trials within as little as two years and believe that it may soon join sutures and staples as a basic operating room tool for doctors patching up surgical wounds or internal injuries. ***Details***

## STRUCTURES NEWS

**Health screening to benefit from a bio-sensing nanodevice**
A Bio-sensing nanodevice has been developed where a gold nano rod is attached to an enzyme which on detection of a single DNA molecule can emit a signal. ***Details***

**Nanotechnology used to improve thermoelectricity efficiency**
Researchers at MIT and Boston College have built tiny alloy nanostructures that can be used as power generators and micro coolers to achieve dramatic increases in thermoelectric efficiency. A milestone that paves the way for a new generation of products - from semiconductors and air conditioners to car exhaust systems and solar power technology- that run cleaner. ***Details Details***

**Tiny submarines developed using "2-faced" spheres**
Researchers have demonstrated that microscopic "two-faced" spheres whose halves are physically or chemically different - so called Janus particles - will move like stealthy submarines when an alternating electrical field is applied to liquid surrounding the particles ***Details***

**Nanoelectronic devices could provide single molecule sensors**
Single molecule sensors have been developed using nanoelectronic devices which can measure electrical and optical properties simultaneously. ***Details***

**Nature provides key to combating bacteria**
Drug resistant bacteria are being combated using nanoscale scaffolds of silica with nitric oxide, a molecule which mammals use to fight off bacterial infections. ***Details***

**Nanocontainer developed to distribute "payload"**
A bio-hybrid nanocontainer has been developed in the Netherlands comprising of a polymer scaffold, a lipid membrane patch and a remote control protein. The nanocontainer can be configured to pick up and distribute "payloads". ***Details***

**Physicists discover Gold can be magnetic on the Nanoscale**
Gold on a nanoscale can be made magnetic through oxygenation of gold nanowires physicists have discovered. They have also found that up to a certain length the gold nanowires are conductive; however they behave as an insulator if any longer. ***Details***

**Carbon nanotubes help fix bones**
Researchers found that placing Carbon nanotubes in contact with damaged bones in mice helps to regenerate bone tissue and reduce inflammation during the healing process. ***Details***

***Please note: all web links included in this e-newsletter are correct at time of distribution. E&OE.***

**The 4th International Conference on Technological Advances of Thin Films and Surface Coatings (ThinFilms2008)**
13-16 July 2008
Singapore
***Details***

**International Conference on Multifunctional Materials and Structures and their Applications (MFMS 2008)**
28-31 July 2008
Hong Kong
***Details***

**Smart Sensing for Structural Health Monitoring (S3HM)**
22-27 September 2008
Udine, Italy
***Details***

**In situ monitoring of monumental surfaces**
27-29 October 2008
Florence
***Details***

## CONFERENCE REVIEW

SPIE Smart Structures and Materials Conference Review
San Diego, March 2008
***Details***

## PAPERS

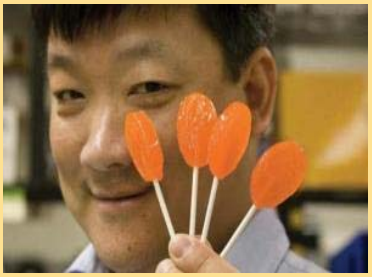
### Sensors for medical applications

A white paper has been produced by Measurement Specialities with regard to choosing sensors for medical applications. ***Details***

## NEWSLETTERS

### Structural health monitoring by ISHMII

A March 2008 newsletter is available from the International Society for Structural Health Monitoring of Intelligent Infrastructure website. ***Download***



**Nano magnets could be used to target cancer cells**
Nano-magnets (magnetosomes) made by bacteria digesting iron could one day be used to target cancerous tumours. ***Details***

**Nanoparticles show potential for miniaturising camera lenses**
Miniature camera lenses and cell phone displays could be a possibility using nanoparticles that are exposed to electric fields whilst in a liquid. ***Details***

**Nanoparticles generate Supersonic shock waves to target cancer**
Researchers have developed a nano-scale thermite that can produce shock waves. It may be possible to combine these with micro-chip technology to provide targeted drug delivery. ***Details***

**Ink-jet technology could be used to print living cells**
The vision of building a mechanical rat is explained by using ink-jet printers to print living cells as well as moving, structural and electrical parts. ***Details***

**T-rays could be harnessed to detect explosives and biological agents using new material**
A new sensor design based on a radiation known as T-rays and a new “metamaterial” is being developed for security sensing and scanning. Many of the molecules in explosives and biological agents like anthrax strongly absorb this type of radiation. ***Details***

**Accelerators are used for intelligent implants**
A European research programme is developing intelligent implants that utilise accelerometers to help stroke victims recover the use of their hands by helping them open their hand and extend their wrist. ***Details***

**Self-heating disposable cleansing wipe**
Redi+Wash is a total body cleansing system that has been developed utilising a patented self heating technology. This new product eliminates the messy and tedious procedures of traditional basin baths at a fraction of the time and cost. ***Details***

**Smart pill box targets TB**
The “ubox” has been developed with 14 compartments that can be loaded with pills which are dispensed daily. The box flashes and buzzes to alert the patient that it is time to take the medicine. It is even clever enough to prevent accidental double doses by keeping the lid shut until the next dose of medication is due. ***Details***

**Drug release controlled by smart necklace**
Researchers have developed a necklace that records when and if medicine has been taken, and reminds the user to take a tablet if a dose is missed. The MagneTrace, contains an array of magnetic sensors that detect medication containing a tiny magnet as it passes through a persons oesophagus. ***Details***

**New book warns of threats posed by ambient intelligence, calls for safeguards**
In the near future, every manufactured product (our clothes, cars, money etc) will be embedded with intelligence, networks of tiny sensors and actuators. The world of ambient intelligence (AmI) is not far off. We already have surveillance systems, biometrics, personal communicators, machine learning and more. AmI will provide personalised services “ and know more about us “ on a scale dwarfing anything hitherto available. A new book written by a European consortium of researchers, aims to warn about the threats and vulnerabilities facing our privacy, identity, trust and security ***Details***

**Optical fibres developed with single crystal semiconductors incorporated**
Penn State University and University of Southampton have grown a single-crystal semiconductor inside hollow optical fibre, enabling both electronic and optical capabilities. ***Details***

**Multimode optical fibre used in security applications**
Any movement of the optical fibre will result in change in the speckle pattern produced by light propagating down the fibre, indicating a possible security breach. ***Details***

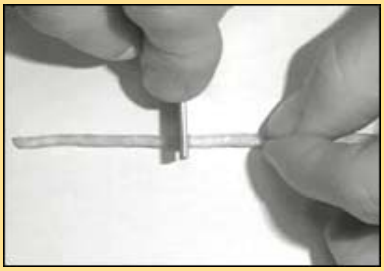
**Morphing mobile phones for the future**
Nokia Research Center (NRC) and the University of Cambridge (UK) have joined forces on a project called Morph which is looking at mobile phones that could change their shape and have self cleaning capabilities. ***Details***

**Tooth friendly lollipops**
An orange flavoured lollipop has been developed using an ingredient found in liquorice that kills the bacteria that causes tooth decay. ***Details***

If you do not wish to receive this newsletter in future, please reply to the email with the word 'unsubscribe' in the subject field. Alternatively, visit the Forum and click on 'My Account' and choose 'no' in the opt-in for mailing contact option.

**IOM3 INSTITUTE MEMBERS**

You are able to update your contact details online and set up your personal interests profile by visiting the new 'members' area ***HERE***



**Risk of injury reduced using intelligent side impact protection system**

European research scientists claim they have developed an intelligent side impact protection system that is said to dramatically reduce the risk of injury.

The system uses a combination of cameras and radar sensors to identify a potential danger and to then deploy the safety system. Cameras integrated in the doors identify the car that will cause the accident and radar sensors in the car's wings measure how far away the car is. Then, 200ms before the crash, the side impact protection system is activated. ***Details***

**Soldiers and motorists could benefit from contact lenses with "heads up" display**

Electronic displays have been built into contact lenses by imprinting circuitry and LEDs on to flexible contact lens. This enables information to be accessible without having to look down to read instruments. ***Details***

**Elastomer material used for new bicycle suspension design**

A damping effect is achieved using Rias (rheopectic impact absorption and suspension) elastomer material, where the molecules line up when subjected to stress. ***Details***

**De-icing of aircraft wings using applied conductive patch**

Composites are being applied with a spray on, electrically conductive coating to enable de-icing of aircraft wings during flight. ***Details***

**BigDog – "a four legged friend"**

BigDog is an advanced four legged robot that can walk, run and cover various terrain types whilst carrying a heavy load. An on board computer controls its motion; taking data from sensors that are used to measure joint force, ground contact and much more. ***Details***

**Piezoelectric material used to harness energy from rain drops**

PVDF (polyvinylidene difluoride) has been utilised to harness the energy of raindrops using the piezoelectric effect. ***Details***

**Shape change used to mimic swift**

A remote aircraft called RoboSwift has been designed to change shape, swinging its wings back like a swift during flight to travel faster at high speeds. ***Details***

## SURFACES NEWS

**Researchers reduce the load for big-breasted women**

While the prospect of incorporating cutting-edge chip technology into women's bras to govern improved movement is probably some way off, a university research team working out of Wollongong in Australia has revealed an 'intelligent' material designed to provide better support for bigger breasts. ***Details Details***

**Generating power whilst you walk**

Scientists have developed a strap-on gadget that generates electricity as you bend your knees and walk. The knee brace generates enough power to charge up 10 mobile phones at once, it is reported by US and Canadian scientists. Although the new energy-capturing knee brace generates a decent amount of power it is still relatively light compared to other gadgets that scientists have been working on to harness the motion of the human body to create power. ***Details***

**Self healing rubber re-joins itself**

Self-healing rubber that binds back together after being snapped or punctured could pave the way for self-healing shoes, fan belts, washing-up gloves and more. Regular rubber gets its strength from the fact that long chains of polymer molecules are coupled, or "crosslinked," in three different ways: through covalent, ionic, and hydrogen bonding between molecules.Of these three bond types, only the hydrogen bonds can be remade once a material is fractured, although normally there are not enough hydrogen bonds for the rubber to re-couple in this way. The solution devised by Leibler and colleagues is to simply get rid of the ionic and covalent bonds. They developed a transparent, yellowy-brown rubber in which crosslinking is performed only by hydrogen bonds. The new substance self-heals when its surfaces are brought together under gentle compression, at room temperature. The material is synthesised from fatty acids and urea, which are cheap and renewable. ***Details Details***

**Electromagnetic forces used to change shape of swarm of robots**

Achieving different shapes of a swarm of microscopic robots is being investigated to see if electromagnetic forces can be used to get them to cling together. ***Details***

**Bed sheets monitor sleeper's heart**
Bed sheets that monitor a sleeper's heart activity and breathing are to be tested as part of a major new European research programme. Scientists involved in the project will also try out hi-tech clothing fitted with heart sensors. ***Details***

**Laundry for lazy people**
Researchers have used nanotechnology to create wool that cleans itself in sunlight; so instead of sending your stained clothes to the drycleaners you could simply clean your woollens by hanging them on the line. ***Details***

**'Power shirt' generates watts as you walk**
A microfibre fabric that generates enough of its own electricity to recharge a mobile phone or ensure that an mp3 player never runs out of power, US scientists say. If made into a shirt, the fabric could harness power from its wearer simply walking around or even from a slight breeze**.** The nanogenerator takes advantage of the semi conductive properties of zinc oxide nanowires, tiny wires 1000 times smaller than the width of a human hair, embedded in the fabric ***Details Details Details***

**At last a bathroom that cleans itself**
Cleaning bathrooms could become a chore of the past with new coatings on bench surfaces, tiles and glass that do the job for you, say Australian researchers. Tiny particles of titanium dioxide up to 20 nanometres in diameter are currently used on outdoor surfaces, such as self-cleaning windows. These titanium dioxide nanoparticles absorb UVA light, ultraviolet light below 380 nanometres in wavelength. This excites electrons and gives the particles an oxidising ability more powerful than chlorine bleach. ***Details***

**Vibrating raindrops may power our homes**
Researchers have developed a technique that harvests energy from rain showers and converts it into electricity. The technology could work in industrial air conditioning systems, where water condenses and drops like rain. ***Details***

**Report highlights demand for specialist fabrics for footwear**
Temperature regulating footwear using phase change materials is one of the examples used to highlight the types of multifunctional fabrics that are in demand from the footwear industry. ***Details***

**Monitoring of air quality using sensors incorporated in clothing**
Asthma sufferers could benefit from research being conducted using sensors worn in pockets of clothing which monitor surrounding air quality. It could provide valuable insight into triggers of asthma attacks. ***Details***

**New generation of smart textiles that analyze your sweat**
BIOTEX partners have developed biosensors that can measure potassium, choloride, sodium and pH in sweat samples which could be incorporated into fabrics for medical applications. ***Details***

**Healing fabrics**
A new technique has been developed that distributes chitosan in cotton fabric, leading to a material that has antibacterial and blood clotting properties. The material could save lives on the battlefield and make people more comfortable in hospital beds. ***Details***

**Sea cucumbers inspire new material**
A new material has been developed that changes from rigid to rubbery when exposed to a liquid. The material comprises of tiny cellulose fibres distributed in a rubbery polymer. ***Details***

**Artificial skin with a sensitive touch**
Robots and patients could benefit from artificial skin being developed as part of the FILMskin project. Thin layers of carbon nanotubes and polymers could help sense temperature and pressure. ***Details***

**DNA molecules "tagged with fluorescent reporter" could be used to detect chemicals**
A method utilising deoxyribonucleic acid using single stranded DNA molecules, specially tagged and deposited onto a solid substrate, are able to respond to chemicals in either a liquid or vapour form. ***Details***

**Nanotechnology used to develop antibacterial paints**
Antimicrobial silver nanoparticles have been incorporated into paints using a low cost method that utilises polyunsaturated hydrocarbon chains containing polymers/oils. ***Details***


**Scientists reveal make-up of fish bling**
Findings show that layers of light reflecting crystals can be altered by fish to achieve a shimmery, metallic sheen which they use to confuse predators. If this structure can be mimicked it could lead to potential use in paints and cosmetics. ***Details***

**Polymer Vision - The rollable display company**
In late summer 2005 Polymer Vision presented the READIUS a 'Worlds first' milestone, a fully functional prototype of a mobile device with a rollable display. January 2008, the READIUS product for commercial launch by mid 2008 has been introduced. The exclusive device exploits the versatility of rollable displays to merge the 'reading friendly' strengths of e-readers with the 'high mobility' features of mobile phones. Together with the READIUS internet portal, designed for personalisation and content selection, the company offers a whole new mobile phone category. ***Details***

**Surgeon Designs RFID device to monitor orthopaedic implants and promote healing**
Using RFID, sensors and electric stimulators the device assesses the functioning of an implanted orthopaedic device and the surrounding tissue, as well as to hasten surgical recovery. ***Details***


**Smart football**
The new v1.08 PUMA match ball takes you into the future of football technology with its reactive foam cushioning that makes it the world's first intelligent ball ***Details***

**Paint that shows acid leaks**
The new range of Acid Detection Paint to provide instant visual indication of pipe and joint failures. Available in two forms:-
On Guard Acid Detection Paint, for acids of pH3 and below - In event of a leak, paint changes colour immediately from Yellow to Red.
On Guard Base Detecting Paint, for pH10 and above **-** In event of a leak, paint changes colour immediately from White to Blue. ***Details***

**'NASA Invention of the year' - Controls noise and vibration**
Developed at NASA's Langley Research Center, the Macro-Fiber Composite (MFC) is an innovative, low-cost piezoelectric device designed for controlling vibration, noise, and deflections in composite structural beams and panels. It was created for use on helicopter blades and airplane wings as well as for the shaping of aerospace structures at NASA. ***Details***


**Wireless chip-on-a-band-aid to monitor patients from home**
The chip is one of an emerging group of smart wearable devices that ultimately aim to help patients get medical monitoring from the comfort of home. ***Details Details***

## Feed back on SOA

SMART.mat is keen to receive feedback on the State of the Art Reviews that can be found on the website. Please send your comments to Jackie.Butterfield@iom3.org

The following reports are available to download :

- NEW In-Vivo aplications of SMART Materials ***Details***
- Smart and Active Packaging to Reduce Food Waste ***Download***
- Consumer Packaging - Opportunities for SMART Technologies ***Download***
- State of the Art Review - Structural Health Monitoring ***Download***
- SMART Materials, a designer's handbook ***Details***

**News on company products**
If you or your company would like to include news on any products / programmes that are applicable to smart structures or surfaces in the SMART.mat quarterly newsletter, please provide a brief description, contact details, and website address to **nicola.radford@namtec.co.uk / lfixter@qinetiq.com**

SMART.mat is a DTI funded project and is part of the Materials Knowledge Transfer Network (KTN) concentrating on 'smart' technology. SMART.mat is a partneship of QinetiQ, NAMTEC and the Institute of Materials, Minerals and Mining.
***Click Here to visit the Materials KTN Website***

**The next issue of the SMART.mat newsletter will be distributed in July 2008.**

Materials
Knowledge Transfer Network