asia research news 2014

A ResearchSEA publication to highlight research in Asia

The global migration of care workers

Harvesting tumour cells to monitor chemotherapy

Exposing the secret life of endangered elephants

Japanese team uncovers ancient Egyptian tomb

South Korea develops heavy ion accelerator

Expanding the frontiers of photonics

CONTENTS

Meet the Asia Research News team

Nadia El-Awady is a science journalist and copy editor. She has a BSc in medicine from Cairo University, and an MA in journalism and mass communication from the American University in Cairo. A past president of the World Federation of Science Journalists, Nadia has taught science journalism and worked as a director of communication.

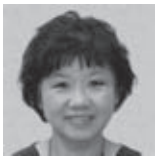
Djuke Veldhuis is a biological anthropologist with a PhD from Cambridge University, with experience ranging from evolutionary anthropology to human ecology, endocrinology and psychology. She is passionate about science communication, both as a journalist and as coordinator of the global science communication competition, Cheltenham Festivals' FameLab.

Keane Shore is an Ottawa-based journalist with experience in newspaper, wire service and magazine writing and editing. Keane has also helped to produce a series of flagship books for Canada's federal statistics agency. For the past 15 years, he has specialized in reporting on international development, science and technology issues.

Ian Fyfe studied natural sciences at the University of Cambridge, specialising in neuroscience, and then completed a PhD in molecular pharmacology. He now works as a technical writer for UK photography magazines, while continuing to use his scientific background as a freelance science writer.

Richard Stone oversees Science magazine's international news coverage. The two-time Fulbright Scholar opened Science's Asia bureau in Beijing in 2007, after four years in Cambridge, UK as Science's European Editor. Rich has also contributed to *Discover, Smithsonian* and *National Geographic* magazines, and is the author of "Mammoth: The Resurrection of an Ice Age Giant."

Ruth Francis is Head of Communications for BioMed Central and Head of Corporate Communications for Springer, UK. Previously, she was Head of Press for Nature Publishing Group. Ruth is the current Chair of Stempra, a network for press officers in science, medicine, engineering and technology, and has run media training workshops in Asia and Africa.



Vivien Chiam is our marketing consultant for Singapore and Southeast Asia. She was the Partnerships and Communications Manager of Canada's International Development Research Centre in Singapore, working closely with Asian research insitutions to build capacity in communications and fundraising.

Aya Kawanishi is a writer with a degree in journalism from the University of Stirling. She was an editor for The Japan Times ST. Aya keeps Asia Research News readers informed of the latest news in Japan and contributes to our social media pages and blog.

Editor's Desk

Magdeline Pokar is editor-in-chief of Asia Research News. After some years in geophysics research, she set up ResearchSEA, Asia's first research news portal to raise the profile of research in Asia. A graduate of Leeds University (PhD) and Universiti Sains Malaysia, she is also a Chevening and Salzburg Global Fellow. Maggie has written for *New Scientist*, *New Straits Times* and *Business Times*.

John Eberlee joined the Asia Research News team after ten years as a science writer at the National Research Council of Canada. John was previously managing editor of *Reports Online*, published by Canada's International Development Research Centre. He earned a BSc and studied journalism at Carleton University in Ottawa.

Welcome to the 2014 edition of Asia Research News.

This is our 6th issue of Asia Research News and 10th year of communicating Asian research to a global audience. When we started out, the idea of communicating research to the public was in its infancy in Asia. Now, more people than ever are aware of the amazing work being done by researchers here.

Asia Research News highlights key research projects conducted by our partner institutions and those working with partners in Asia. From a 3000-year-old tomb to 21st Century robots, this issue showcases many exciting advances in research.

Read about South Korea joining the international race to discover stable superheavy elements, breakthroughs in graphene, photonics and energy research, and advancements that will save lives in our technology and construction pages.

In our agriculture and environment sections, find out about an app that tells farmers how much fertiliser to use, a genetic technique to enhance plant growth by increasing leaf pores, and a conservation project using satellites and cameras to mitigate human-elephant conflict.

Our health section highlights a robot that uses radio waves to destroy breast cancer cells, a traditional herb for osteoporosis, and artificial membranes that speed up drug development while reducing costs.

Finally, among other research, our people section profiles efforts to preserve a 450 year-old language online, and the world's first music synthesizer to recreate the sounds of traditional bamboo instruments.

Enjoy reading and we welcome your feedback. If you have exciting research to share with us, please contact Magdeline Pokar at m.pokar@researchsea.com

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Professor YongKeun Park, KAIST

Editorial Consultants
Daniel Raymer
Pokar Vellaykuti

Design
Fulton Design

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Asia Research News
PO Box 5048
Manly Brisbane
QLD 4179
Australia

My Mail Box 883126
919191 Singapore

+61 468 606 929 (Australia)
+44 7846 672 534 (UK)
+65 9760 6821 (Singapore)

info@researchsea.com
www.researchsea.com
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Ek Chen, a village model farmer in the Fish on Farms Project, feeding his fish.

Fish on farms: Tackling hidden hunger in rural Cambodia

Cambodians in Prey Veng Province are raising fish and improving harvests to battle chronic malnutrition and increase women's share of household incomes.

Rice is a staple in the Cambodian diet. Although the country grows enough rice to meet its needs, rural households face a hidden hunger: chronic malnutrition due to a lack of vitamins and nutrients.

Since 1998, Helen Keller International has helped households diversify their diets and increase the production of nutrient-rich foods. Together with researchers from the University of British Columbia, they are now testing the benefits of adding fish farming to household food production. The aim is to enhance nutrition, food security and women's share of household incomes. Small fish can be raised for household consumption with larger fish sold for cash.

Researchers are testing the aquaculture-enhanced model through trials involving nearly 1,000 households in Prey Veng Province. Participating households receive training and inputs such as seedlings and fish stocks through village model farms to help them increase the variety of fruits and vegetables they grow. They also receive health and nutrition advice from a specially trained village health volunteer. One group of households is combining aquaculture with plant-based agriculture. Others are focusing solely on agriculture.

Data from two initial four-month periods show promising increases in both food production and women's financial control. Average fruit harvests increased by more than one-third while vegetable harvests initially doubled, then rose by a further two-thirds. Among those involved in fish farming, harvests of small fish rose by one-third while the catch of larger fish increased five-fold. At the outset, only 53% of women had money they could spend without their husband's permission. This figure rose to 68%.

Teams are now focusing on increasing the production of seeds, saplings and fish fingerlings on village model farms to ensure participating households have the inputs they need for their farming efforts.

Over two years, researchers hope to draw important lessons on using aquaculture to strengthen household food production and nutrition, empower women and improve livelihoods. Their efforts are supported by Canada's International Development Research Centre and Foreign Affairs, Trade and Development Canada through the Canadian International Food Security Research Fund.

Helen Keller International

Homestead garden

For further information contact:
Isabelle Bourgeault-Tassé
International Development Research Centre, Canada
Email: ibourgeault-tasse@idrc.ca

Plant "pore key" increases growth

Researchers of the Institute of Transformative Bio-Molecules (ITbM) at Nagoya University in Japan have developed a technique to boost energy production in plants and enhance their growth. If applied to food crops and fuel plants, the technique could help in creating a sustainable low-carbon society.

Plants require carbon dioxide for energy production in a process called photosynthesis. They absorb the gas mainly through small pores, called stomata, located on the surface of their leaves. The size of these stomata limits carbon dioxide absorption, and therefore energy production, and is controlled by two guard cells on either side of each pore. When light levels increase, these cells respond by opening the stomata more widely.

Professor Toshinori Kinoshita, Dr Yin Wang and colleagues at the ITbM set out to enhance this response to light by increasing the size of plant stomata and enhancing carbon dioxide absorption.

The researchers genetically manipulated the expression of H^+-ATPase, a protein found in guard cell membranes that is key to the opening mechanism. They increased the amount of H^+-ATPase in *Arabidopsis thaliana* plants, also known as thale cress, causing the plants' stomata to open wider than normal. This led to more carbon dioxide absorption and faster energy production, resulting in plants that grew larger than genetically unaltered plants grown under the same conditions.

Since all plants obtain carbon dioxide in the same way, a similar genetic approach could be applied to enhance the growth of crop plants and those used to generate biofuels. The researchers say this could help increase global food production while lowering carbon emissions.

Institute of Transformative Bio-Molecules (ITbM)

Comparison of plant growth between wild-type plant (WT) and H^+-ATPase overexpression plant (TG).

Wikimedia

For further information contact:
Professor Toshinori Kinoshita
Institute of Transformative Bio-Molecules (ITbM)
World Premier International Research Center Initiative (WPI)
Nagoya University, Japan
Email: kinoshita@bio.nagoya-u.ac.jp

University of Nottingham Malaysia

Natural protections for tropical fruits prolong shelf life

Malaysian researchers are developing natural products, bio-fungicides and ozone treatments to enhance the storage and shelf life of tropical fruits.

In developing countries, disease and decay can inflict huge losses on food that left the field in perfect condition. These losses occur during harvesting, handling, shipment and after purchase by the consumer.

Led by Dr Asgar Ali, researchers at the University of Nottingham Malaysia Campus are developing new technologies to reduce food losses and improve food quality and safety. Their aim is to increase profits for growers and marketers while making quality and nutritious food available to consumers.

"In developing countries, losses of between 10 to 50% have been recorded," says Dr Ali. "Tropical countries have a particular problem because of the number of microorganisms that exist due to humidity. Cutting post-harvest losses could add a sizable quantity to the global food supply."

Dr Ali's team has been exploring a range of natural biodegradable materials that can be applied as edible coatings to protect food from microbial infestation while delaying ripening. "Farmers are currently using pesticides to reduce [post-harvest losses], but we are trying to develop technologies that are free from synthetic chemicals and fungicides," he says. "We are using natural products and bio-fungicides, or physical treatments such as ozone and negative ions, to enhance the storage and shelf life of tropical fruits."

For example, in the first research of its kind, PhD student Mehdi Maqbool is looking at ways of developing edible coatings from natural gum arabic powder to extend the shelf life of fruit. His research is focused on the banana and papaya, two of Malaysia's most common crops. These fruits are susceptible to diseases that occur in cold storage and also have a short shelf life.

"Natural gum arabic is already used as an emulsifier in cold drinks and sweets," says Maqbool. "In liquid form, gum arabic can create a thin edible film around the fruit, which creates a modified atmosphere protecting it from disease and decay."

Dr Ali's team has already proved the concept of this technology and is now negotiating with industry to conduct product trials. The researchers have also successfully applied other natural products – including essential oils and propolis, a resinous substance collected by bees to seal gaps in their hives – as edible coatings for tropical fruits.

For further information contact:
Dr Asgar Ali
Associate Professor and Director
Centre of Excellence for Postharvest Biotechnology
The University of Nottingham Malaysia Campus
Email: asgar.ali@nottingham.edu.my

National Electronics and Computer Technology Center

Rice leaf app for smarter farming

A Thai research team has developed an app to help farmers estimate more accurately the amount of nitrogen-based fertilisers needed in rice fields.

The app could help to reduce the cost of rice crops by cutting excess fertiliser usage, improve the recovery of fertiliser and prevent nitrogen oxide pollution in water.

The simplest way of estimating the amount of fertiliser needed in rice fields is to visually inspect the rice leaves and compare their colours to a standard leaf colour chart. However, an incorrect reading of the chart often leads to an incorrect application of fertiliser. The new app, developed by researchers at the National Electronics and Computer Technology Center in Thailand, effectively turns a smartphone or tablet into a colorimeter that can measure the colour of leaves and recommend the amount of fertiliser to use.

The app uses the device's camera to capture an image of a rice leaf and analyse its colour. Accuracy is achieved by comparing the colour of the leaf to a white reference, such as a piece of paper, that the user holds directly behind the leaf during image capture. The colour is then equated to a standard level on the leaf colour chart and the app displays the amount of fertiliser needed. It can also estimate potassium deficiency. In field tests, the app achieved over 93% accuracy in estimating leaf colours.

Called BaiKhaoNK (after the Thai word BaiKhao, meaning rice leaf), the app is currently compatible with Android 2.2 smartphones and above. This year, the researchers are planning to work with the Department of Rice in Thailand's Ministry of Agriculture and Cooperatives and the National Center for Genetics Engineering and Biotechnology to promote the use of the app with farmers.

For further information contact:
Sarun Sumriddetchkajorn
National Electronics and Computer Technology Center (NECTEC), Thailand
Email: sarun.sumriddetchkajorn@nectec.or.th

Palm oil waste into wealth

Lactic and acrylic acid for food, textile and chemical industries

Researchers in Singapore have produced lactic and acrylic acids from palm oil waste, mitigating the negative impacts of oil palm plantations on the environment.

Oil palm plantations have a controversial history in Southeast Asia, not least because of their environmental impact on the landscape. Plantations yield a great deal of waste. Many researchers believe this waste could be harnessed for industrial processes, reducing some of the environmental impact of the palm oil trade.

Researchers at A*STAR's (Agency for Science, Technology and Research) Institute of Chemical and Engineering Sciences recently published a method for converting one palm oil by-product, empty fruit bunches, into lactic acid. This could have uses across many industries: from food and drink to textiles.

The team, led by Wu Jinchuan, obtained soil samples from their local environment. They cultivated bacteria from these samples with two types of sugar present in industrial processes involved in palm oil manufacture: xylose and glucose. The most effective strain in producing L-lactic acid was identified as *Bacillus coagulans JI12*. The team now hopes to genetically engineer this strain to allow the fermentation process that produces lactic acid to take place at a lower pH with minimised yeast extract requirement. This will further increase efficiency and reduce costs. This work was published in *Bioresource Technology*.

The lactic acid can be further converted to acrylic acid after a simple separation and purification process.

Institute of Chemical and Engineering Sciences

Empty fruit bunches from palm oil trees

Acrylic acid has broad applications in making paint additives, adhesives, textiles and super-absorbent materials and is currently produced from fossil fuels. The production of acrylic acid from lactic acid derived from lignocellulose – plant dry matter – would provide a sustainable way for producing this important platform chemical for industries.

Dr Wang Chuan is leading the research for chemically converting lactic acid to acrylic acid. A powerful catalyst has been developed, which gave an acrylic acid yield of more than 80% with good operational stability. Improvement in the catalyst efficiency is still ongoing to further reduce the production cost of acrylic acid. This work has been submitted for patent filing.

For further information contact:
Wu Jinchuan
Institute of Chemical and Engineering Sciences
Singapore
Agency for Science, Technology and Research
Email: wu_jinchuan@ices.a-star.edu.sg

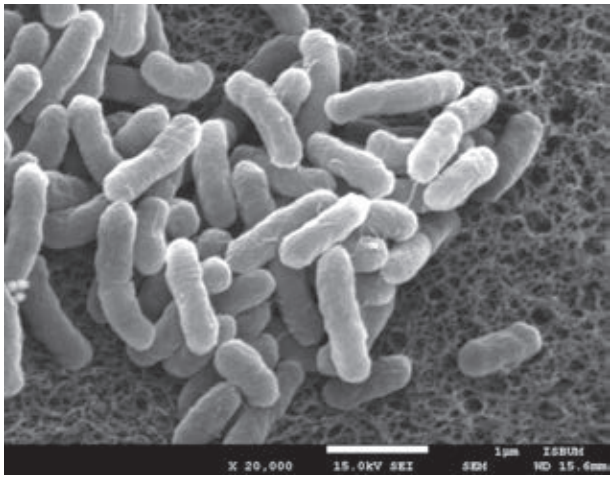
Turning an environmental problem into fish food

Malaysian researchers are using palm oil mill effluent to grow bacteria, ultimately transforming the waste product into a food source for fish larvae.

In countries that encourage palm oil cultivation, the discharge of palm oil mill effluent (POME) is often a serious environmental problem. Researchers at the University of Malaya have now shown that bacteria grown in palm oil mill effluent (called POME-BAC) can transform this waste product into nutrients suitable for culturing rotifers – the tiny aquatic animals that fish larvae feast on.

The team estimates that about 50 litres of POME ultimately produces enough rotifers to feed more than one million fish larvae. The use of POME-BAC could help solve the woes of Southeast Asian fish hatcheries that depend on the unhygienic practice of growing rotifers in fermented trash fish broth.

As wild fish stocks decline and aquaculture expands, the search is on for alternative sources of protein and omega-3 rich oils to produce feeds for farmed fish.



Scanning electron microscope image of bacteria grown in palm oil mill effluent

For further information contact:
Professor Dr Chong Ving Ching
Institute of Ocean and Earth Sciences /
Institute of Biological Sciences
University of Malaya, Malaysia
Email: chong@um.edu.my

Biosensor detects fungal rot in oil palms

A team of international researchers in Malaysia is developing a portable biosensor to detect and ultimately help prevent the spread of the most devastating disease that infects oil palm trees.

The proposed biosensor is designed to identify the fungus *Ganoderma boninense*, which is considered the major cause of basal stem rot and upper stem rot disease.

"Fungi that rot and eventually kill oil palm trees may be costing some South-East Asian countries US$500 million a year," report the researchers in a review paper published in *SpringerPlus*.

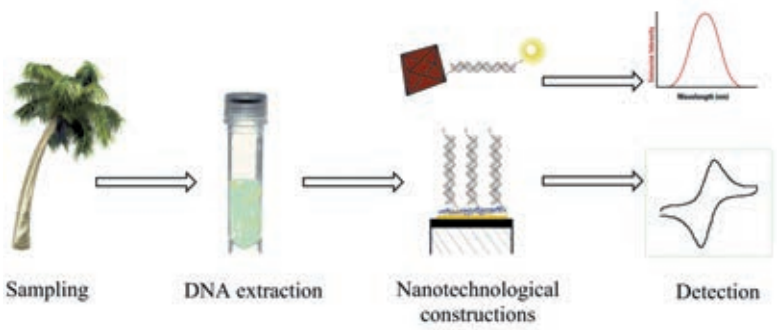
One of the world's main sources of edible oil, the oil palm is also a significant precursor of biodiesel fuel.

"Oil palm trees start bearing fruit after 30 months of planting and are productive for 20 to 30 years," state the authors. "They are the most efficient oil-bearing crop in the world."

To help sustain the economic benefits of the palm oil industry, the team, led by Professor Nor Azah Yusof of Universiti Putra Malaysia, hopes to control fungal rot through early detection of the *G. boninense* fungus. "Once young palms show symptoms of the disease they usually die within one or two years, while mature trees can survive for only three or so years," the researchers explain.

A tree that is 50% infected is already useless, says Professor Yusof. But if caught early enough, this fungal infection can be controlled using a number of methods

Universiti Putra Malaysia



including chemical treatments and sanitation measures designed to prevent uninfected trees from contacting the roots of infected trees.

So far, the researchers have shown that their *G. boninense* biosensor functions at a laboratory scale. "Our next step is to develop a portable device for the sensor system," says Professor Yusof. "We plan to use an imaging technique, with which we can develop a smartphone app for detecting this fungus."

For further information contact:
Professor Nor Azah Yusof
Institute of Advanced Technology
Universiti Putra Malaysia
Email: azahy@upm.edu.my

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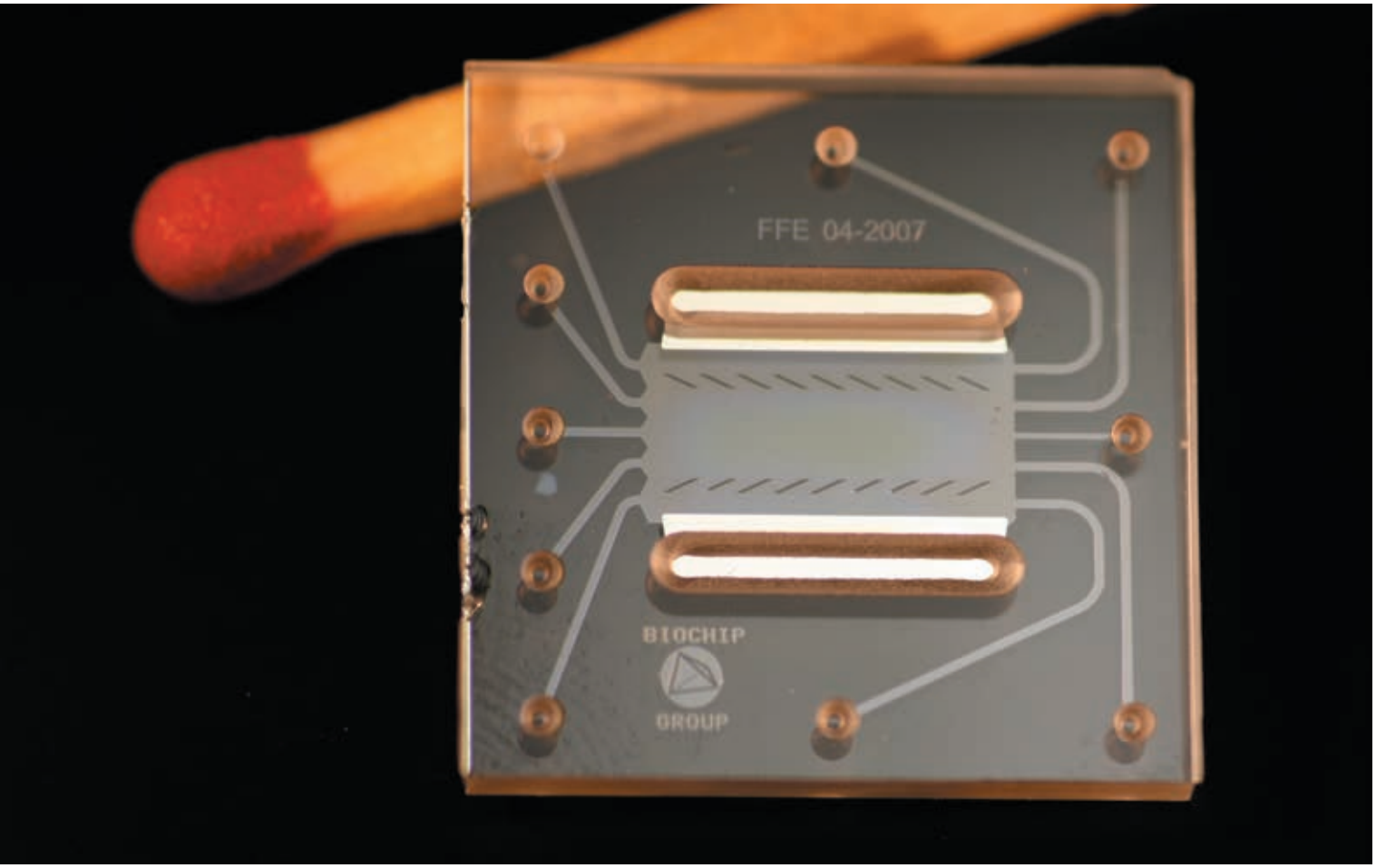


Stefan Schlautmann / Flickr

Microfluidic Chip

Taking the heat off microfluidic chips

Replacing a high-temperature processing technique with an infrared treatment allows the manufacture of tiny devices without damaging their polymer components.

Microfluidic devices allow microelectronic engineers to shrink laboratories to the size of a computer chip. By ferrying reagents through a series of microscopic channels and reservoirs carved into a flat plate, researchers can develop new chemical reactions or monitor the cellular effects of drugs on a much smaller scale, potentially saving time and money.

Some microfluidic devices have electrical components that act as heaters or sensors. But researchers have struggled to develop a rapid, low-cost method for creating the detailed metal patterns that make up these circuits.

Conventional techniques used to build these circuits tend to require high-temperature processing, which can damage the transparent polymers typically used to build microfluidic devices, such as polycarbonate or poly(methyl methacrylate). Despite this drawback, polymers are preferred over hardier alternatives because they "have very good optical properties, which most microfluidic devices require, and they are viable for plastic injection moulding, which enables high-volume production," explains Zhaohong Huang of the A*STAR Singapore Institute of Manufacturing Technology.

Huang and his co-workers have developed an alternative process that avoids exposing the polymers to high temperatures. They first cover sheets of polymers with thin layers of chromium, copper and nickel, and add a coating of a light-sensitive material called a photoresist. Huang's team then uses infrared heating elements to remove any residual solvents. The metal layer acts as a protective barrier, reflecting more than 95% of any infrared radiation that hits it. This means that the radiation warms the photoresist layer but not the polymer beneath.

The researchers then use standard photolithography processes to create the microfluidic device. They place a patterned mask over the sandwich and shine ultraviolet light to erode some areas of the photoresist. They then etch away the exposed areas of metal beneath using a wash of chemicals. This leaves a clean metal pattern, which has features as small as 10 micrometres in width.

"If the surface finish is gold, our method can cut costs by more than 90%," says Huang. His team is now refining the process and creating patterns of different metals with catalytic properties, which could speed up chemical reactions inside microfluidic devices.

For further information contact:
Zhaohong Huang
Singapore Institute of Manufacturing Technology
Agency for Science, Technology and Research
Email: zhhuang@SIMTech.a-star.edu.sg

Scattering light to improve focus

The properties of light make it difficult to control on a scale smaller than its own wavelength. But researchers at the Korea Advanced Institute of Science and Technology (KAIST) have made a breakthrough in subwavelength optics that makes this easier, providing a way to visualise structures that are too small to see with conventional microscopes.

When focusing light with conventional optical tools such as microscope lenses, an effect called diffraction, which spreads light waves, makes it impossible to resolve individual objects that are smaller than about 250 nm. If this diffraction limit could be overcome, it would be possible to directly visualise individual molecules within cells, or nanostructures used in manufacturing electronics, for example.

Theoretically, it is possible to overcome the 250 nm diffraction limit and resolve smaller objects by controlling "near-field" light waves. These are created when light reflects off the surface of an object, but doesn't travel any further from the surface than a distance equal to one wavelength. This is in contrast to "far-field" light waves, which travel long distances from the surface and can be easily controlled with conventional optics. Since near-field waves are confined to within a few nanometres of an object's surface, they are inaccessible with such optics and so are impossible to control in the same way. But KAIST researchers have found a way to overcome this problem.

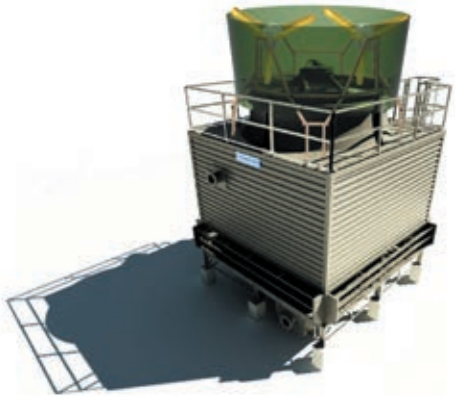
The team discovered that by scattering far-field light waves in a controlled way, they could recreate near-field waves to allow focusing of light below the diffraction limit. The light was scattered by passing it through a layer of turbid (cloudy) medium containing nanoparticles: if they selectively manipulated the shape of the far-field light waves that reached this layer, they could focus the light at a resolution below the normal limit of diffraction.

The KAIST team showed that the same effect was achieved with a layer of either zinc oxide nanoparticles or simple white spray paint, and they say that any similarly turbid medium would be suitable. Other methods developed to overcome the diffraction limit require specialist equipment, such as a near-field scanning optical microscope or lenses made from artificial materials, so the new approach is cheaper, easier and more versatile. The research was published in *Nature Photonics*.

Professor YongKeun Park

For further information contact:
Professor YongKeun Park
Department of Physics
Biomedical Optics Laboratory at KAIST
Korea Advanced Institute of Science and Technology
Republic of Korea
Email: yk.park@kaist.ac.kr

Micro turbine generates clean electrical energy



Artist's impression of the exhaust air-wind energy recovery turbine generator at the outlet of a cooling tower.

Scientists at the University of Malaya have designed a micro-scale vertical-axis wind turbine (VAWT), reminiscent of the stern wheel of an old-fashioned paddle boat, to generate clean electricity by harvesting some of the wind from powered air vents on buildings.

Airflow that would otherwise go to waste can now be used to supplement power to the buildings on which such turbines are mounted. This reduces the greenhouse gas emissions from conventional power generation, earning buildings that use these turbines a higher green rating.

According to the researchers, natural wind in Malaysia is too low-speed and inconsistent for large-scale wind generation. By contrast, "unnatural" wind from powered air vents on buildings forms a strong, predictable, reliable and harvestable energy supply for Malaysia and other countries with similar wind patterns.

The VAWT system can be retrofitted to existing cooling towers, giving them together with powered air vents and air conditioning systems worldwide a high market potential.

The VAWT mounts above, and slightly offset from, a building cooling tower's air stream. It is designed not only to avoid degrading a cooling tower's efficiency, but also to improve it. A safety enclosure is designed with internal air guides that create a Venturi effect, funnelling the air stream to increase its speed. This pulls air from a cooling tower vent more efficiently and at the same time directs more airflow to the turbine generator's blades.

Field-testing of an early turbine design showed no measurable difference in the speed of the airstream in cooling towers fitted with it. In fact, the fan motor driving the tower's airflow drew only 0.39% more electricity. By comparison, the new design recovered about 13% of a cooling tower fan's motor energy consumption.

The research team says it is now exploring several design improvements that should increase efficiency even further.

For further information contact:
Dr Chong Wen Tong
Faculty of Engineering
University of Malaya, Malaysia
Email: chong_wentong@um.edu.my

Harvesting vibrations to power microsensors

Dead batteries may soon be a thing of the past. Researchers in Singapore have found a way to efficiently harness low frequency vibrations as a power source for miniature electronic devices.

A team from Singapore's Agency for Science, Technology and Research (A*STAR) is tapping into low frequency vibrations – the most abundant and universal energy source in our environment – as a means to power small-scale electronic devices, such as mobile electronics.

The A*STAR energy harvester can continuously convert vibrations of different frequencies into electricity. This breakthrough offers a green, economical and sustainable long-term solution to eliminate the manual recharging or replacement of power sources in miniature devices.

Previous attempts to harvest electricity from low frequency vibrations have focused on expanding the size of the device in order to attain maximum power output. However, this limits the potential applications of energy harvesters. In addition, most reported designs can only operate at one fixed frequency, which significantly reduces the power generation efficiency in practical environments.

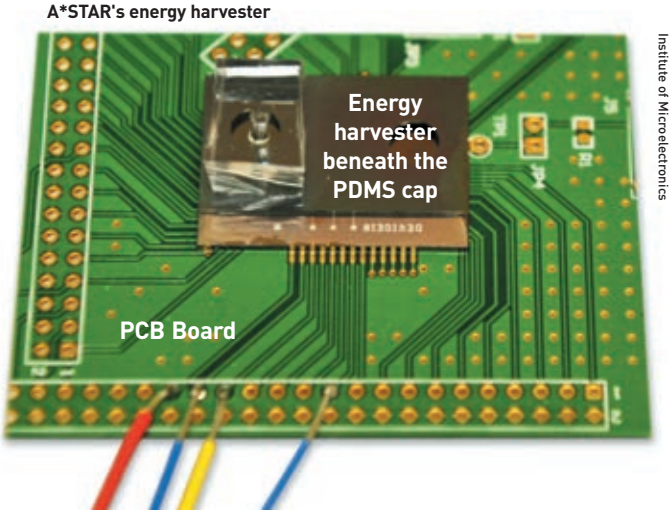
To address these design challenges, researchers at A*STAR's Institute of Microelectronics (IME) have developed an aluminium nitride-based energy harvester that can generate enough electricity to power three commercial implantable batteries over a ten-year period. What's more, the device can harvest the widest possible spectrum of low frequency vibrational sources, ranging from 10-100Hz. This will make it possible to harness real-world vibrational sources more productively, in spite of their irregularity and randomness.

"This breakthrough presents tremendous opportunities to realise a practical, sustainable and efficient energy renewal model for a wide range of applications – from implantable medical devices, wireless communication and sensor networks, to other mobile electronics that enable a future mobile society," says Professor Dim-Lee Kwong, executive director of IME.

The IME team is currently fine-tuning the energy harvester's features to achieve greater performance.

For further information contact:
Dr Shin-Miin Song
Institute of Microelectronics
Agency for Science, Technology and Research
Singapore
Email: songsm@ime.a-star.edu.sg

A*STAR's energy harvester



Institute of Microelectronics

Waseda University Research Institute for Advanced Network Technology

Japan begins testing "smart house" technology

Japan is starting to test demand-response (DR) control technology that will eventually allow the remote coordination and control of low-voltage electric equipment used in residential and business settings.

When widely deployed, DR control technology will allow electricity suppliers to control the settings of low-voltage appliances and devices used in houses and buildings equipped with smart meters and home energy management systems. In doing so, this technology could help avoid scheduled blackouts and achieve energy conservation within reasonable limits, even during times of highly stringent power supply and demand such as the 2011 earthquake and tsunami.

In December 2013, Waseda University and Japan's Ministry of Economy, Trade and Industry set up new servers, located at the Energy Management System (EMS) Shinjuku Demonstration Center, to handle DR signals over the Internet or privately owned networks. This is an important first step towards the development of communication standards for linking electric utilities, aggregators (wholesale electricity suppliers) and consumers with automated demand response (ADR) systems.

Based at Waseda University, the EMS Center provides platforms for testing and evaluating DR control technology using telecommunications standards. The facility is being used to link and coordinate low-voltage equipment made by different manufacturers – including smart meters, solar cells, electric vehicles, fuel cells, heat pump water heaters, air conditioning equipment and storage batteries – in response to energy conservation signals sent from electric utilities.

For further information contact:
Professor Yasuhiro Hayashi
Director
Waseda University Research Institute for Advanced Network Technology, Japan
Email: c.takizawa3@kurenai.waseda.jp

A wireless sensor to remotely diagnose stressed machines

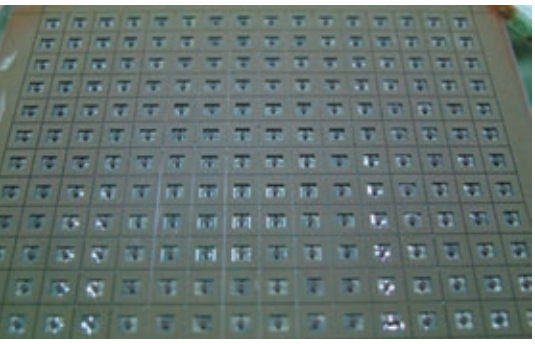
A new diagnostic tool for machinery can save industries time and money.

Researchers at the Singapore Agency for Science, Technology and Research (A*STAR) have developed and demonstrated a miniature wireless sensor to remotely diagnose the health of machinery, such as motors, pumps and generators.

The technology works by monitoring the vibrations and physical stresses that impact the efficiency of equipment.

Licensed to Hoestar PD Technology Pte Ltd of Singapore, A*STAR's piezoelectric sensor technology is designed to provide real-time updates on the physical integrity of a machine and act as an early warning system to alert users about impending failures.

By diagnosing the health of deteriorating equipment, the technology will allow businesses to plan for the replacement of crucial components before they fail, thereby minimising costly production delays. It will also raise productivity by removing the need to manually check equipment and by reducing the chances of undetected defects due to human error.



Institute of Materials Research and Engineering (IMRE)

A batch of piezoelectric sensors similar to the ones currently being customised to Hoestar's design specifications for the automated, wireless monitoring of equipment.

The prototype technology couples Hoestar's expertise in diagnosing machine health with A*STAR's know-how in piezoelectric and sensor research. A*STAR's Institute of Materials Research and Engineering (IMRE) customised its piezoelectric technology so a millimetre-sized sensing element could be integrated with wireless technology to enable remote monitoring.

Dr Yao Kui, who leads the IMRE team, says their goal for 2014 is to demonstrate the improved performance and operation of a second-generation prototype wireless sensor.

"This new system will save companies time, money and labour as the innovative sensor is safer, more accurate and quicker at data collection," says Leong Weng Hoe, managing director for Hoestar.

Did you know?

The term "piezoelectric" refers to the electric charge that builds up in certain solid materials in response to pressure.

For further information contact:
Dr Yao Kui
Institute of Materials Research and Engineering
Agency for Science, Technology and Research
Singapore
Email: k-yao@imre.a-star.edu.sg

Laurent Jégou /Flickr

New memory takes the heat for use in harsh environments

A new type of non-volatile computer memory which can withstand higher temperatures has been developed at the Agency for Science, Technology and Research (A*STAR).

This makes it useful for systems capable of handling data in what are known as harsh environments; such as satellites, aircraft turbines and motor vehicle engines. More specifically, this memory can be integrated into sensors that are used for structural health monitoring.

Examples of non-volatile memory include the cards used to store information in most digital cameras and music players, or the solid state drives (SSDs) that are replacing hard drives in some computers. Non-volatile memory does no require constant power to keep data intact. New data is stored by applying an electrical current, but once changed, it remains intact without any power connected.

The greatest weakness of non-volatile memory is its sensitivity to heat. At temperatures above 85°C, data loss is accelerated at an exponential rate with every additional degree of temperature. A*STAR's phase change memory operates reliably at temperatures as high as 150°C while accessing data 500 times faster than current flash memory cards and SSDs. To achieve this, a team at A*STAR's Data Storage Institute developed new materials with better stability and temperature resistance that can be produced using the same methods employed to make current electronic chips.

Preliminary tests suggest the new memory will safely undergo at least as many read/write cycles as current flash memory devices before wearing out. They should also store data safely for up to ten years.

The researchers have subjected the new memory to radiation testing with the goal of using it in space missions and will continue to develop materials that will handle even higher temperatures. The research project was completed this year.

For further information contact:
Dr Franck Ernult
Data Storage Institute
Agency for Science, Technology and Research
Singapore
Email: franck_ge@dsi.a-star.edu.sg

University of Malaya

Researchers test wave energy generator

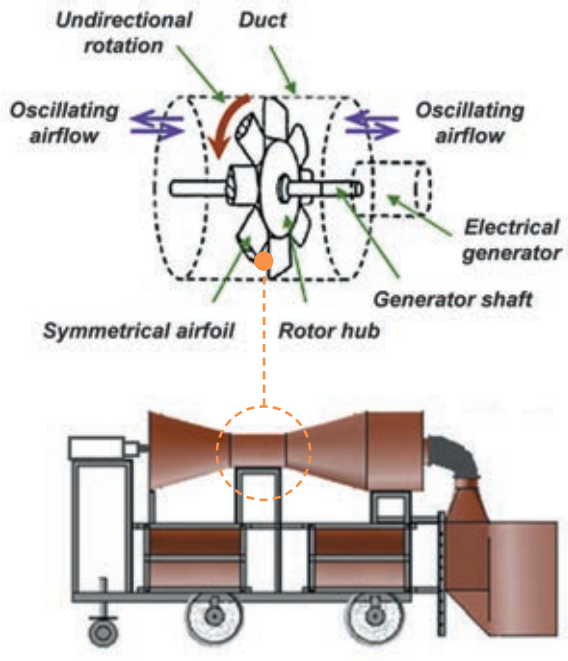
Ocean waves provide concentrated, abundant, inexhaustible and non-polluting renewable energy, but Malaysia's coastal waves hold only half the power considered viable for competitive electrical generation.

Now a research team, headed by Norhafizan Ahmad of the University of Malaya, has found a practical way to harness low-energy waves for small-scale electricity generation in coastal and island nations.

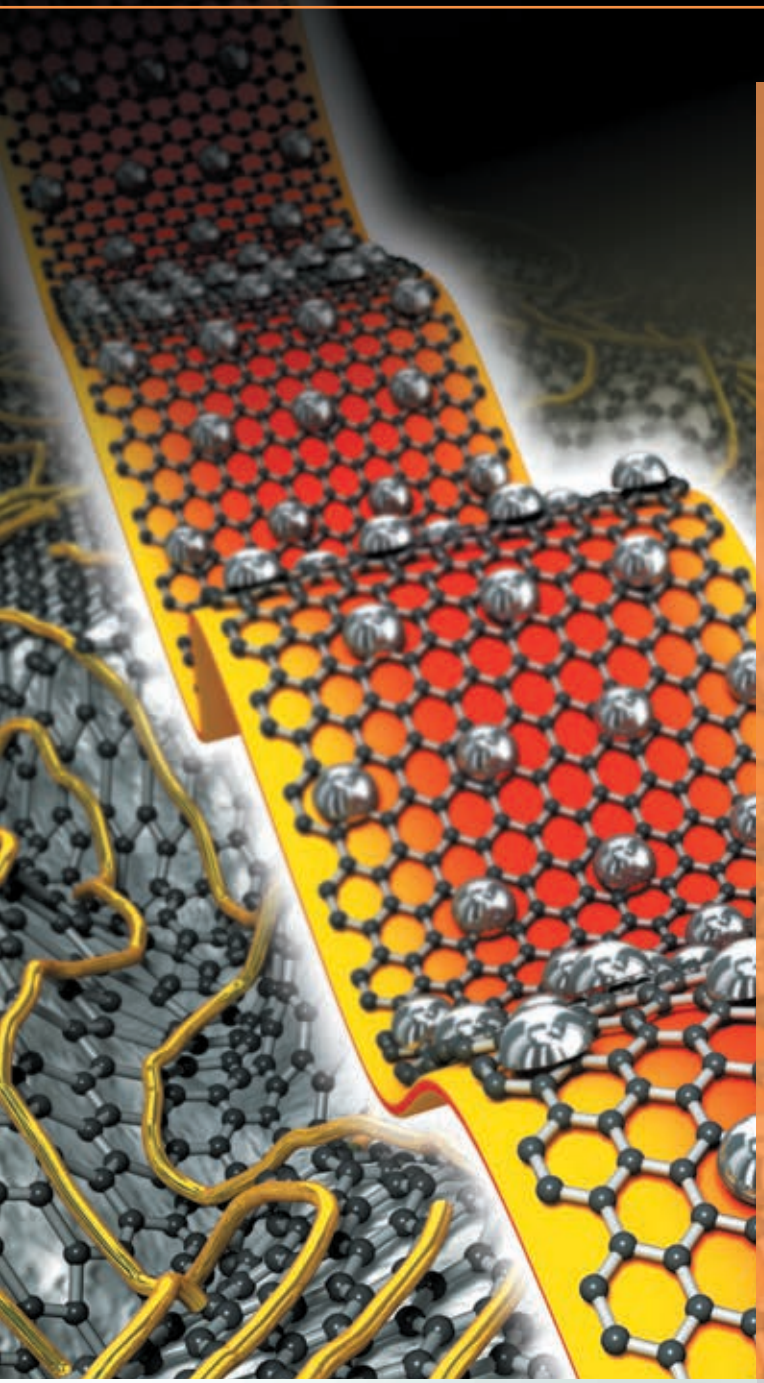
The first prototype wave energy generator has been tested near the coastal area of Terengganu, Malaysia. The system converts wave energy to low-pressure airflow, which drives an air turbine connected to a generator. While the airflow oscillates as waves move in and out, the turbine blade is designed to capture this back-and-forth flow while rotating in only one direction.

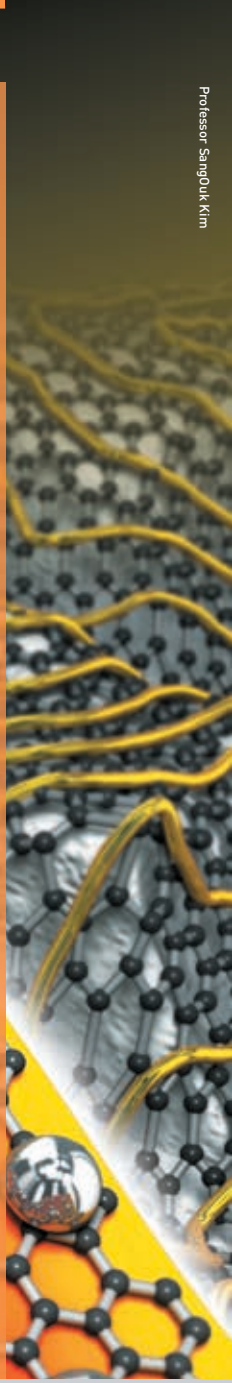
So far, the research team has fabricated a special design solution allowing the turbine blades to be used at low-pressure airflow levels. The team is now working on the optimisation of the turbine blades with funding from the Ministry of Energy, Green Technology and Water.

"Malaysia has a total coastline of 4,675 kilometres, so there is a great potential for the utilization of wave energy, especially along the coast and islands," says Ahmad. "Based on our analysis, the total available wave power in Malaysian seas is more than 39,000 megawatts. This means that if 30% of the coastal area is harvested, then almost 12,000 megawatts of energy could be extracted, which is equivalent to half the present energy needs of Malaysia."



For further information contact:
Mr Norhafizan Ahmad
Department of Mechanical Engineering
Faculty of Engineering, University of Malaya
Malaysia
Email: norhafizan@um.edu.my





Professor SangOuk Kim

Inexpensive graphene film produces nanoscale semiconductors

Korean researchers are using modified graphene to produce 3D nanopatterns that can be transferred onto other substrates to make flexible electronic devices.

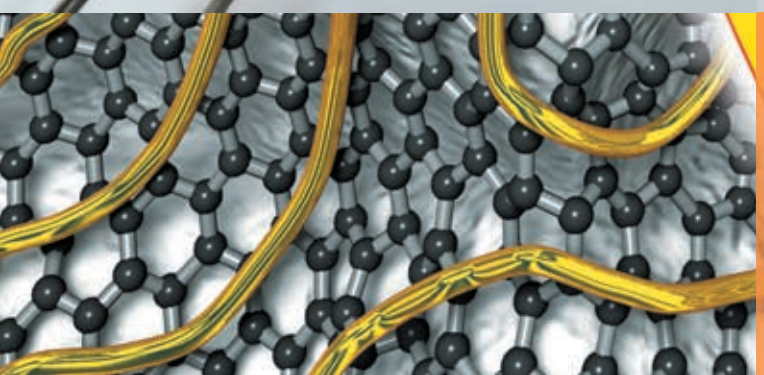
The process uses block copolymer (BCP) self-assembly on a chemically modified graphene (CMG) substrate to produce irregular, flexible and even three-dimensional nanostructures. BCP self-assembly is a process in which disorganized nanoscale components react with each other to form organized patterns.

CMG is an inexpensive, flat, smooth, robust, yet flexible and disposable intermediate film. It is an ideal foundation for producing precise, nanoscale semiconductor structures. CMG film can, in turn, be used to transfer the semiconductors it holds onto hardier plastic surfaces, which are themselves too rough or irregular to support accurate nanopatterns.

The researchers say CMG film is an excellent transferrable and disposable substrate for supporting self-assembling nanopatterns - far better than normal graphene. It keeps precise semiconductor patterns intact during transfer, even when applied to highly curved three-dimensional or flexible materials, without distorting nanopatterns or the larger designs they form.

The team says its process could also be used in concert with other self-assembly systems for producing nanostructures to make finer, more complex shapes than current methods allow on their own. It works with DNA and protein processes as well as nanopatterning methods such as e-beam lithography and scanning probe nanolithography. This research was published in *Advanced Materials*.

For further information contact:
Professor SangOuk Kim
Department of Materials Science and Engineering
Korea Advanced Institute of Science and Technology (KAIST)
Republic of Korea
Email: sangouk@kaist.ac.kr



"Co-doped" graphene produces working semiconductor devices

Researchers at the Ulsan National Institute of Science and Technology (UNIST) in South Korea are on their way towards industrial-scale production of graphene suitable for semiconductors.

Graphene is a one-atom-thick carbon layer that is highly conductive. While graphene's outstanding electrical properties have made it the focus of many studies since its discovery in 2004, it has not been practical for manufacturing semiconductors.

Pure graphene is a semimetal material that, alone, does not allow the electrical switching needed to make logic devices, such as field-effect transistors. The operation of semiconductor chips is based on such logic devices. The UNIST team is researching ways to make graphene-based logic chips practical.

To address the problem, the team has developed a simple but promising way to "dope" graphene: in other words, to modify its electrical properties by deliberately inserting impurities. The process involves coupling boron with nitrogen.

Boron doping has shown promise for scaling up graphene production, but boron and carbon atoms are mismatched in size, which makes uniform doping challenging. After the UNIST team paired boron with nitrogen to overcome the mismatch, the combination was easily introduced into graphene. It turns out the resulting boron-carbon-nitrogen graphene (BCN-graphene) can be efficiently mass-produced.

Current test devices made by using BCN-graphene are less efficient than commercial silicon devices but prove the concept. The experimental device's switching ability and its potential for scalable production using simple solution processing methods suggest many potential practical uses such as logic devices, water splitting devices and sensors.

Professor Jong-Beom Baek, who leads the UNIST team, says the remaining challenge is fine-tuning its band-gap to improve switching performance for real-world semiconductor devices.

Did you know?

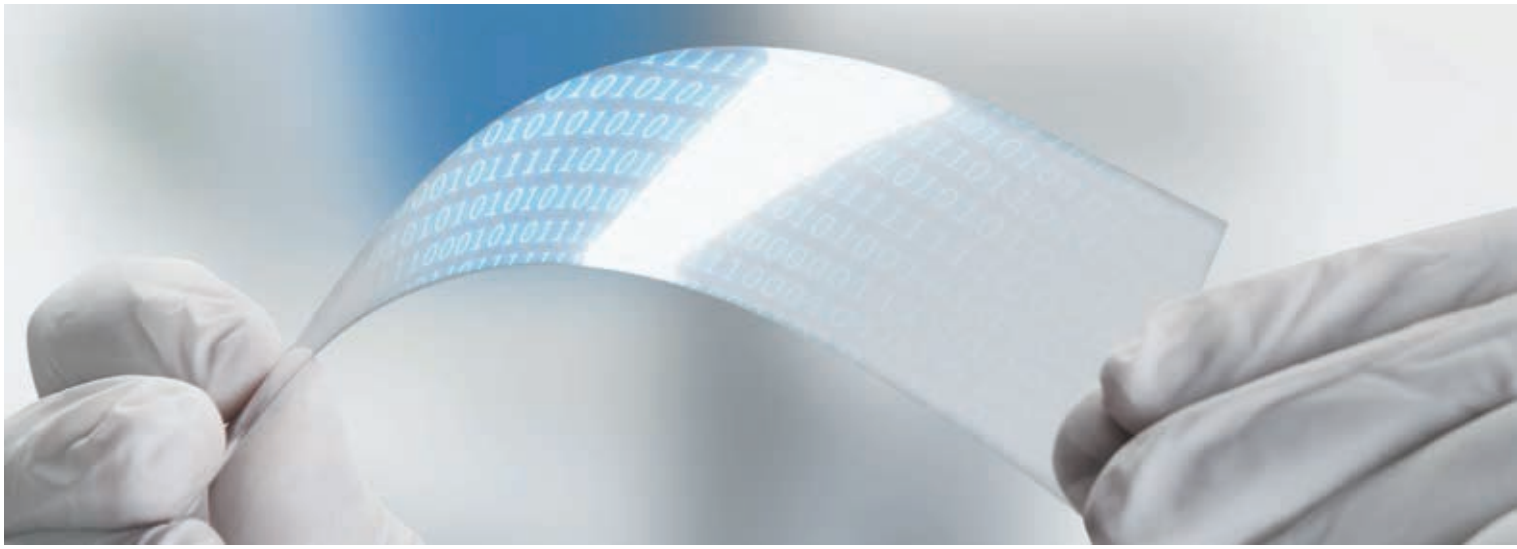
Through 2013, the UNIST team combined "ball-milling", or grinding, with chemical processes to make several graphene variants that are chemically modified at their edges. These variants are suitable for producing efficient, cost-effective non-metal electrodes in fuel cells. One variant also promises better energy conversion for flexible solar cells.

In June 2013, UNIST reported using ball-milling to produce graphene "nanoplatelets": nanoscale stacks of graphene discs that are doped with various halogen atoms, including chlorine, bromine and iodine molecules. All of these materials proved to catalyse the reduction of oxygen very efficiently. Since fuel cells rely on this reaction to work, such halogenated materials show promise for use as non-metal fuel cell cathodes, which could lead to less costly mass-produced fuel cells. Until now, most fuel cells have relied on costly platinum electrodes to function.

UNIST researchers also combined ball-milling and chemical processes to fix nitrogen molecules in the edges of graphene. This has resulted in a material that offers very good catalytic performance for dye-sensitised solar cells and fuel cells. The material has the ability to replace conventional platinum catalysts for energy conversion.

Lastly, UNIST announced a ball-milling process, this time using sulphur, to produce another metal-free catalyst that offers good efficiency and long-term stability. The research team says the material shows promise for manufacturing low-cost, high-efficiency fuel cells.

For further information contact:
Professor/Director Jong-Beom Baek
Interdisciplinary School of Green Energy/
Low-Dimensional Carbon Materials Center
Ulsan National Institute of Science and Technology (UNIST)
Republic of Korea
Email: jbbaek@unist.ac.kr



Producing graphene bubbles from blown sugar

Researchers are using the ancient art of blown sugar to produce three-dimensional graphene for supercapacitors.

Graphene is a two-dimensional material made from a single layer of carbon atoms. Despite being very thin, graphene is extremely strong, lightweight and excellent at conducting electricity, so it has a wide range of potential applications. The ability to make three-dimensional graphene structures would increase its potential further, but this has proved difficult. Most attempts have resulted in structures that have poor electrical conductivity and lack strength, but recent work led by researchers at Japan's World Premier International Center for Materials and Nanoarchitectonics (WPI-MANA) has overcome these problems for the first time.

The WPI-MANA team used a technique based on the ancient art of blown sugar to produce a structure consisting of a network of conjoined graphene bubbles, similar to the structure of a sponge. The researchers heated a syrup of ordinary sugar to form a structure called melanoidin. This syrup was mixed with ammonium chloride, which produced gas to create bubbles. As the reaction continued, the melanoidin bubble walls gradually formed graphene, finally setting into a solid structure they called "strutted graphene", made up of the original bubble walls and interconnecting struts.

The team showed that strutted graphene is extremely strong and can be compressed to 80% of its size without collapsing. What's more, it also retains full electrical conductivity. Costing just US$0.5 per gram to produce, this makes it suitable for many applications, including supports, chemical catalysts, hydrogen reservoirs, gas sensors and air filters. The team also showed that strutted graphene can act as a supercapacitor that stores a large amount of electricity, with the potential to create more efficient batteries that charge more quickly, store more power and have a longer lifespan.

For further information contact:
International Center for Materials
Nanoarchitectonics (MANA)
World Premier International Research
Center Initiative (WPI)
National Institute for Materials Science, Japan
Email: mana-pr@ml.nims.go.jp

Mass-produced 3D graphene paves way for more efficient supercapacitors

Researchers have found a way to successfully synthesise three-dimensional graphene in mass production quantities, opening the door to its eventual use in high performance electric vehicles.

Using polymers as a carbon source and metal precursors as a catalyst, a team at the Ulsan National Institute of Science and Technology (UNIST) has developed an environmentally-friendly, high-yield process for synthesising highly conductive 3D mesoporous graphene: a material riddled with tiny holes to increase its surface area.

Offering better conductivity than standard graphene, the three dimensional material could be used to make more efficient electrodes for supercapacitor applications. For example, the long life and power-handling characteristics of supercapacitors make them a preferred power source for future high performance electric vehicles.

Current high-quality commercial graphene manufacture couples low yields with potentially large environmental impacts such as the release of toxic gases. By contrast, 3D mesoporous graphene offers higher-volume and cleaner mass production.

For further information contact:
Professor Ji-Hyun Jang
School of Energy and Chemical Engineering
Ulsan National Institute of Science and Technology (UNIST)
Republic of Korea
Email: clau@unist.ac.kr

Professor Ji-Hyun Jang

New technology increases polymer LED and solar cell efficiency

A new method has been developed to fabricate high-performance polymer electronic devices using carbon-dot supported silver nanoparticles.

South Korean researchers have developed a single process for fabricating polymer light-emitting diodes (PLEDs) and polymer solar cells (PSCs) that, they say, remarkably increases their efficiency. The new method also shows great promise for producing polymer-based lasers.

This method, which involves carbon dot-supported silver (CD-Ag) nanoparticles, significantly enhances the outputs of polymer electronic devices. The effect of the nanoparticles is to reinforce the tiny electromagnetic fields within such devices to make them more energy efficient.

Reporting their results in *Nature Photonics*, the researchers – based at Ulsan National Institute of Science and Technology (UNIST) – say their method offers a versatile and effective way to create high-performance polymer electronic devices. Polymer devices are less expensive and easier to produce than current non-organic devices, such as gallium nitride (GaN) LEDs and silicon solar cells. Non-organic raw materials are also rarer than polymers.

While metal nanoparticles are thought to have great potential for improving the efficiency of semiconductors, there have been few examples, until now, of a single process that can enhance both PLED and PSC devices. What's more, only basic equipment is required to create CD-Ag nanoparticles, while a low temperature, solution-based process adapts the method easily to both high volume mass production and to printed electronics.

Did you know?

Organic polymer semiconductors offer several advantages over silicon: they weigh less, offer mechanical flexibility, and are easier and less expensive to manufacture. However, their power conversion efficiency remains below the 10% threshold that is considered a minimum for, say, commercial solar cells.

Now, using a simple surface treatment, researchers at UNIST have raised the efficiency of experimental organic semiconductor devices to a level of 8.31%. Promising uses of this technology include high performance organic polymer solar cells, light emitting diodes, thin-film transistors and laser diodes.

For further information contact:
Professor Jin Young Kim
School of Energy and Chemical Engineering
Ulsan National Institute of Science and Technology (UNIST), Republic of Korea
Email: jykim@unist.ac.kr

Randomized beam improves laser imaging

New technology for generating smoother laser images could be used to control the quality of polymer packaging and printed electronics, and for biomedical imaging.

Laser light is synchronized in time and space to produce a very bright, sharp, coherent beam, making it ideal for accurate imaging and measuring devices.

But a laser beam reflecting from even a slightly uneven surface accentuates irregularities. This distortion complicates the process of reading biomedical imaging done in the infrared spectrum.

Now, a Singapore research team led by Ying Zhang is generating smoother laser images by etching nanoholes in semiconductor lasers to randomize parts of the mid-infrared spectrum without reducing brightness.

Images produced by the electrically pumped mid-infrared random laser are very bright like those of a conventional laser. But the altered, slightly softer focus it produces in certain wavelengths provides a better, more easily read image.

Team member Dr Hou Kun Liang says that before random lasers can be brought to market, the team wants to build a version that operates at room temperature and adds more random wavelengths.

For further information contact:
Dr Hou Kun Liang
Singapore Institute of Manufacturing Technology
Agency for Science, Technology and Research
Email: hkliang@SIMTech.a-star.edu.sg

Institute for Basic Science

South Korea develops heavy ion accelerator

South Korea has embarked on an ambitious billion-dollar project to develop a heavy ion accelerator, thus allowing the country to join the international race to discover stable superheavy elements.

South Korea is an economic powerhouse thanks to its support of applied research that has made companies like Samsung and LG household names. But a sluggish economy of late has convinced the government that a vibrant fundamental research effort is critical to future growth. With that in mind, the nation is embarking on its most ambitious basic science project ever: the US$1 billion RAON heavy ion accelerator in the city of Daejeon, one hour south of Seoul by high speed train.

When it is completed around 2020, the RAON accelerator, named after a Korean word meaning joyful, will be the jewel of South Korea's young Institute for Basic Science. As part of the Institute's Rare Isotope Science Project, RAON will allow Korean researchers to probe how elements heavier than iron are forged in supernovae. South Korea will thus join the international race to discover stable superheavy elements.

"The science will be broad and wide," says physicist Sun Kee Kim, director of the Rare Isotope Science Project.

The RAON accelerator will also be used for biomedical applications, including the development of sharper diagnostic imaging, and for heavy ion therapy using carbon and other isotopes in cancer treatments that cause less collateral damage to a patient's DNA.

Even before RAON's science program kicks into gear, Korean physicists and engineers will learn new skills by fabricating the superconducting cavities and other advanced materials for the 18.5 million electron volt accelerator.

"We want to develop our own capacity to build this machine," says Kim, whose 90-person team has wrapped up most of the design work and is now moving to build a prototype.

Before being appointed project director in December 2011, Kim was a leader of South Korea's premier dark matter experiment and enjoyed the exhilarating hunt for the elusive cosmic quarry. Kim says it was well worth moving on to bring an accelerator to life.

For further information contact:
Ga-young Koo
Rare Isotope Science Project
Institute for Basic Science
Republic of Korea
Email: gykoo@ibs.re.kr

Nanoscale pores turn plastic into oil-absorbent material

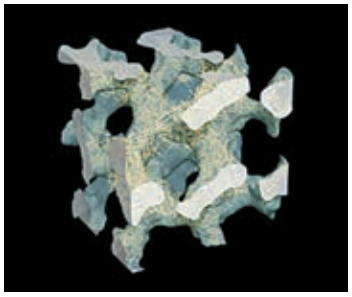
Japanese researchers have developed a method to clean oil-contaminated water at oil and natural gas development sites.

Large volumes of oil-contaminated water are generated at oil and natural gas development sites. Such sites need low-cost and efficient water treatment systems that can prevent this water from polluting the environment. Now, researchers at Japan's National Institute for Materials Science (NIMS) have developed a method, published recently in *Nature Communications*, that harnesses engineering plastics widely used for industrial purposes to prepare a high-performance oil absorbent.

Previously, conventional technologies were unable to form, in a controlled manner, the nano-sized pores necessary to give polymer materials an oil-absorbent property. The NIMS researchers used cryogenic separation to separate a polymer and solvent from a polymer solution. The solvent was then used to form nanocrystals within engineering plastics. By removing the nanocrystals, they created a mesoporous polymer containing nanoscale pores connected in sequence. This new absorbent polymer can take the form of a sheet, pellet or fibre.

The polymer has a large surface area exceeding 300 square metres per gram, which allows it to efficiently absorb oil from water, say the researchers. They found that the new mesoporous material could absorb more than 260 mg of cresol per gram. Cresol is an organic compound found in oil-contaminated water. Moreover, at high temperatures, oil could be removed from the absorbent polymer, allowing it to be used repeatedly.

The researchers say their next focus will be confirming the on-site performance of the separation system using the new material.

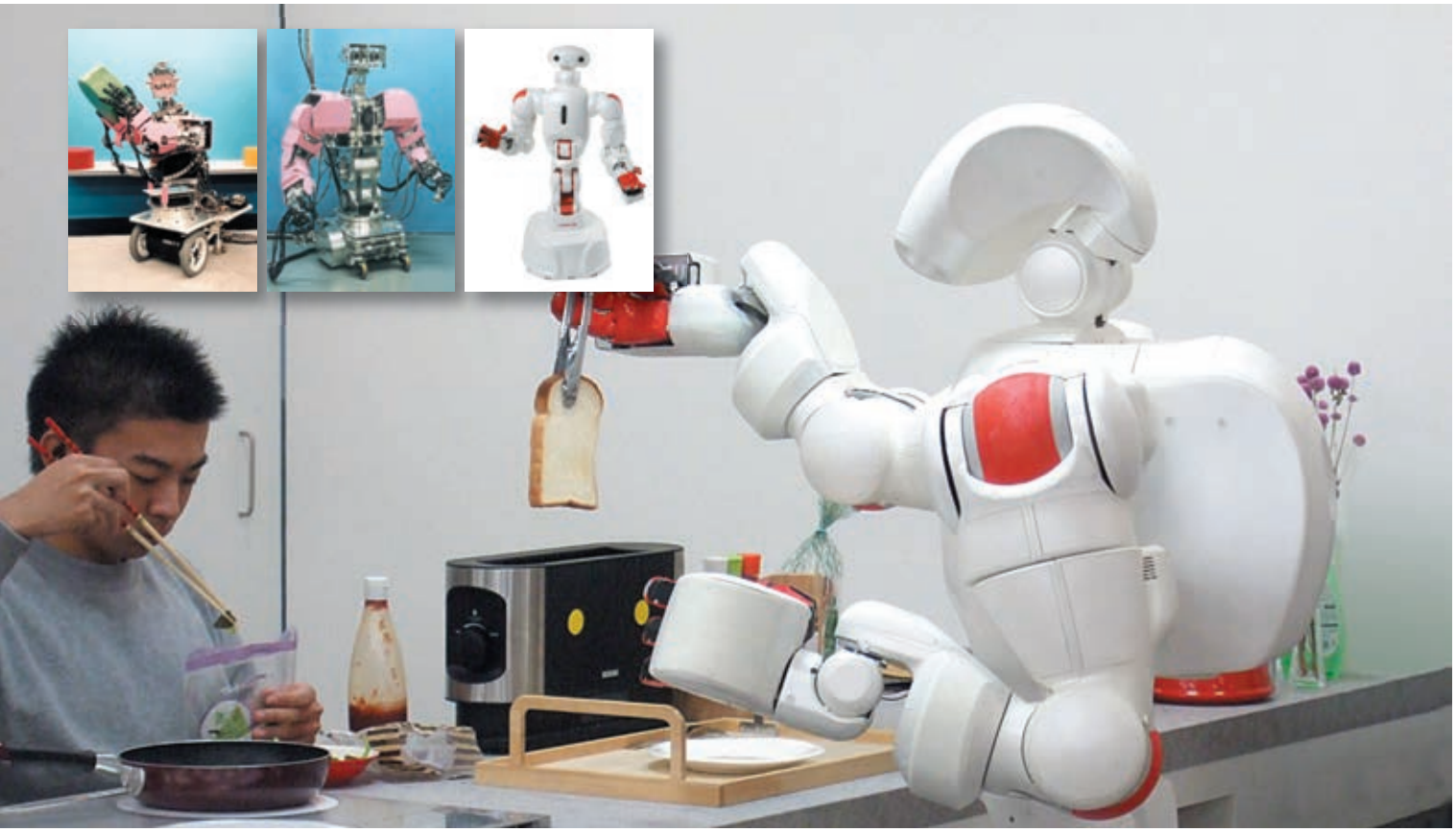


National Institute for Materials Science

Schematic view of a mesoporous polymer

For further information contact:
Sadaki Samitsu
Researcher, Separation Functional Materials Group
Polymer Materials Unit
National Institute for Materials Science, Japan
Email: samitsu.sadaki@nims.go.jp

Izumi Ichinose
Unit Director
Polymer Materials Unit
National Institute for Materials Science, Japan
Email: ichinose.izumi@nims.go.jp

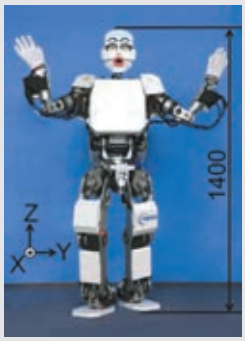


Sugano Laboratory, Waseda University

INSET: Left to right - Hadaly-2 (1997), Wendy (1999) and TWENDY-ONE (2007 onwards). TWENDY-ONE is the 21st Century version of WENDY, its predecessor. WENDY stands for Waseda ENgineering Designed sYmbiont.

Did you know?

Also at Waseda University, Takanishi Laboratory researchers have developed KOBIAN, a walking robot that uses its whole body to display a range of emotions. Able to move eyelids, eyelashes and lips, open its mouth in a circle, wave its arms or make a crying gesture, KOBIAN can express happiness, anger, surprise, sadness, fear, dislike and a normal face. With human-like movements and an ability to show feelings, this robot, or its next generation, may someday offer comfort to people in nursing homes.



(Kobian robot): Takanishi Laboratory, Waseda University

Researchers in the Takanishi Laboratory expect the control method and software developed for KOBIAN to be widely used in many humanoid-type personal robots within the next five or ten years.

In the meantime, the KOBIAN team's goal for 2014 is "to make more people laugh by interaction."

Robots to care for the elderly

Researchers in Japan are developing robots that have the ability to perform household tasks and provide emotional comfort for the elderly.

With birth rates declining and populations aging in many developed countries, demand for eldercare is growing. One creative solution is to design affordable robots that can support the elderly in their daily tasks. These robots would need to be able to handle a variety of items such as household appliances, plates and utensils.

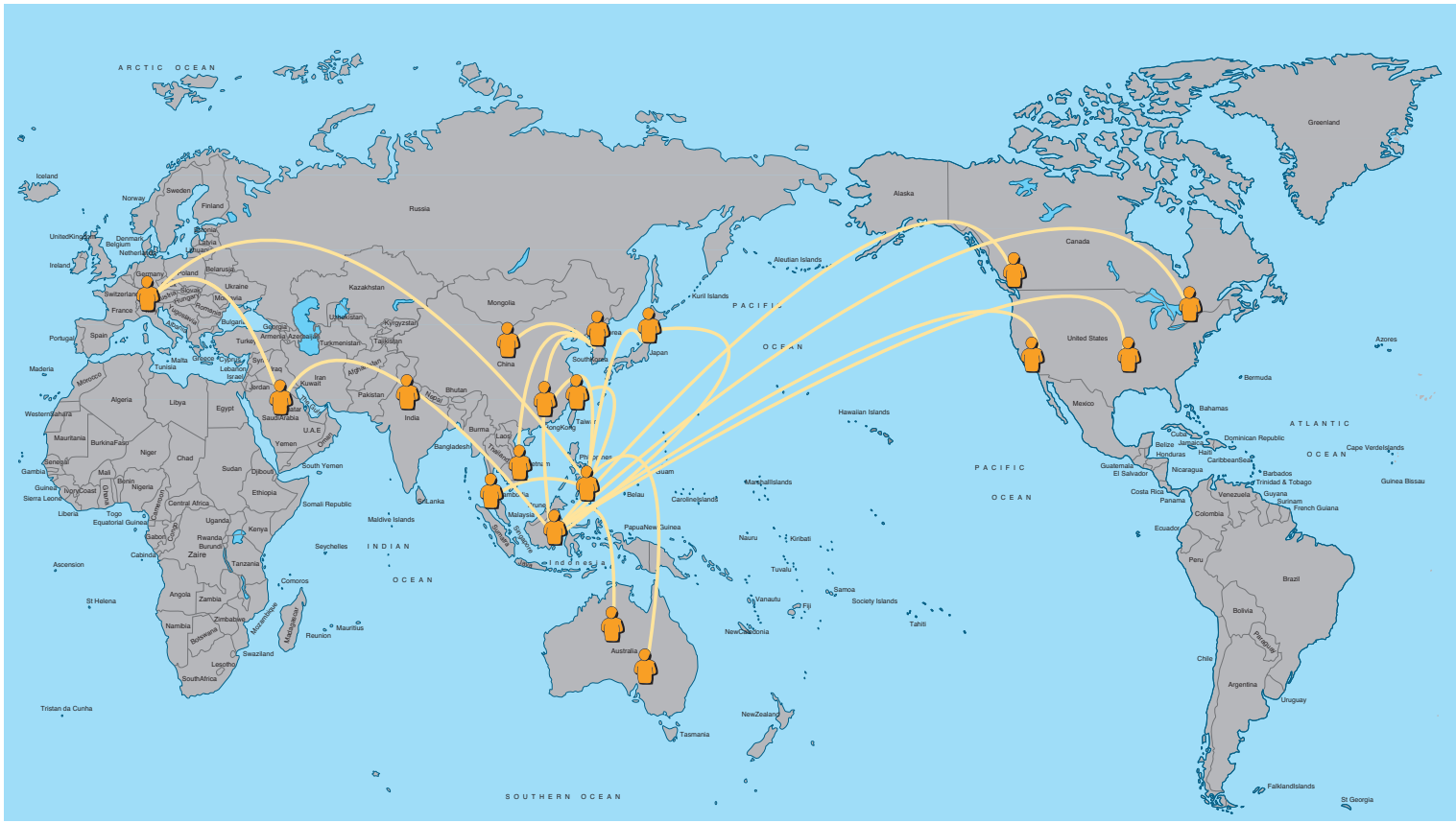
Researchers at Waseda University's Sugano Laboratory have developed TWENDY-ONE, a robot equipped with flexible joints, springs in its arms and fingers with adjustable pressure. These features give the humanoid robot the dexterity necessary to manipulate soft or complex-shaped objects in the same way as people. TWENDY-ONE can do housework or provide simple nursing care, such as helping someone move from a bed into a wheelchair, opening a refrigerator and taking out food, or baking bread.

Designed with safety in mind, the robot features contact-detection software and advanced sensing capability, allowing it to avoid accidental collisions with humans. The research team hopes to commercialize TWENDY-ONE within a few years, after reducing the robot's cost, increasing its reliability and simplifying its maintenance.

For further information contact:
Department of Modern Mechanical Engineering
School of Creative Science and Engineering
Waseda University, Tokyo, Japan

Sugano Laboratory
Email: twendy-one@sugano.mech.waseda.ac.jp

Takanishi Laboratory
Email: contact@takanishi.mech.waseda.ac.jp



This map depicts the migration of Asian women around the world, in response to growing demand for caregivers.

The global migration of care workers

Researchers in North America and the Asia-Pacific region are exploring how the reorganization of domestic care work around the world is influencing migration patterns and how migration, in turn, is influencing social welfare and care.

Professor Ito Peng of the University of Toronto, who leads the international research team, explains that growing demand for caregivers in the developed north is creating a powerful incentive for women from developing countries to migrate to fill the jobs. These "care chains" – moving women from low and middle income countries to immigrant-receiving nations – are resulting in care deficits in sending countries as well as increasing inequalities between sending and receiving countries and in the receiving countries.

Until now, researchers have largely focused on the migration of healthcare workers, such as doctors and nurses, from developing to developed countries. "The kind of work we're talking about – eldercare, child care, domestic care – has been relatively low on the radar," says Professor Peng.

The current study builds on previous research by Peng and her collaborators. For example, in the 2001 book "Servants of Globalization: Women, Migration and Domestic Work," Rhacel Parrenas found that children of Filipino women who migrate abroad often end up being cared for by elder sisters, grandmothers, aunts or other female relatives. "The physical, emotional and financial costs of caring for those children left behind are being absorbed by their families and communities," says Professor Peng.

However, in another earlier study, collaborator Daniele Belanger found that the migration of Vietnamese brides to Korea brought benefits to their home communities in Vietnam. "Remittances from these brides to their families helped their economic well-being and social standing in their communities," notes Professor Peng.

The research team is focusing on migration within the Asia-Pacific region and between it and North America. Sending and receiving countries in the two regions offer sharp cultural and institutional contrasts, yet both regions are deeply involved in the global migration of care workers. "By far, the largest migrations in terms of numbers, proportions and future prospects are happening in Asia – and I don't just mean international migration," says Professor Peng. "In China alone, millions of people are migrating from rural to urban areas, many of whom end up doing domestic service-type care work."

Professor Peng hopes their research will generate information, data and analyses about the condition and migration of care workers across the globe, which could be used to develop better policies to address their issues. "I would like to see some kind of global governance structure to oversee the migration of care workers and make sure that people don't get exploited," she says.

For further information contact:
Professor Ito Peng
Faculty of Arts and Science
University of Toronto, Canada
Email: itopeng@chass.utoronto.ca

Shahzad Ahmad/Bytes for All

Cyber Stewards: Protecting human rights in the digital sphere

A worldwide network of cyber stewards is promoting cybersecurity approaches that respect openness and human rights.

The explosive growth of digital information technologies provides citizens worldwide with unprecedented connectivity. According to the International Telecommunication Union, there were almost as many mobile-cellular telephone subscriptions in 2013 as there were people in the world. More than half of these subscriptions are in the Asia-Pacific region: some 3.5 billion.

As digital communications networks expand and deepen in the developing world, these new tools are enabling rapid social transformations, such as the Arab Spring. But there are growing concerns about how cyberspace is governed and constituted. Facing a range of threats from cybercrime to espionage and warfare, governments are developing ambitious security strategies, some of which include the use of far-reaching surveillance tools to monitor and censor their citizens' activities.

In 2012 the Canada Centre for Global Security Studies and the Citizen Lab at the University of Toronto's Munk School of Global Affairs launched the Cyber Stewards Program. With support from Canada's International Development Research Centre, 14 organizations around the world are promoting cybersecurity approaches that respect openness and human rights. Members of this global network focus on local priorities while sharing knowledge and expertise with counterparts around the world.

Through their joint efforts, cyber stewards are helping to expose surveillance methods that threaten human rights. In Pakistan, network member Bytes for All monitored and documented online surveillance activities during the 2013 general election. In Indonesia, ICT Watch is focusing on civil society and Internet governance. And in India, Tibet Action Institute is training exiled members of the Tibetan community in digital security measures so they can protect themselves against threats.

As they work to map, analyse and ultimately influence cybersecurity policies, the cyber stewards are bringing much-needed Southern perspectives on issues of Internet governance. Over the next year they will document and share their findings at global expert gatherings and through briefs, reports and an expanded Web presence.

For further information contact:
Isabelle Bourgeault-Tassé
International Development Research Centre, Canada
Email: ibourgeault-tasse@idrc.ca

University of the Philippines Diliman

Bamboo musical instruments get synthesized

Researchers in the Philippines have developed the world's first music synthesizer to recreate the sounds of five traditional bamboo instruments: the Kolitong (polychordal bamboo tube zither), Diwas (bamboo panpipes), Takumbo (parallel-stringed tube zither), Gabbang (bamboo xylophone) and Bungkaka (bamboo buzzer).

A team from the University of the Philippines Diliman built the synthesizer by analysing sound recordings from each instrument and then correlating them with the instrument's physical properties - such as the length of a bar, tube or string. The music synthesizer includes a graphical interface that allows users to adjust an instrument's physical parameters, set the pitch, and then hear and save the sound produced along with the corresponding physical parameters.

"As far as we know, our synthesizer is the only one specializing in bamboo musical instruments with these features," says Jessa Rili, a member of the team.

The original goal of this project was to preserve the art of making bamboo instruments and to help raise awareness of their existence. "We are planning to make our software freely available for download - our target being elementary and secondary schools," says Rili.

The team may eventually commercialize the synthesizer, but first more work is required to improve the usability of its graphical interface.

For further information contact:
Andrew Noel B. Aragon or Jessa Faye M. Rili
Electrical and Electronics Engineering Institute,
College of Engineering
University of the Philippines Diliman
Email: droo.aragon@gmail.com or jfmrili@gmail.com

reenoreluv/flickr

Colombo, Sri Lanka

Safe and inclusive cities: Understanding poverty, violence and urban displacement

A study is comparing the experiences of internally displaced populations in Sri Lanka and India. How are they rebuilding their lives and what can governments do to promote security and protect livelihoods?

Ethnic conflict, natural disaster and changes in land ownership are just some of the factors behind large, involuntary population shifts that have changed the face of many Asian cities. In Sri Lanka, for example, nearly 100,000 people remain internally displaced after decades of conflict. Close to half a million more have returned to their former homes but face enormous challenges in meeting their basic needs.

In urban areas, which receive most migrants today, the influx puts great stress on the existing social fabric and can fuel tensions as newcomers and returnees seek jobs, shelter and social services. Governments and humanitarian organizations charged with responding to these challenges struggle to create effective programs and policies. A lack of solid data on the interactions between poverty, violence and displacement is hampering their efforts.

To better understand these dynamics, researchers from Sri Lanka's International Centre for Ethnic Studies and India's Centre for Development Studies are comparing the experience of resettled populations in three cities: Cochin, Colombo and Jaffna. Their efforts are part of a global research program supported by Canada's International Development Research Centre and the UK's Department for International Development, which aims to identify what works — and what doesn't — to reduce violence in urban centres.

The study focuses on urban populations that have been uprooted by conflict or development pressures and on the communities that now host these displaced people. Researchers are mapping the types of violence experienced by internally displaced city dwellers and identifying how this strife affects livelihoods. They are looking at how resettled people are rebuilding their lives and the impacts of the newcomers on their neighbours. They are also examining how governments and other agencies promote security and protect the livelihoods of the urban displaced.

By comparing communities in post-conflict Sri Lanka with the relative stability of Cochin in the Indian state of Kerala, researchers hope to pinpoint lessons on how the causes of violence in urban environments differ between post-war and more stable societies. The project is expected to produce a rich body of comparative data that will inform and support more peaceful resettlement processes.

For further information contact:
Isabelle Bourgeault-Tassé
International Development Research Centre, Canada
Email: ibourgeault-tasse@idrc.ca

Jenifer Lie

Dr Guieb with the Dumaracol chanters

The chanters of the Philippines: In search of an epic tale

Researchers from the Philippines are searching for the last chanters of an epic tale. Reconstructing the tale may help the researchers understand the local knowledge systems and cultural practices of one of the country's oldest ethnic groups.

The island province of Palawan, situated on the southwestern part of the Philippines, is one the largest provinces in the country.

Palawan has a very rich and diverse culture as several ethnic groups live on its islands - each with its own language and dialects, literature, music, dance, drama and visual arts. Each group varies in its religious rituals, celebrations and daily activities.

Palawan's Tagbanua are among the Philippines' oldest ethnic groups and are located in the central coastal and northern parts and islands of the province.

The Tagbanua are further divided into four subgroups. Among them, the Kalamianen Tagbanua are located in the northern mainland of Palawan and on the Calamianes group of islands north of the mainland. The Kalamianen Tagbanua, who in recent years have settled in villages, depend mainly on marine and land resources for their livelihood.

The Kalamianen Tagbanua sing the epic tale - or tultul - of a mythical male adventurer called Dumaracol. The narrative is long and it is chanted by men and women at night, during the waxing moon, or as part of ceremonies for the dead. Sadly, the chanting of the Dumaracol is a diminishing practice among the Tagbanua.

The exploratory research of Dr Eulalio R. Guieb III of the College of Mass Communication at the University of the Philippines Diliman sought to locate any remaining chanters of the Dumaracol. Dr Guieb and his team were able to find chanters in several islands of the municipalities of Taytay, El Nido and Linapacan who were willing to participate in the project.

With the help of chanters, the team will record the Dumaracol on digital video and audio and then document, transcribe, translate and investigate this almost unknown and rarely cited epic tale. It is hoped that the reconstruction of the Dumaracol will help uncover some important local knowledge systems and customary practices of the Tagbanua that find expression in the tale.

For further information contact:
Dr. Eulalio R. Guieb III
Department of Broadcast Communication
College of Mass Communication
University of the Philippines Diliman
Email: eulalio.guiebiii@gmail.com

Stefanie Pillai

The Intrudu Water Festival in a Portuguese settlement is held on the last Sunday before Lent begins. In the project, members of the community speak about the festival in Creole. Below: Dr Pillai interviewing a fisherman at the settlement while he mends his net.

Malaccan Portuguese Creole language archived before it goes extinct

Malaccan Portuguese Creole, spoken mainly by a small community in Malaysia, is getting a breath of life as researchers and community members archive this rapidly disappearing language.

The United Nations Educational, Scientific and Cultural Organisation (UNESCO) estimates that if nothing is done, half of the world's 6000 plus languages will have disappeared by the end of the current century.

At the University of Malaya, researchers are archiving and developing an online dictionary of Malaccan Portuguese Creole (MPC), also known as Kristang. This endangered language, spoken by a dwindling number of people, can be traced to the arrival of the Portuguese in Malacca in the 16th century.

"The intermarriage between the Portuguese and locals resulted in a hybrid community whose descendants continue to exist in Malaysia," note Dr Stefanie Pillai and her colleagues in a 2014 paper published in *Language & Communication*.

The largest concentration of the community is estimated to be around 750 in the settlement of Kampung Portugis in Malacca in the southern region of Malaysia, a popular tourist destination where Portuguese music and dance are mixed with more traditional elements.

"The decrease in the number of MPC speakers is not surprising as it is a minority language fighting to survive amidst the increasing use of English and the backdrop of Malay, the national and official language of Malaysia," state the authors. "The use of MPC is largely confined to the family and social domains."

MPC was first archived with the Endangered Languages Archive at London's School of Oriental and African Studies - this involved community members, who provided audio and video data. These audio and video files are paired with time-aligned orthographic transcriptions in Malaccan Portuguese Creole and their English translations. This archive is still a work in progress and will be amended periodically as other native speaker consultants review the files.

In collaboration with computer sciences colleague, Dr Nor Aniza Abdullah, and Professor Dr Alan Baxter, a Portuguese-based Creoles expert from Universidade Federal da Bahia in Brazil, the online dictionary will feature a text-to-speech system enabling new speakers to learn the language. Both projects will be completed in 2014.

For further information contact:
Associate Professor Dr Stefanie Pillai
Faculty of Languages and Linguistics
University of Malaya, Malaysia
Email: stefanie@um.edu.my

Institute of Egyptology, Waseda University.

Images of Khonsuemheb (centre) and his family

Institute of Egyptology, Waseda University.

Khonsuemheb's funeral procession

Japanese team uncovers ancient Egyptian tomb

Japanese archaeologists from Waseda University have discovered a tomb that probably dates back more than 3000 years to the Ramesside Period of Ancient Egypt (c. 1292–1070 BC). The tomb's owner was Khonsuemheb, chief brewer for the goddess Mut.

Led by Professor Jiro Kondo, the archaeologists were working in the Theban Necropolis, across the Nile from Luxor. The team discovered the well-preserved, T-shaped tomb while cleaning the forecourt of the tomb of Userhat, overseer of the king's private apartment under Amenhotep III.

Khonsuemheb's tomb is connected to an unfinished and unidentified tomb hewn into the southern wall of the forecourt of Userhat's tomb.

"Stylistic elements that characterize the Ramesside period are shown in Khonsuemheb's tomb, such as wall and ceiling decorations," says Professor Kondo. For example, on a sidewall, Khonsuemheb, his wife Mutemheb and his daughter Isetkha are represented as statues. Several different motifs representing Khonsuemheb and his family are painted on the walls.

One wall depicts the scene of the funeral procession for Khonsuemheb's burial, which also depicts a ritual to the mummy of Khonsuemheb by his son.

The tomb is crowned with a pyramid. In the centre of the ceiling are an image of the solar boat, the text of the "Hymn to the Sun God", and two figures of Khonsuemheb making adoration.

Professor Kondo and his colleagues hope that future exploration will reveal further details about the tomb's decorations and Khonsuemheb's burial.

For further information contact:
Professor Jiro Kondo
Institute of Egyptology
Waseda University, Japan
Email: jkondo@waseda.jp

A 3000-year-old Egyptian noblewoman

Since 1991, archaeologists from Waseda University's Institute of Egyptology have been excavating an ancient necropolis at Saqqara, south of Cairo.

In March 2009, a team discovered the previously unknown tomb of an Egyptian noblewoman, who may have been Princess Isisnofret, the granddaughter of Ramses II.

This famed pharaoh ruled Egypt for about 66 years, from 1279 to 1213 BC.

Other notable projects include:

- In 1996, a joint Waseda University/Tokai University team discovered the large, free-standing tomb-chapel of Ipay, royal butler and royal scribe, at the Dahshur North Necropolis, south of Saqqara.
- Since 2002, Waseda archaeologists have worked with UNESCO and the Egyptian government to conserve and restore wall paintings in the royal tomb of Amenhotep III in the Valley of the Kings.
- In 2005, the intact tomb of Senu was discovered in Dahshur North Necropolis.
- In 2007, two intact rectangular wooden coffins belonging to Sobekhat and Senetites were excavated at the same site of Dahshur North Necropolis.

University of Nottingham Malaysia

Crossing continents:
Where we drive affects how we drive

Researchers working in Malaysia and the UK are finding that drivers' perceptions of hazards, and thus their reaction times to them, vary from one country to another.

According to the International Transport Forum, Malaysia has one of the highest death rates from road traffic accidents in the world. In 2011, there were 6,877 fatalities - a rise of 70% since 1990. By contrast there were only 1,960 fatalities on British roads in 2011 - a fall of nearly 64% since 1990.

To help improve road safety, teams in the UK and Malaysia have examined drivers' hazard perception from a cross-cultural perspective. Research by the University of Nottingham Malaysia Campus (UNMC) and the University of Nottingham in the UK shows that Malaysian drivers have significantly slower reaction times to hazards than British drivers and require a higher threshold of danger before taking action.

In the study, volunteers from the UK and Malaysia were shown videos of driving scenarios in both countries and asked to respond to hazards by pressing a button. British drivers took an average of 1.68 seconds to register an emerging threat while Malaysian drivers took 2.25 seconds to respond. Eye tracking data showed the Malaysians were seeing the hazards at the same time as the British drivers but taking longer to respond, suggesting they considered the hazards to be less dangerous.

"The fact that Malaysian drivers are slower to respond to danger possibly reflects the more hazardous road environment they are used to," says Phui Cheng Lim, a postgraduate student who led the research.

"Our results suggest that hazard perception testing, particularly in developing countries, would benefit from a paradigm where performance cannot be confused with differing thresholds of what is regarded as a potential hazard."

"The kind of test we used works very well in the UK, but for countries where people seem more desensitised to hazards, it may not be as appropriate," says Dr Elizabeth Sheppard, head of the Driving Research Group at UNMC. Her team is currently investigating alternative ways to examine hazard perception in both the UK and Malaysia.

Did you know?

According to World Health Organization statistics, approximately 1.24 million people die in traffic accidents every year, while tens of millions more are injured or disabled. Only 28 countries, covering 7% of the world's population, have comprehensive road safety laws in force.

For further information contact:
Phui Cheng Lim
School of Psychology, Faculty of Science
The University of Nottingham Malaysia Campus
Email: khyx1lpn@nottingham.edu.my

Southeast Asian research network aims to enhance macroeconomic stability

Canada's North-South Institute is incubating a network of research organizations in South-East Asia to help improve their capacity to provide relevant macroeconomic policy advice.

The Southeast Asian Macroeconomic Network, which is expected to formally launch in 2014, is the first of its kind in the region. It will include participants from Vietnam, Cambodia, Thailand, and possibly Laos, Myanmar, Indonesia, Mongolia and China's Yunnan Province.

Many Southeast Asian countries want to put in place new macroeconomic institutions to help make their economies more resilient to shocks and thus better able to sustain growth over the medium and long term. In addition, "Vietnam and Cambodia are moving into middle-income status, so it's becoming more challenging to maintain high growth rates," says Dr Rodney Schmidt, vice president and director of research at the North-South Institute.

"It's relatively easy to initiate a growth spurt when you start from a fairly low base. But when you get close to middle-income status and have taken advantage of all the easy policy fixes, you start having more sectors and more actors, so economic growth can get stalled," he explains.

"We want to foster a dynamic research community in each country, which would include research think tanks, universities and recognized domestic experts. We would then bring in the stakeholders – policy makers associated with national assemblies or macroeconomic institutions like central banks, ministries of finance and regulatory agencies," says Dr Schmidt.

"Our goal is to encourage peer-reviewed and practical macroeconomic research and then enable productive dialogues between those who are doing the research and those who are using it," he adds.

In Vietnam, potential partners include the Vietnam Academy of Social Sciences and the Vietnam Centre for Economic and Policy Research. "We're also working with the Cambodia Development Resource Institute in Phnom Penh, the National University of Laos and National Economic Research Institute in Laos, and the Thailand Development Research Institute among others," says Dr Schmidt.

For further information contact:
Dr Rodney Schmidt
Vice President and Director of Research
The North-South Institute, Canada
Email: rschmidt@nsi-ins.ca

Nugroho Nurdikiawan Sunjoyo/World Bank

Yogyakarta, Indonesia

Enterprise in Asia: Nurturing the "golden middle"

Research teams in Asia are gathering data to help middle-income countries devise smart strategies that support small and medium businesses as a pathway to higher incomes and inclusive growth.

In South Asia, small and medium enterprises (SMEs) account for more than 90% of all businesses and employ more than half the workforce. By providing opportunities for women, youth and the poor, SMEs can play a vital role in generating inclusive growth. But what can countries do to nourish thriving enterprises that help generate more equitable growth?

Some lessons can be taken from successful middle-income economies. For example, small and medium enterprises in Korea, Japan and Taiwan gained technology and skills as subcontractors for larger export-focused firms. In these three countries, many people benefited from the resulting rise in incomes, which spurred a domestic market for manufactured goods. With smart government investments, these small and medium enterprises became a "golden middle," playing a crucial role in boosting employment and value-added production and export.

In 2012, the Asian Institute of Management launched a research competition with support from Canada's International Development Research Centre. Through case studies, research teams are using data drawn from firms to produce lessons for policy makers. The aim is to help middle-income countries in Asia support SMEs as a pathway to higher incomes and inclusive growth.

In November 2013, researchers from across the region gathered to explore key issues for small business development. Already, a number of policy-relevant messages are emerging. For example:

Corruption risks: Analysis from 13 Asian countries shows some of the factors that expose firms to government corruption include higher levels of private ownership, orientation to domestic markets and dependence on government contracts.

Benefits of international integration: A study of Malaysia's high-technology sector shows that foreign direct investment produces significant technology spillovers that benefit local firms. Such spillovers tend to involve many more firms in a country's industrialization process.

Crisis resilience: Evidence shows that some firms thrive during financial and environmental crises. During the 2008-2009 global economic crisis, Indonesian firms with more resources and intimate knowledge of local consumer demands benefited by increasing their domestic market share. By offering better-quality domestic products, local SMEs took market share from imported goods that became more expensive.

For further information contact:
Isabelle Bourgeault-Tassé
International Development Research Centre, Canada
Email: ibourgeault-tasse@idrc.ca

Eric Parker/flickr

Did you know?

Under the United Nations Millennium Development Goal on child mortality, India has pledged to reduce under-five mortality to 38 deaths per 1000 live births by 2015. According to a 2013 study published in *Lancet Global Health*, while 222 of India's 597 districts are on track to achieve this target, an equal number will not achieve it until after 2020. The study also found that female mortality among children under five exceeded male mortality by 25 per cent in 303 Indian districts.

Understanding gender bias in India's health systems

A review of maternal deaths in India's Koppal district reveals that pervasive community gender bias contributes to avoidable deaths. Researchers are developing assessment tools for frontline health workers to improve care for women.

Because of their low social status, girls and women in India's state of Karnataka are less likely to receive medical attention when they are sick or expecting a child and receive inferior care when they do seek help. With support from Canada's International Development Research Centre, the Indian Institute of Management in Bangalore is exploring how patterns of neglect and abuse within households and communities affect women's health.

A review of verbal autopsies — interviews conducted following a death — suggests that oversights and bias may be masking the true causes of women's deaths. For example, common underlying conditions such as nutrition-related anaemia, which affects nearly two-thirds of pregnant women in Karnataka, are not recorded. Anaemia increases risk during pregnancy. And because verbal autopsies are normally conducted by a single medical officer, often one involved in treating the deceased, mistakes by health workers are under-reported.

The team is using data on maternal deaths to identify the prevalence of abuse and its consequences in Karnataka's Koppal district. Researchers are finding that the health system reflects community norms that contribute to avoidable deaths. For example, because anaemia and pregnancy are considered routine, doctors and health workers often neglect to point out obvious signs of risk to pregnant patients, such as the risks posed by poor nutrition and iron deficiency.

The project is taking steps to improve care for women at the village level and to inform district and state policies. Given the area's high rates of undernourishment, teen pregnancy, anaemia and domestic abuse, researchers are testing measures to help health workers address these factors earlier than usual. A pregnancy risk assessment tool for frontline health workers was developed and applied in 15 villages. Village-level support groups and district-level advocacy are promoting safe motherhood and building awareness of maternal rights and safety.

Lessons are also being shared at the community, state, national and international levels through channels such as the Fostering Knowledge-Implementation Links Project. Commissioned by the Karnataka state government, this initiative aims to strengthen the links between researchers and policy makers so that research findings can be better translated into sound public health policy.

For further information contact:
Isabelle Bourgeault-Tassé
International Development Research Centre, Canada
Email: ibourgeault-tasse@idrc.ca

Sriram Bala / Flickr

Insulin pens

On the TRAIL of obesity and diabetes

Researchers are currently investigating whether a naturally occurring human protein that can trigger the death of cancer cells could also be used as a treatment for obesity and diabetes.

Called tumour necrosis factor-related apoptosis-inducing ligand (TRAIL), the protein's role in promoting apoptosis, or programmed death, in cancer cells is well established. There is also increasing evidence that TRAIL can stimulate the proliferation, migration and differentiation of cells.

It turns out this protein may figure prominently in several biochemical pathways. For example, "TRAIL has been reported to have both positive and negative roles in, but not limited to, metabolic disorders and cardiovascular disease," says Hanis Harith, a staff member of Universiti Putra Malaysia who is pursuing a PhD at the University of New South Wales in Sydney, Australia.

What's more, "there is now growing evidence supporting its involvement in the development of obesity and diabetes," states Harith and her colleagues in a review paper published in *Trends in Endocrinology and Metabolism*. Specifically, various studies in rodent models suggest a negative association between TRAIL and features of obesity or diabetes.

According to the authors, various factors may influence the protein's functions including its level of expression and secretion, the expression of its receptors, signalling, the cell types involved and the environment. "Only with further research can we grasp the far-reaching abilities of this very special molecule," state the researchers.

For further information contact:
Hanis Harith
Universiti Putra Malaysia
Email: hanisharith@yahoo.com

Mary Kavurma
Heart Research Institute, Sydney, Australia
Email: Mary.Kavurma@hri.org.au

New tool boosts hope for stem cell use in drug screening

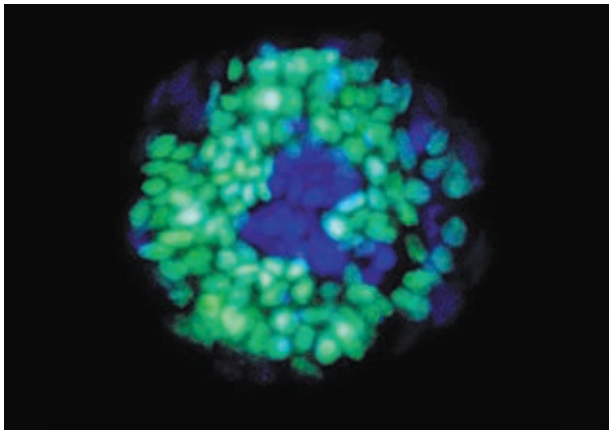
A new method for testing how human stem cells respond to environmental cues could dramatically improve the ability to harness these cells for regenerative medicine and drug-screening applications.

The method has been developed by a University of Toronto (U of T) team in collaboration with the Agency for Science, Technology and Research in Singapore. It involves using a high throughput platform, combining robotics and automation, to assess the impact of different chemical compounds on human pluripotent stem cells (hPSCs) – cells that can grow indefinitely or transform into any type of body cell. The researchers grow hPSCs on custom-made micro environments in which they can control the size and density of stem cell colonies as well as other important parameters.

By controlling the cellular microenvironment, "our technology allows a better understanding of how stem cells are regulated," says Emanuel Nazareth, the lead researcher and a PhD student in the laboratory of Professor Peter Zandstra at U of T.

One of the key benefits of this technology is the ability to compare how different stem cell lines respond to drugs in order to rapidly identify the most suitable candidate for further drug screening or therapeutic development.

The U of T work is part of the International Stem Cell Initiative, a worldwide collaborative effort involving research investigators in Canada, Australia, Singapore and the United Kingdom. Its aim is to establish a consensus on basic criteria and techniques to underpin the eventual development of applications for hPSCs in human medicine.



Zandstra Laboratory, University of Toronto

Colony of human pluripotent stem cells, stained for DNA (blue) and the protein Oct4 (green).

For further information contact:
Emanuel Nazareth or Peter Zandstra
Institute of Biomaterials and Biomedical Engineering, University of Toronto, Canada
Email: emanuel.nazareth@utoronto.ca or
Email: peter.zandstra@utoronto

Robotic surgical assistant helps treat breast cancer

Japanese researchers are harnessing robotics technology to develop a safe and minimally invasive treatment for breast cancer.

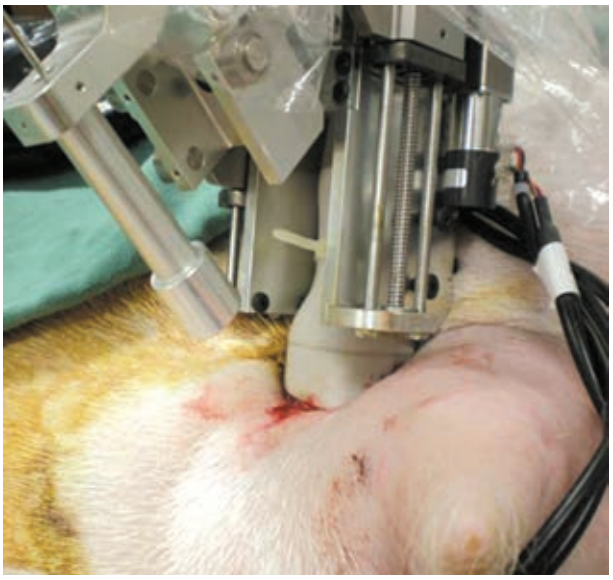
Researchers at Waseda University's Fujie Lab, in cooperation with Kyushu University and Tohoku University, are building a robotic surgical assistant that uses radiofrequency ablation to kill breast cancer cells. A popular method for treating liver cancer, this technology involves cauterizing cancer cells using radio waves emitted from the tip of an inserted needle.

The robot's role will be to locate and quantify breast cancer cells, and then to accurately control a needle that pierces and cauterizes those cells.

"The robot is intended as an assistive device for the surgeon, who will make decisions on the course and execution of medical treatment," explains the research team leader, Professor Masakatsu Fujie.

The researchers' first step is to ensure their robot can accurately insert a radio frequency ablation needle into a breast cancer tumour. Since breast tissue is soft, it can easily deform when a needle pierces it, thus displacing the tumour. "Therefore, we are developing a preloading probe for accurate needle insertion," says Professor Yo Kobayashi.

The team's next steps are to develop an intraoperative estimation and control method, and to improve the safety and reliability of these technologies. "Based on progress with our technology last year, we plan to perform a field study in 2014 to collect data for future clinical application," says Professor Fujie.

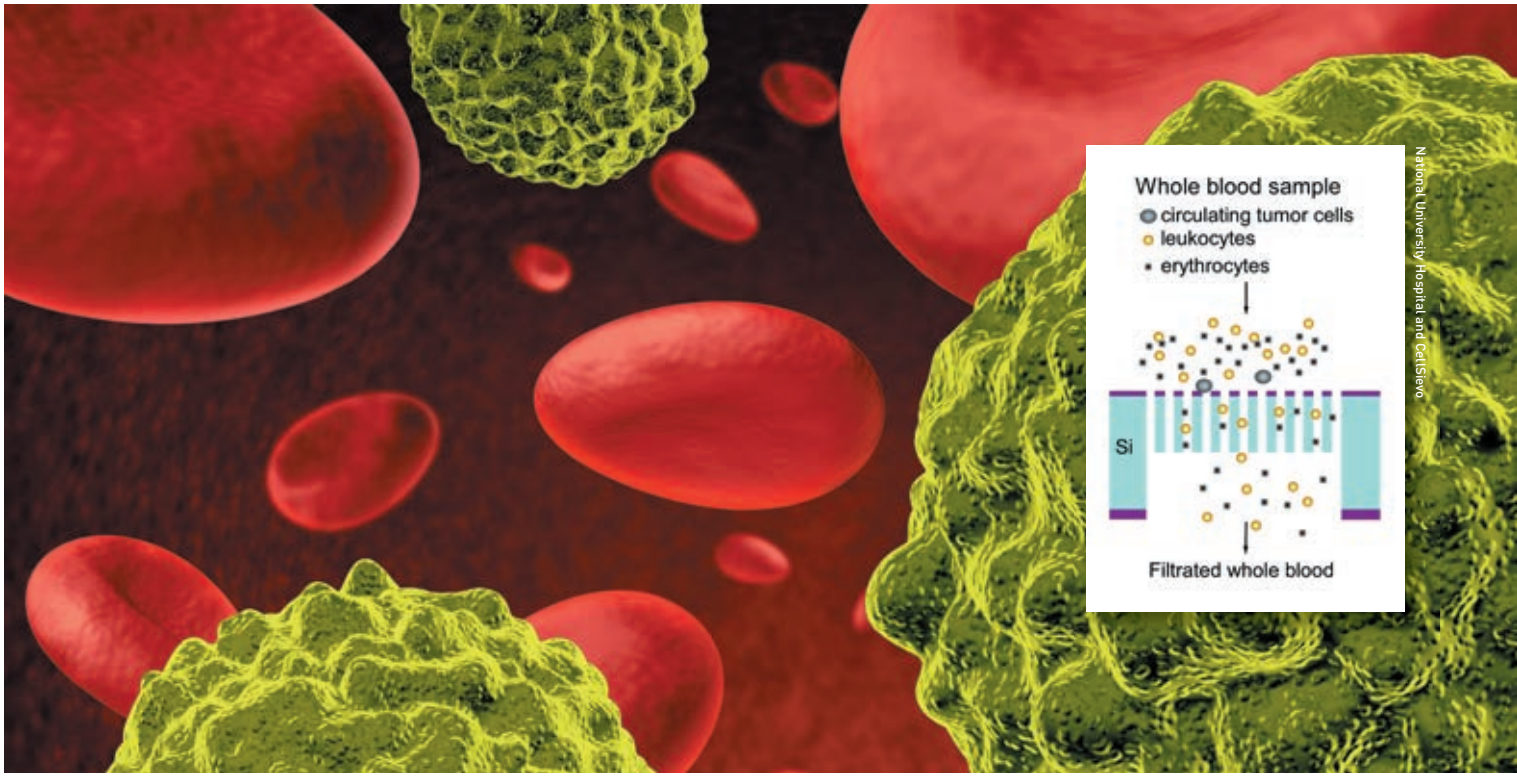


Fujie Lab, Waseda University

This robotic system is designed to help surgeons insert a radiofrequency ablation needle into a breast tumour as demonstrated on this goat.

For further information contact:
Fujie Laboratory
Faculty of Science and Engineering
Waseda University, Japan
Email: mgfujie@waseda.jp

123rf.com



Cancer cells spread and grow through the body via the bloodstream as malignant cells in a human body. Insert: Diagram demonstrating the isolation of circulating tumour cells."

Harvesting tumour cells to monitor chemotherapy

A new non-invasive method in Singapore, involving the harvest of circulating tumour cells, will help doctors monitor the progress of cancer patients to determine the effectiveness of chemotherapy.

Circulating tumour cells (CTCs) are cancer cells that have sloughed off from the primary tumour into the bloodstream. They either die off in the blood or re-seed themselves and grow elsewhere in the body through a process called metastasis. A team in Singapore has now found a way to harvest these cells to determine if specific drug treatments are curbing the spread of cancer in individual patients.

Traditional methods of obtaining cancer cells from tumours – involving the use of small surgical tools – are highly invasive and often difficult to perform. In contrast, harvesting CTCs from blood is relatively easy and non-invasive. What's more, patients' blood can be drawn repeatedly to monitor their progress over time. Compared to red and white blood cells, CTCs are extremely rare: there are no more than 100 CTCs per billion blood cells in a cancer patient. However, CTCs are usually bigger and much stiffer than blood cells.

Taking advantage of this property, Dr Mo-Huang Li and his colleagues at the bioengineering firm, CellSievo, have designed a tiny silicon sieve to trap and recover CTCs from patients with breast, prostate, colorectal or ovarian cancer.

Using harvested CTCs, Professor Evelyn Siew-Chuan Koay, Dr Leong Sai Mun and co-workers at the National University Hospital, Singapore analyse the molecular information they contain to determine whether a patient's chemotherapy regimen is becoming ineffective at killing cancer cells. This allows the attending physician to change the treatment strategy if necessary to combat the further spread of cancer. It also saves the patient from any side effects due to prolonged exposure to ineffective drugs.

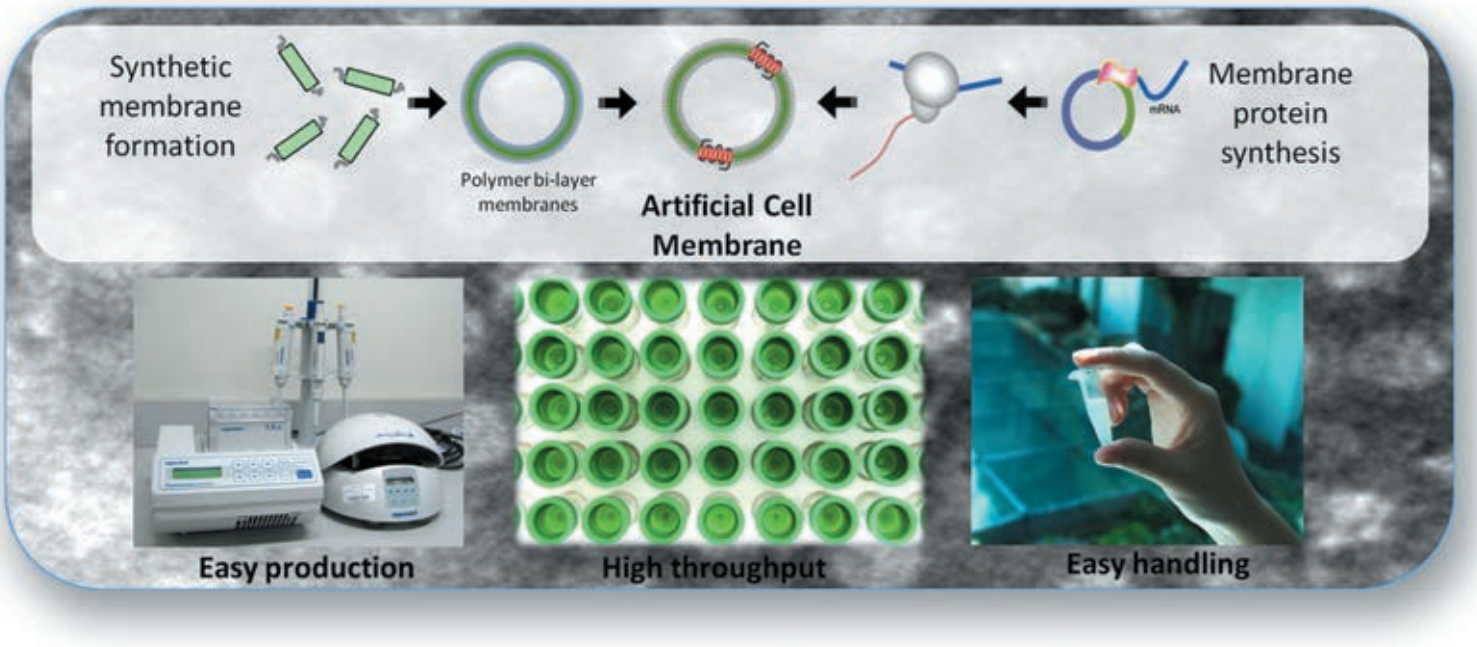
The researchers are now developing a diagnostic kit to detect the molecular markers that indicate whether a cancer drug is becoming ineffective. Their focus is on detecting the expression of microRNAs – small RNA molecules – that signal for drug resistance in cancer cells. The team is also applying for a patent and hopes to launch its diagnostic kit for commercial use by 2017.

Did you know?

Chemotherapy drugs are usually administered to prevent the regrowth of a primary tumour after its surgical removal and to stop the spread of residual cancer cells released into the blood. However, cancer cells often become resistant to drugs after prolonged treatment, either by accumulating mutations or by readjusting the expression of specific genes to escape the toxic effect of the chemotherapy.

For further information contact:
Associate Professor Evelyn Siew-Chuan Koay and Dr Leong Sai Mun
Department of Laboratory Medicine
National University Hospital, Singapore
Email: evelyn_koay@nuhs.edu.sg
Email: sai_mun_leong@nuhs.edu.sg

Dr Mo-Huang Li
CellSievo Private Limited, Singapore
Email: mohuangli@cellsievo.com



Schematic showing how the artificial cell membranes are formed and their advantages over existing live cell culture methods. Credit: ACM Biolabs

Artificial cell membranes speed up drug discovery

Synthetic cell membranes offer low-cost, easily maintained drug targets that help shorten the drug discovery process. What once took weeks or even months can now be done in a matter of days.

Cells communicate with each other and exchange vital molecules through their membranes, facilitated by specific membrane proteins. Disruption of the communication pattern can lead to cancer, diabetes, obesity or other diseases. Understanding how membrane proteins work is critical in creating medicines to combat diseases.

Artificial cell membranes (ACMs) are customised synthetic cell membranes that mimic live cell membrane proteins. The new technology allows the production of membrane proteins without the need for the specially controlled environments, conditions and training that is required in current live cell culture laboratories. The patented artificial cell membrane technology was first developed at Singapore's Agency for Science, Technology and Research (A*STAR) by integrating biology with innovative materials and is now licensed to ACM Biolabs.

ACM Biolabs has adapted natural cellular processes to invent a simple yet functional system where synthetic materials are engineered to host membrane proteins. These include some membrane proteins that cannot currently be produced in a stable form using today's cell-based technology.


J. Troha (National Cancer Institute)

"Our proprietary artificial cell membrane technology is a unique combination of engineered polymer materials and biology that gives pharmaceutical companies a faster, cheaper alternative to current drug discovery methods," says Dr Madhavan Nallani, a former A*STAR scientist who is the founder and now director of ACM Biolabs. "Our aim is to lower the entry barrier for more companies and labs to screen novel drugs or test existing drugs on novel targets."

According to Dr Nallani, the new ACM technology allows pharmaceutical companies to screen many more potential drug candidates in less time than it normally takes to test a single molecule. As a result, companies could save up to 60% of the costs of drug development, which in some cases may reach hundreds of millions of dollars.

For further information contact:
Mr Eugene Low
Institute of Materials Research and Engineering
Agency for Science, Technology and Research, Singapore
Email: loweom@scei.a-star.edu.sg

Dr Madhavan Nallani
ACM Biolabs Pte Ltd., Singapore
Email: mnallani@acmbiolabs.com

The Hong Kong Polytechnic University

Sambucus williamsii

Chinese herb potential wonder drug for osteoporosis

A traditional Chinese folk medicine used for treating bone fractures and joint diseases may be just as effective for managing osteoporosis as commercially available medications, but without their potential side effects.

Epidemiological studies in China suggest that almost 70 million people suffer from osteoporosis and more than 210 million have low bone mineral density. Although conventional medicines for osteoporosis such as estrogen replacement therapy (ERT), bisphosphonates (BIs) and selective estrogen receptor modulators (SERMs) offer promising therapeutic benefits, these drugs are expensive and their side effects can be serious. For example, the long-term use of ERT is associated with an increased risk of developing breast and endometrial cancers. BIs increase the risk of atypical fractures. And SERMs are linked with an increased risk of developing blood clots.

Associate Professor Dr Man-sau Wong and her colleagues at The Hong Kong Polytechnic University have been studying the use of Chinese medicine in the prevention and treatment of osteoporosis for more than a decade. Her team is currently focused on determining the therapeutic impact, metabolic properties and active ingredients of *Sambucus williamsii HANCE* (SWH), or North China red elder, a herb with bone healing properties.

In one experiment, the team compared the effects of SWH extract to two commercial drugs on female rats that had their ovaries removed. After 12 weeks, the SWH extract increased the mineral density and improved the micro-architecture of rat bone in a way similar to the effects of one medication while enhancing the biomechanical strength of rat bone in a way similar to the second.

"These results indicate that the bioactive fraction of SWH has the dual advantages of Western and Chinese medicines on improving bone quality," says Dr Wong. Moreover, unlike one of the two drugs, the SWH extract did not stimulate the growth of rat endometrial tissues.

By the end of 2014, the researchers hope to identify several chemical compounds responsible for the therapeutic benefits of SWH and to determine their metabolic pathways. So far, the team has identified two potential active ingredients and their underlying molecular mechanisms.

"We hope that our study can provide scientific evidence for developing the bioactive fraction of SWH as a new agent for managing osteoporosis," Dr Wong concludes.

BruceBlaus

Illustration depicting normal standing posture and osteoporosis

For further information contact:
Associate Professor Dr Man-sau Wong
Department of Applied Biology and Chemical Technology
The Hong Kong Polytechnic University
Email: man-sau.wong@polyu.edu.hk

Combatting respiratory infections in Sarawak

Malaysian researchers are investigating the epidemiology of severe viral respiratory infections in young children in hopes of developing rapid diagnostic tools to better control their transmission.

Acute respiratory tract infection (ARI) is a major cause of death and disease around the world, particularly in young children. According to a 1995 study published in *Archives of Disease in Childhood*, ARI accounts for about 25% of deaths in children under the age of five in developing countries. In Malaysia, respiratory tract infections are the fourth leading cause of hospitalization in children under the age of five.

Bacterial pathogens often contribute to severe lower respiratory tract infections. But most ARI cases in developed countries are caused by a handful of respiratory viruses including adenovirus, coronavirus, influenza virus, parainfluenza virus, rhinovirus and respiratory syncytial virus.

In temperate countries, there is a clear seasonal activity of respiratory viruses with peaks during the cold winter months. In tropical countries, however, the "correlation of respiratory viral activity with climatic factors is not so well defined," according to Professor David Perera and his colleagues at Universiti Malaysia Sarawak (UNIMAS). "An awareness of the epidemiology and seasonality of these infections is needed to increase the effectiveness of any planned vaccination and prophylaxis programs besides the treatment of respiratory virus infection."

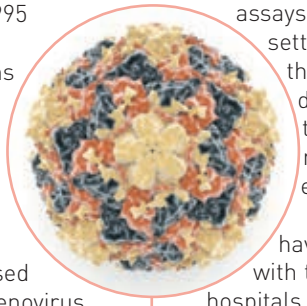


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Illustration showing the structure of the rhinovirus.

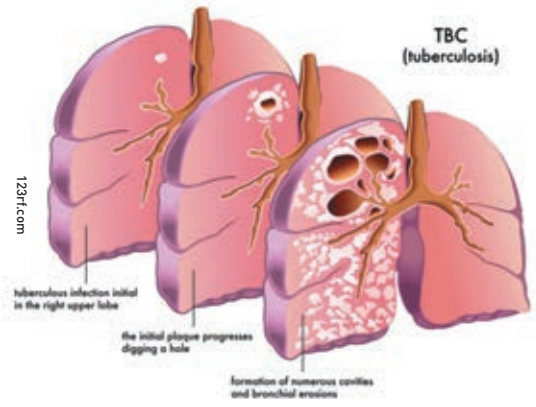
Professor Perera's team plans to examine the clinical characteristics, causative agents and seasonality of ARI cases among young children who have been admitted to a paediatric intensive care unit in Sarawak, in the northwest of Borneo. The researchers will then attempt to develop rapid and affordable diagnostic assays optimised for use in a Sarawak hospital setting. Their goal is to create diagnostic tools that can simultaneously identify several different viruses, not only to help control the transmission of ARI but also to avoid the misuse of antibiotics, which are only effective against bacteria.

"As part of a win-win situation, we have established an online reporting system with the doctors at three major government hospitals to provide laboratory viral identification results," reports Professor Perera. "So far we've managed to identify a number of respiratory viruses that were not previously identified in Sarawak by routine hospital laboratory investigations."

For further information contact:
Associate Professor David Perera
Institute of Health and Community Medicine
Universiti Malaysia Sarawak
Email: dperera@ihcm.unimas.my

A rapid, paper-based diagnostic test for tuberculosis

Researchers in Taiwan have developed a simple, colour-based diagnostic approach with the potential to detect target DNA sequences found in tuberculosis-causing mycobacteria - in just a fraction of the time required for established diagnostic tests.



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More than a century after the identification of organisms that cause tuberculosis (TB), this disease remains a global public health challenge. According to World Health Organization estimates, there were 8.7 million new cases in 2011 and 1.4 million deaths. Most new cases occur in developing countries that lack the facilities and trained personnel required for early detection of TB.

In a study published in the journal *Science and Technology of Advanced Materials* (STAM), a team from four research organizations in Taiwan describe a simple, colour-based diagnostic approach with the potential to detect DNA sequences found in TB-causing mycobacteria - in just a fraction of the time required for established diagnostic tests.

The standard method for diagnosing TB involves culturing the *Mycobacterium tuberculosis* bacillus, which requires 3-6 weeks to grow on solid culture media or 9-16 days in rapid liquid culture media. A faster alternative is polymerase chain reaction (PCR) technology. However, this method is still too slow (turnaround time of 2-5 hours) and requires sophisticated infrastructure and trained personnel that might not be available in developing countries.

In their STAM paper, Tsung-Ting Tsai and colleagues employed gold nanoparticles and microfluidic paper-based analytical devices to achieve a rapid diagnosis without the need for complex and time-consuming laboratory processes. They easily detected target DNA sequences from TB mycobacteria, with a turnaround time of approximately one hour after the human DNA was extracted from patients.

Although the researchers are still optimising their technology, they believe that it will result in "affordable, sensitive, specific, user-friendly, rapid and robust, equipment-free, and highly end-user-deliverable diagnostic applications."

For further information contact:
Mikiko Tanifuji
National Institute for Materials Science, Japan
Email: stam_office@nims.go.jp

Wikipedia

Higher tobacco taxes can save lives

In the absence of intervention, smoking will kill about 250 million current and future cigarette smokers who are alive today in China, India, Philippines, Thailand and Vietnam.

Recent tobacco tax increases in India and the Philippines could significantly lower smoking-related deaths in those countries, says the lead researcher of a report for the Asian Development Bank.

The report, entitled "Tobacco Taxes: A Win–Win Measure for Fiscal Space and Health", examined how changes in cigarette taxes can reduce consumption and save lives in five Asian countries. Already home to about 400 million adult smokers, these countries are: the People's Republic of China, India, Philippines, Thailand and Vietnam. The report estimates that in the absence of intervention, smoking will eventually kill about 250 million current and future cigarette smokers who are alive today in these nations.

"We find that for all five countries, increases in cigarette prices ... effectively reduce the number of smokers and the number of smoking-related deaths, and generate substantial new revenues," states the report. For example, "A 50% price increase, corresponding to a tax increase of about 70%–122%, would reduce the number of current and future smokers by nearly 67 million and reduce tobacco deaths by over 27 million, while generating over $24 billion in additional revenue annually," it concludes.

Since the report's release in November 2012, the Indian government raised cigarette taxes by about 18% in its 2013 budget. Given that India has about 100 million current smokers plus notable uptake rates among young men, this measure alone "might avoid a few hundreds of thousands of deaths," says Professor Prabhat Jha, lead author of the report. Jha is director of the Centre for Global Health Research and a professor of epidemiology at the University of Toronto in Canada.

"More impressively," adds Professor Jha, "the Philippines government has raised taxes by well over 75%," while similar actions are being contemplated in other countries.

In 2014, Professor Jha's team plans to start monitoring the impact of tobacco tax increases in India and the Philippines as well as in other settings in partnership with the World Health Organization and the US Centers for Disease Control. "We know the full impact of smoking will only hit Asian countries a few decades from now," he says. "Evidence from high income countries finds that smokers can expect to lose a full decade of good life. But quitting early in adult life can reduce that risk by 90% or more."

Did you know?

Extending the logic of the "Tobacco Taxes" report, Prabhat Jha of the University of Toronto and Richard Peto of Oxford University recently suggested that by effectively doubling the worldwide price of cigarettes, governments could prevent 200 million tobacco-related deaths over the rest of this century.

In a *New England Journal of Medicine* article, the authors note that: "If current smoking patterns persist, tobacco will kill about 1 billion people this century. About half of these deaths will occur before 70 years of age." However, they add that governments could reduce by one-third the global prevalence of smoking through aggressive taxation. In many low- and middle-income countries, this "could be achieved by tripling the specific excise tax on tobacco."

For further information contact:
Professor Prabhat Jha
Centre for Global Health Research, St Michael's Hospital and Dalla Lana School of Public Health, University of Toronto, Canada
Email: prabhat.jha@utoronto.ca

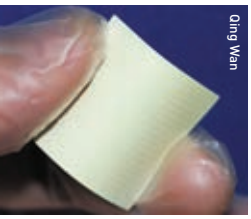
Paper transistor mimics neuronal signals

Chinese researchers have created a paper-based device that mimics electrochemical signalling in the human brain. The novel device could become a key component in the development of artificial neural networks for use in applications ranging from robotics to computer processing.

Developed by a team at Nanjing University and the Ningbo Institute of Material Technology and Engineering, the thin-film transistor (TFT) device was designed to replicate the natural junction, known as a biological synapse, between two brain cells or neurons. Neurons use the synapse to pass electrochemical signals and messages around the brain.

The synaptic TFT consists of an indium-zinc-oxide (IZO) channel and gate electrode, separated by a 550-nanometre-thick film of proton-conducting silicon dioxide electrolyte. The team chose to fabricate their TFT using paper because it is flexible, lightweight, inexpensive and environmentally friendly.

All neurons can generate an electric spike when their voltage changes by large enough amounts. These spikes cause signals to flow between neurons: the first neuron releases chemicals – called neurotransmitters – across the synapse, which are received by the second neuron, passing the signal on.



Qing Wan

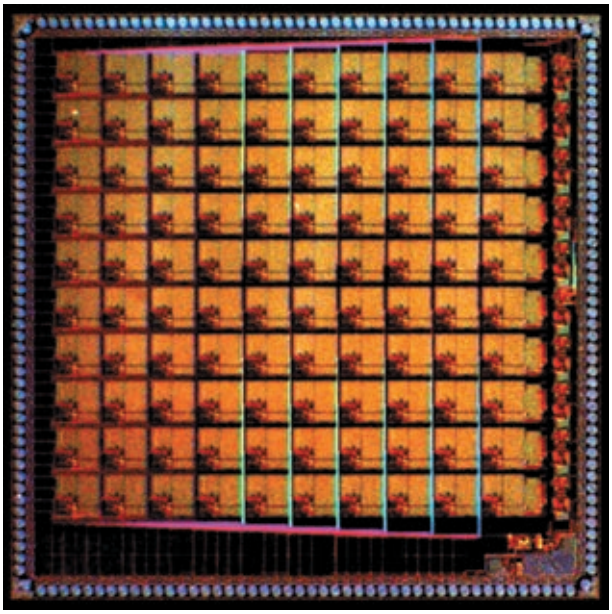
Similar to these spikes, the researchers applied a small voltage to the gate electrode in their device, causing protons from the silicon dioxide films to migrate towards the IZO channel opposite it. As protons are positively charged, this induced negatively charged electrons to be attracted toward them in the IZO channel, which subsequently allowed a current to flow through the channel – mimicking the movement of neurotransmitters from one neuron to another across a synapse.

As more and more neurotransmitters pass across a synapse between two neurons in the brain, the connection between the two neurons becomes stronger. This is the basis of how people learn and memorise things.

The researchers demonstrated this phenomenon, known as synaptic plasticity, in their own device. As reported in IOP Publishing's journal, *Nanotechnology*, the team found that when two voltage pulses were applied to the device in a short space of time, the second pulse triggered a larger current in the IZO channel than the first voltage, as if it had remembered the response from the first voltage.

"A paper-based synapse could be used to build lightweight and biologically friendly artificial neural networks," says co-author Qing Wan of Nanjing University. "At the same time, with the advantages of flexibility and biocompatibility, it could be used to create the flexible organism-machine interface for many biological

For further information contact:
Qing Wan
School of Electronic Science and Engineering,
Nanjing University, Ningbo Institute of
Material Technology and Engineering
Chinese Academy of Sciences
Peoples Republic of China
Email: wanqing@nju.edu.cn



Nanyang Technological University and A*STAR Institute of Microelectronics

Micrograph of the 100-channel neural recording integrated circuit chip

Power-efficient chip records brain activity

Neural recording systems are vital tools for acquiring and processing brain signals. Scientists at the A*STAR Institute of Microelectronics, Nanyang Technological University and the National University of Singapore have developed an integrated circuit chip that offers record-low power consumption for direct recording of brain activities.

The implantable system, which comprises multiple electrodes for data acquisition, promises to minimise a patient's exposure to electromagnetic radiation and heat during the recording process, making it possible to integrate more than 100 channels to acquire a more comprehensive profile of brain signals.

"This power-efficient device will enable new possibilities for the development of implantable brain interfaces, allowing paralysed patients to control wheelchairs or robotic arms with their minds," says Associate Professor Gavin Dawe of the National University of Singapore and Singapore Institute for Neurotechnology. So far it has been used to record the brain activity of an anaesthetised rat, bringing it one step closer to clinical deployment.

For further information contact:
Dr Song Shin Miin
Institute of Microelectronics
Agency for Science, Technology and Research,
Singapore
Email: songsm@ime.a-star.edu.sg

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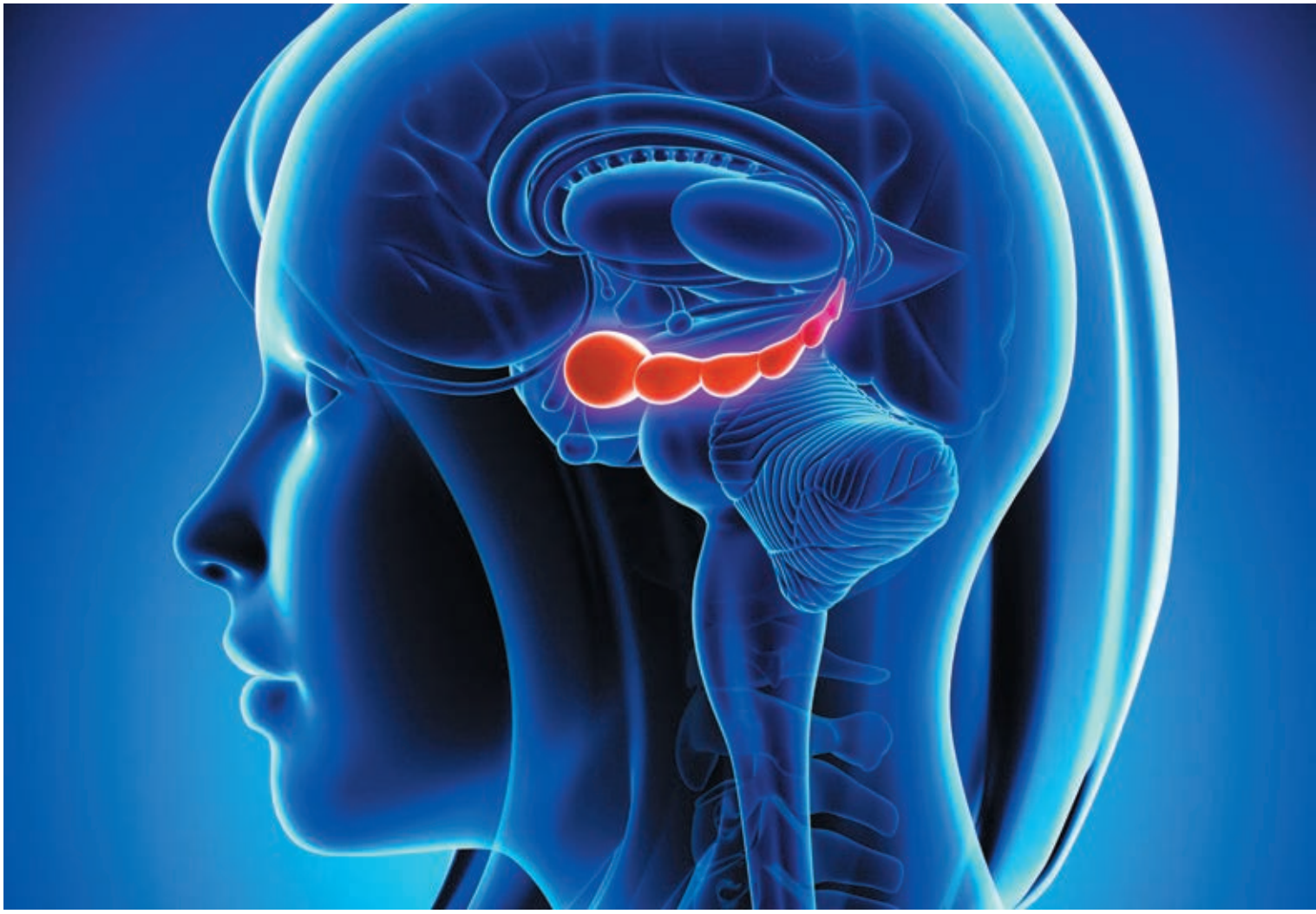


MIF is highly expressed in immune cells and in the hippocampus, an area of the brain responsible for memory function.

Korean researchers uncover molecular mechanism linking exercise and depression

The long-term health benefits of regular exercise for preventing heart disease, obesity and mood disorders are well established. However, until now, the underlying mechanisms linking exercise and depression remained elusive.

Depression affects around 121 million people worldwide. The social and economic consequences are profound. Although antidepressant drugs have been available for decades, their effectiveness varies in part because our understanding of the underlying neuronal mechanisms they affect is limited. Studies have shown that certain genes in the brain are directly affected by exercise and may be responsible for antidepressant effects seen in people who take part in regular physical activity.

To find out how exercise impacts these genes, a team led by Professor Pann Gill Suh of Korea's Ulsan National Institute of Science and Technology analysed previous studies and found that voluntary exercise and electroconvulsive seizures (one of the most effective treatments for depression symptoms) elevate levels of a protein – called macrophage migration inhibitory factor (MIF) – in the hippocampus, an area of the brain responsible for memory function.

Professor Suh and his colleagues wanted to find out the role of MIF in exercise-induced antidepressant therapy. To do so, they conducted behaviour tests using mutant mice that lack MIF. The results revealed that mice lacking this protein display depression-like behaviours and benefited less from exercise. In addition, the administration of recombinant MIF protein produced antidepressant-like behaviours in rats. Professor Suh suggests that MIF may mediate the antidepressant action of exercise, probably by increasing levels of serotonin (a chemical messenger involved in promoting feelings of well-being) and the formation of new brain cells.

For further information contact:
Professor Pann-Ghill Suh
School of Life Sciences
Ulsan National Institute of Science and Technology (UNIST)
Republic of Korea
Email: pgsuh@unist.ac.kr

Improving the performance of titanium implants

Researchers in China and Japan have tested a novel process for coating titanium implants with bioactive composites. Their research suggests that titanium implants coated with calcium phosphate and gelatine have great potential in clinical joint replacements or dental implants.

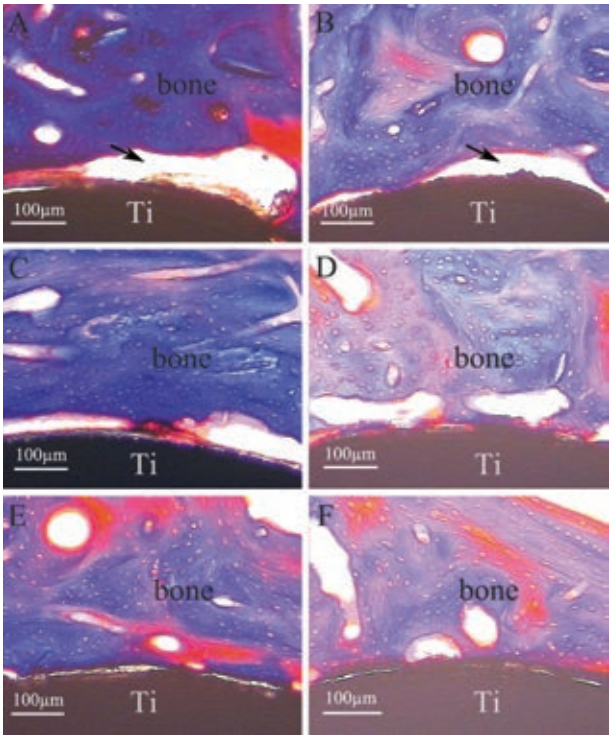
Titanium (Ti) and its alloys are the most popular materials used in orthopaedic implants because of their good mechanical and chemical properties, biocompatibility, corrosion resistance and low allergenicity. One drawback, however, is that they cannot bond directly to living bone, but need to be coated with bioactive materials to improve their integration.

Calcium phosphate (CaP) and collagen are the main constituents of natural bone. Gelatine is a denatured form of collagen and because of that has excellent biodegradability and biocompatibility properties. Many organic-inorganic composites combine the advantages of the organic and inorganic components, hence a composite of CaP and gelatine may be an effective coating for Ti implants.

In a study published in the journal *Science and Technology of Advanced Materials*, researchers at Zhejiang University in China and Yamagata University in Japan tested a novel process for coating titanium implants with bioactive CaP/gelatine composites.

In the study, Wei-Qi Yan and colleagues implanted tiny 2mm by 10mm CaP/gel/Ti and CaP/Ti rods into the thighbone of rabbits, while pure Ti rods served as controls. Four and eight weeks following the operation, the researchers found much more new bone on the surface of the composite CaP/gel/Ti rods than in the other two groups. What's more, the CaP/gel/Ti rods bonded to the surrounding bone directly, with no intervening soft tissue layer.

The team concluded that the CaP/gel/Ti implants not only enhanced the proliferation of stem cells and the differentiation of bone cells, but they also enhanced the ability of the implants to bond to bone. This research suggests that titanium implants coated with CaP and gelatine have great potential in clinical joint replacements or dental implants.



Science and Technology of Advanced Materials

Surface staining of bone-implant interface four weeks (A, C, E) and eight weeks (B, D, F) after implantation.

A, B: pure titanium (Ti)

C, D: calcium phosphate (CaP)/Ti

E, F: CaP/gel/Ti. Much more new bone has formed on these composite rods compared to pure titanium and CaP/Ti. The composite rods are also seen to bond to the bone directly with no intervening soft tissue.

For further information contact:
Wei-Qi Yan
Department of Orthopaedic Surgery
School of Medicine, Zhejiang University
People's Republic of China
Email: mikewqyan@gmail.com

New chips chew away at gum disease

Researchers in Malaysia are using derivatives from old-world toothbrushes to treat gum disease.

Records show that as early as 3,500 BC, chewing sticks were used for purposes of oral hygiene. To Arabs, the chewing stick is known as the miswak. To make one, twigs are taken from the Arak tree and shaped into small finger-length rods. Their ends are then chewed to remove the bark, revealing frayed fibers that can be used as a toothbrush.

Clinical studies have demonstrated that the chewing stick can reduce dental plaque and oral bacteria. Now, researchers from the Centre of Periodontology Studies at Universiti Teknologi MARA (UiTM) in Malaysia have developed a product from the miswak to treat chronic gum disease.

The team made periodontal chips containing miswak in a chitosan base. Chitosan is a stable, biodegradable, non-toxic hydrophilic polysaccharide with excellent mucoadhesive and permeation-enhancing properties. To treat gum disease, miswak chips are placed in the periodontal pocket: a gap that forms during gum disease when the inflamed gum pulls away from the teeth.

In clinical studies conducted on dental patients, the miswak chips remained in the periodontal pocket and reduced the pocket depth. Noteworthy effects included the control and inhibition of dental plaque formation, alleviation of gingival inflammation, and the treatment of mobile teeth.

For further information contact:
Fouad H. Al-Bayaty
Faculty of Dentistry
Universiti Teknologi MARA
Malaysia
Email: fouad@salam.uitm.edu.my

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Aseptic loosening is most challenging in the femoral component of a knee implant because it interfaces with all of the other components of a knee prosthesis.

New biomaterial may extend knee implant life spans

Researchers in Malaysia, Iran and the UK have designed a new biomaterial that could significantly extend the life span of total knee replacements by addressing the most common cause of their failure.

Led by Marjan Bahraminasab of Universiti Putra Malaysia, the researchers used computer modelling and structural analysis to help design a metal-ceramic, porous biomaterial that would replace the cobalt-chromium metal alloy normally used in knee implants. The team's goal was to reduce the risk of aseptic loosening: a failure of the bond between a knee implant and bone tissue.

In a paper published in *Materials and Design*, the team reported that their functionally graded biomaterial (FGBM) would improve the performance of total knee replacements. It would do this by addressing the three leading causes of long-term failure: stress-shielding of the bone by the implant, wear of the articular surfaces, and the development of soft tissue due to motion between the bone and implant.

For the FGBM to be fully effective, the shape of the femoral component, particularly the interface geometry, should be modified in order to optimise the design, state the authors. "This will need to be done in consultation with an orthopaedic surgeon in order to better understand the practical limitations of surgery and avoid weakening of the femur."

Various animal tests and in vitro experiments are required before using the new biomaterial in human trials. "After obtaining acceptable results, our research will focus on optimising the material processing aspects to ensure cost effective manufacture of the implant," says Bahraminasab.

For further information contact:
Marjan Bahraminasab
Department of Mechanical and Manufacturing Engineering, Faculty of Engineering
Universiti Putra Malaysia
Email: m.bahraminasab@yahoo.com

Professor Constantin Christopoulos

Viscoelastic coupling dampers (VCDs) consist of multiple layers of viscoelastic material sandwiched between layers of steel plates, allowing them to absorb vibrations caused by high winds and earthquakes.

Earthquake and typhoon-resistant shock absorbers for high-rises

A new technology that reduces vibrations in skyscrapers could significantly reduce the costs of constructing and repairing high-rise buildings in earthquake and typhoon-prone regions around the world.

Called the viscoelastic coupling damper (VCD), the shock absorbing technology was developed by Canadian researchers to better control building vibrations caused by high winds and tremors. VCDs are especially relevant for the Asian market as the vast majority of high-rise buildings built in the next few decades will be located in Asia.

Designed to replace a typical concrete beam and averaging about 0.3 cubic metres in size, a single VCD consists of multiple layers of viscoelastic material sandwiched between layers of steel plates. Depending on the size of a building and the amount of damping required, between 100 and 300 VCDs might be installed per high-rise. This would replace the standard heavy concrete coupling beams used in many existing high-rises that are expected to sustain damage after large earthquakes.

"In the designs we've completed, the savings to a builder ranged from US$4-10 million when compared to vibration absorption systems," says Professor Constantin Christopoulos of the University of Toronto (U of T). "These savings are primarily because our technology does not occupy any architectural space, as a VCD is embedded inside a building's structure. By contrast, tuned mass damper or sloshing vibration absorbers often occupy the top floors of the building, which are the most valuable."

In the event of a severe earthquake, replaceable VCDs would absorb most of the vibrations, eliminating the need for major building repairs, adds Professor Christopoulos. "There would still be localized damage at the base of the walls. But this does not impact a building as much as distributed damage from concrete coupling beams over its entire height, which may render a building completely unusable during repairs."

Commercialization of this technology is being led by a U of T spinoff company, Kinetica, which has forged a partnership with Nippon Steel Engineering – a subsidiary of Nippon Steel Mill – to market the VCD worldwide. Construction of the first high-rise building, where VCD technology is being considered for use, is scheduled to begin in Toronto in 2014. "In addition, Kinetica is currently in discussions with the structural engineers of three major projects in Asia," says Professor Christopoulos.

For further information contact:
Professor Constantin Christopoulos
Department of Civil Engineering
University of Toronto, Canada
Email: c.christopoulos@utoronto.ca

Hong Kong researchers develop "third eye" to protect construction workers

Researchers at The Hong Kong Polytechnic University are developing a proactive construction management system to enable construction workers to detect and thus avoid dangers.

In Hong Kong, construction ranks as its most dangerous industry in terms of on-the-job fatalities. In 2011 the industry accounted for about one-quarter of all workplace deaths, with 46 construction workers losing their lives. Research underway at The Hong Kong Polytechnic University could eventually help on-site workers stay safe, not only in Hong Kong but around the world.

Led by Professor Heng Li, the research team aims to develop a proactive construction management system (PCMS) that would provide a "third eye" to construction workers, enabling them to detect, and thus avoid, site dangers.

"Using a PCMS, we believe more lives can be saved and the number of fatal accidents in the construction industry can be further reduced," says Professor Li.

"Our technology aims at managing the entire construction stage where three major safety hazards exist: falling from heights, striking or being struck by moving objects, and being struck by moving vehicles," he adds. "This project is the first attempt to make construction processes computable and construction safety risks monitorable, based on real-time location techniques and 3D virtual construction simulation of construction processes."

So far, the research team has completed the design and implementation of a prototype PCMS and has begun testing the system in lab and construction site environments.

"According to test results, the accuracy of our real-time location technology is within one metre at a distance of 30 metres and with an 85% guarantee rate," says Professor Li.

In 2014, the researchers plan to conduct pilot studies in two real-life construction projects to evaluate the accuracy, stability and practicality of the PCMS. Further fine-tuning will then be conducted to address any issues identified during the trials. Down the road, Professor Li and his colleagues hope to expand the capability of their technology to help construction companies track the flow of materials and components at building sites.

Did you know?

The Hong Kong Polytechnic University's proactive construction management system consists of two major parts: a real time location system (RTLS) - comprised of tags, anchors and wireless communication devices - and a virtual construction simulation (VCS) system. Tags are mounted to the helmets of workers and moving equipment while anchors are installed in particular locations on a construction site to provide reference points for the RTLS. The VCS records the 3D movements of workers and equipment and measures the relative positions of workers and their surrounding danger sources/zones. If necessary, warnings alert workers through the tags installed in their helmets.

The Hong Kong Polytechnic University

Prototype proactive construction management system (PCMS) undergoes testing in a construction site environment.

For further information contact:
Professor Heng Li
Department of Building and Real Estate
The Hong Kong Polytechnic University
Email: heng.li@polyu.edu.hk

Na9234

Discovering new strengths in an ancient plant fibre

A plant fibre traditionally used by ancient Egyptians to make rope and sailcloth is now finding uses as a component in structural building materials.

Kenaf (*Hibiscus cannabinus*), a versatile, quick-maturing, fibrous plant of the jute family, was first planted in Egypt about 3,000 years ago. It now grows on four continents, and researchers at Malaysia's Universiti Teknologi MARA (UiTM) are finding a host of new cutting-edge applications, including soundproofing, thermal insulation and a sturdy, low-maintenance plastic-wood composite that forms a strong structural building material.

Historical uses for kenaf range from rope and sailcloth on ancient Nile boats to clothing, heart-friendly cooking oils and, starting last year, interior door panels in some Ford vehicles.

Now civil engineering researchers at UiTM have added kenaf fibre to masonry to create sand-cement kenaf blocks, which offer better sound and thermal insulating properties than standard concrete blocks. Since Malaysian tropical buildings feature single-wall construction, insulation that does not add an extra layer is more practical. A bonus is that where traditional insulations use inorganic fibres that are known to be harmful to human health, natural kenaf fibre appears to be a safer additive.

In another project, a second UiTM team has developed a kenaf-based wood-plastic composite (WPC), for structural uses such as joists and rafters. Their product promises low maintenance, durability and resistance to termites and other insect attacks.

The researchers say that fibre from the fast-growing kenaf plant shows excellent promise as a replacement for traditional sawdust fillers, which are becoming scarcer and more costly. What's more, when kenaf is mixed with a plastic binder in higher proportions than sawdust, the resulting material is as strong or stronger than current sawdust-based structural products, while using less plastic binder. This makes it a more cost-effective and environmentally sustainable product.

The researchers recommend further testing to confirm the mechanical properties of this product. But based on the strength of testing to-date, they believe the data reinforces the case for commercializing WPCs with higher kenaf content.

For further information contact:

Sand-cement kenaf blocks

Kartini Kamaruddin
Faculty of Civil Engineering
Universiti Teknologi MARA
Malaysia
Email: ce_kartini2002@yahoo.com

Wood-plastic composite

Aruan Effendy Mohd Ghazali
Faculty of Civil Engineering
Universiti Teknologi MARA
Malaysia
Email: aruan624@salam.uitm.edu.my

Wikimedia

Understanding urban ventilation

Hong Kong is a unique city due to its complex geographical setting and its concentration of very high buildings. Researchers are taking advantage of this fact to study how cities are ventilated in order to provide guidelines for future city design.

The ventilation of cities is fundamental to the removal of heat and airborne pollutants. With more than half the world's population now living in urban areas, ventilation is a growing health concern.

In Hong Kong, the average wind speed has declined every decade since 1968. "We think this is due mainly to dense urban development, especially the inclusion of podiums," says Professor Janet Nichol of The Hong Kong Polytechnic University. "The podium around most residential developments extends almost to the plot boundary, leaving hardly any open space at ground level for cooler fresh air to penetrate into the city." Podiums are large projecting structures at the base of a tower block that commonly contain shopping malls or car parks.

As a result, "the air in the city's centre is stagnant as it cannot be flushed out by penetrating winds," says Professor Nichol. "This means that local pollutants from traffic accumulate near where they are generated: within streets and in urban canyons surrounded by tall buildings."

In collaboration with the University of Hong Kong, Professor Nichol and her colleagues hope to better understand the city's ventilation mechanisms in different wind conditions. They also hope to determine the roles of building height, vegetation, sea breezes and other urban parameters on ventilation, and to compare ventilation conditions in Hong Kong with those in China's city of Shenzhen to provide guidelines for future city design.

"Hong Kong provides a unique world laboratory for studying city ventilation due to its concentration of very high buildings and its complex geographical setting," says Professor Nichol. The ultimate goal is to guide urban ventilation planning in rapidly developing cities in Asia and around the world.

So far, the team has spent several months collecting data on urban heat island patterns and distributions in Hong Kong's largest and most extensively built-up area, the Kowloon Peninsula. The urban heat island effect occurs in large metropolitan areas due to high levels of human activity, converting them into "islands of heat".

"In August 2013, we measured the wind directions and wind strength at ground level on hot summer nights across the coastline in Hung Hom district," says Professor Nichol. "We also flew over Kowloon on a hot day in August taking thermal images of Kowloon's urban heat island from a helicopter."

In 2014, the researchers plan to repeat the helicopter thermal survey during a night-time flight. "At the same time, we will collect ground data on wind at the urban edges to identify the major ventilation pathways across Kowloon and those areas where air is stagnant," she says. "We will also build 3D models of temperature and ventilation corridors across the urban area."

Did you know?

Heat that accumulates during the day in Hong Kong often cannot escape at night due to its retention by buildings and the lack of wind. "Research has shown that hot temperatures at night are more related to heat stress and heat-related mortality than daytime heat, as people are unable to cool down during a 24-hour period," says Professor Nichol.

For further information contact:
Professor Janet Nichol
Department of Land Surveying and Geo-Informatics
The Hong Kong Polytechnic University
Email: lsjanet@polyu.edu.hk

ADRA India/EU Humanitarian Aid and Civil Protection

Coastal town of Gopalpur, Odisha on 13 October, 2013 in the aftermath of Cyclone Phailin

Protecting lives and livelihoods in India's Chilika Lagoon

Authorities, environmental experts and local stakeholders are working together on India's east coast to assess the area's biophysical and social vulnerabilities to climate change. This is helping them develop proactive adaptation strategies to protect the area and those who live in it from destructive weather patterns similar to Cyclone Phailin that struck the Mahanadi Delta in 2013.

Cyclones are common along India's southern coastline, but there are fears they may grow more destructive as climate change warms the atmosphere and raises ocean levels. When Cyclone Phailin struck the Mahanadi Delta in October 2013, it was the strongest to hit India in more than a decade. Thankfully, most lives were spared due to effective early warning systems.

Among the most sensitive areas to feel the brunt of the storm was the Chilika Lagoon. Situated on India's east coast, it is a biodiversity hotspot and an important buffer zone between freshwater and seawater ecosystems. Some 200,000 fishers and 400,000 farmers make their living in and around the lagoon and its delta.

Since 2011, Wetlands International South Asia and the Chilika Development Authority have worked with local stakeholders to assess biophysical and social vulnerabilities to climate change in the area. Understanding these vulnerabilities is essential to developing proactive adaptation strategies that can reduce the risk to lives, occupations and ecosystems.

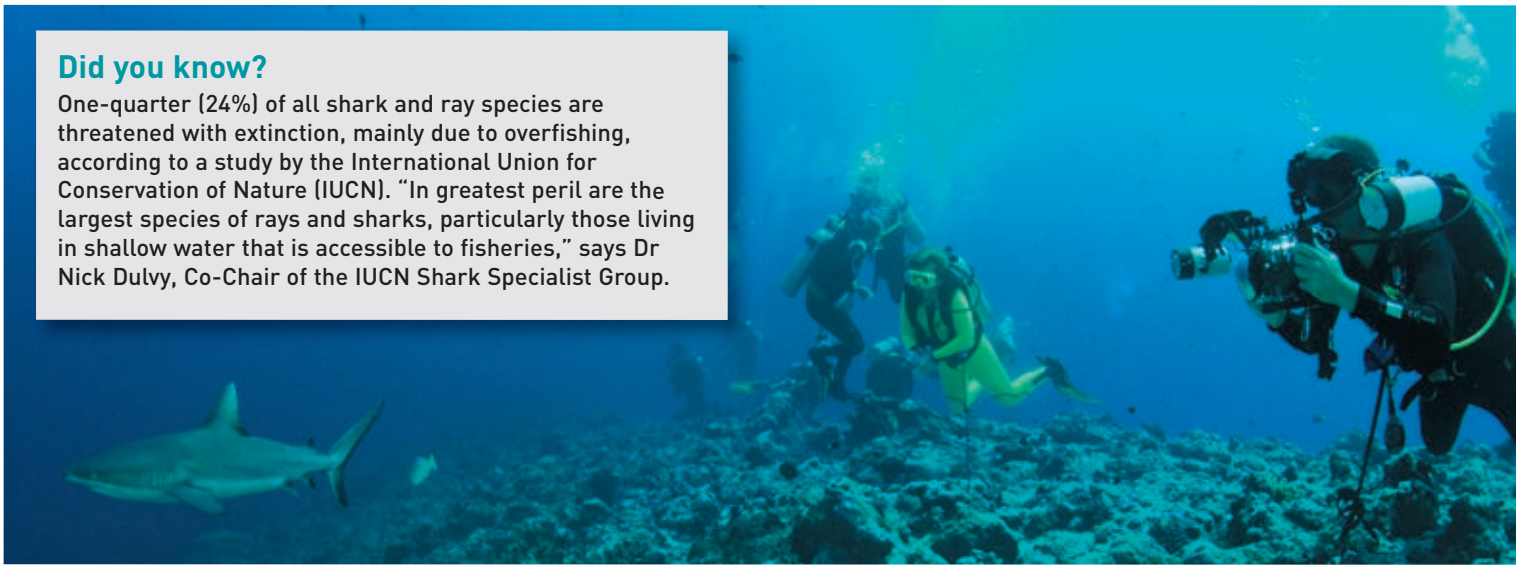
Supported by Canada's International Development Research Centre, the project aims to produce a solid body of evidence to guide both livelihood supports and wetland management plans.

In October 2012, an integrated plan for "climate smart" management of the Chilika Lagoon was released. The research team is pilot-testing various adaptation strategies in local villages. The team is also developing training modules on climate change adaptation for wetland managers and resources for decision makers.

Some of the project's disaster-response measures were dramatically tested when Phailin struck. Disaster resilience committees in 11 coastal villages around Chilika that had formed under the project joined the effort to ensure early evacuation of villagers. Mock drills had been rehearsed, cyclone shelters had been stocked with food and medicine, and family survival kits helped stranded community members survive for the three days during which no outside relief could reach them. In the heavy rains that followed, committee members were able to help other flood-affected villages.

Major loss of life was avoided in Chilika, but coastal forests and shorelines have been devastated. Restoring habitats and livelihoods remains a significant challenge. In the long run, improved wetland management and disaster preparation planning will be key to ensuring the resilience of communities and the ecosystems they depend on.

For further information contact:
Isabelle Bourgeault-Tassé
International Development Research Centre, Canada
Email: ibourgeault-tasse@idrc.ca



Peter Verhoog, Dutch Shark Society

Did you know?

One-quarter (24%) of all shark and ray species are threatened with extinction, mainly due to overfishing, according to a study by the International Union for Conservation of Nature (IUCN). "In greatest peril are the largest species of rays and sharks, particularly those living in shallow water that is accessible to fisheries," says Dr Nick Dulvy, Co-Chair of the IUCN Shark Specialist Group.

Overfishing of sharks harms coral reefs

Scientists from Canada and Australia have discovered that a decline in shark populations is detrimental to coral reefs, information that may prove integral to restoration and conservation efforts.

"Where shark numbers are reduced due to commercial fishing, there is also a decrease in the herbivorous fishes that play a key role in promoting reef health," says Jonathan Ruppert, a recent University of Toronto PhD graduate. This is because with fewer sharks, the population of mid-level predators – such as snappers – increases.

Dr Ruppert now hopes to show that human activity plays a pivotal role in altering the role of sharks in coral reef food webs throughout the Pacific.

For further information contact:
Dr Jonathan Ruppert
Postdoctoral Research Associate
Department of Biology, York University
Email: jonathanruppert@gmail.com

Greener filter cloth treats waste water

A new method to manufacture cloth involving the use of a common industrial bleaching agent promises an environmentally safe way for waste water filtration.

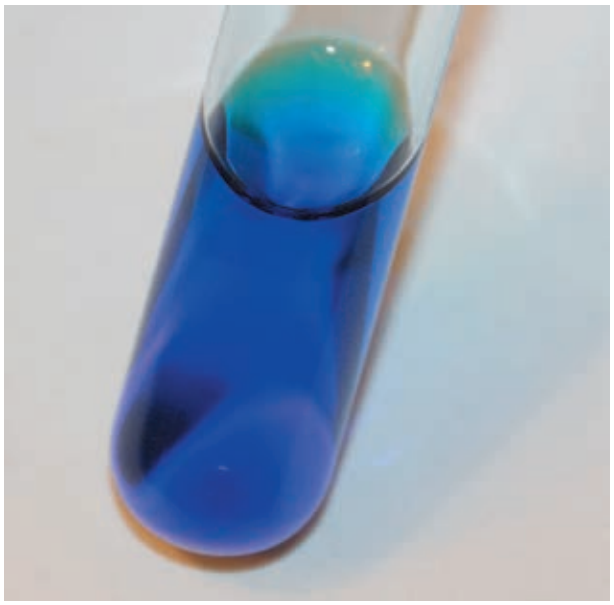
Titanium dioxide (TiO_2) is an odourless white powder used as an industrial and commercial bleaching agent for paint, paper, pharmaceuticals and plastics, and as a photocatalyst in the manufacture of semiconductor chips.

Because it is an active photocatalyst, mixing titanium dioxide with certain organic contaminants then subjecting them to ultraviolet light to create a photochemical reaction is an effective way to degrade and neutralize them.

Michelle Marie S. Villamayor of the University of the Philippines Diliman is focusing on using TiO_2-deposited filter cloth to remove a toxic organic dye, called methyl blue, from waste water more safely and efficiently. Methyl blue is used for staining biological samples.

Current methods for making TiO_2-deposited filter cloth involve many steps and spawn a number of undesirable acid and chemical by-products along the way. The new method, by contrast, uses a single-step plasma process to "sputter-deposit" a thin film of TiO_2 onto filter cloth under vacuum conditions, with no toxic by-products.

Villamayor's research is part of a partnership with Doshisha University in Kyoto, Japan, that aims to find new ways to use semiconductor photocatalysts to oxidise and neutralise organic wastes in waste water treatment.



Wikipedia

Methyl blue is a toxic organic dye generally used for staining biological samples.

For further information contact:
Ms Michelle Marie Villamayor
National Institute of Physics
University of the Philippines Diliman
Email: mvillamayor@nip.upd.edu.ph

University of Nottingham Malaysia

The Management and Ecology of Malaysian Elephants project is using satellite tracking devices to learn more about elephant behaviour and ecology, and how to mitigate human-elephant conflict.

Exposing the secret life of endangered elephants

A new project is using GPS-collars, camera traps and dung to tell us more about elephants in Malaysia and how to mitigate human-elephant conflict.

"We can only manage what we measure." That is the key to a unique research project that's harnessing high-sensitivity GPS satellite collars, VHF receivers and antennae, as well as camera traps to film Malaysian elephants as they move about in the forest.

Called the Management and Ecology of Malaysian Elephants (MEME) project, its aim is to learn more about the behaviour and ecology of Asian elephants living in tropical rainforests and how to mitigate human-elephant conflict. In addition, the MEME team is studying the immediate and mid-term behavioural response of elephants to translocation – when they are moved away from a conflict area.

University of Nottingham Malaysia

One of this project's objectives is to study the immediate and mid-term response of elephants to translocation – when they are moved away from a conflict area.

"Peninsular Malaysia may become one of the last strongholds for Asian elephants in Southeast Asia," says Dr Ahimsa Campos-Arceiz of the University of Nottingham Malaysia Campus. "With low human density, a very developed economy, and a functional Department of Wildlife and National Parks, the long-term conservation of elephants in this part of the world depends on social and political will. With our project, we intend to contribute the know-how and provide data to aid the authorities to do evidence-based elephant conservation."

A hundred years ago wild elephants on the Malay Peninsula could be counted in the thousands. Now due to the loss of habitat, there might be around 1,500. But this figure is just guesswork; what we know for sure is that elephants have lost a lot of range in Malaysia during the last few decades. The main reasons for this decline have been the loss and fragmentation of natural habitats and the resulting human-elephant conflict that occurs when elephants enter plantations and villages to feed on attractive crops and grasses. Live capture and poaching for ivory have also impacted Asian elephant populations, although not so much in Malaysia.

There are now about 20 collared elephants roaming the Malaysian tropical rainforest. "Our aim is to fit 50 elephants with satellite tracking devices to monitor how they're responding to the changes in their habitat, how they react to translocation, and what effect conservation measures such as highway viaducts and wildlife corridors are having on the elephant population," says Dr Campos-Arceiz.

The MEME project receives its main financial support from the Yayasan Sime Darby Foundation as well as the US Fish and Wildlife Asian Elephant Conservation Fund, Wildlife Reserves Singapore, and Marinescape NZ, among others.

For further information contact:
Dr Ahimsa Campos-Arceiz
Associate Professor, School of Geography
University of Nottingham Malaysia Campus
Email: ahimsa.camposarceiz@nottingham.edu.my

Study looks at temperature regulation in tropical conditions

Tarsiers and tree shrews are being studied to learn more about the effects of ambient temperature on body temperature under tropical conditions.

Little is known about the thermal physiology of mammals in the hot and humid tropics. Earlier studies with tree shrews found a high level of daily variation in body temperature whereas a more recent study found the opposite. Researchers in Malaysia and South Africa are now working together to record the activity of tree shrews and tarsiers in the wild and to determine how they respond to different ambient temperatures. Data from free-ranging animals will not only provide an opportunity to study the effects of ambient temperature on body temperature under humid tropical conditions, but will also shed more light on the evolution of thermal regulation in mammals.

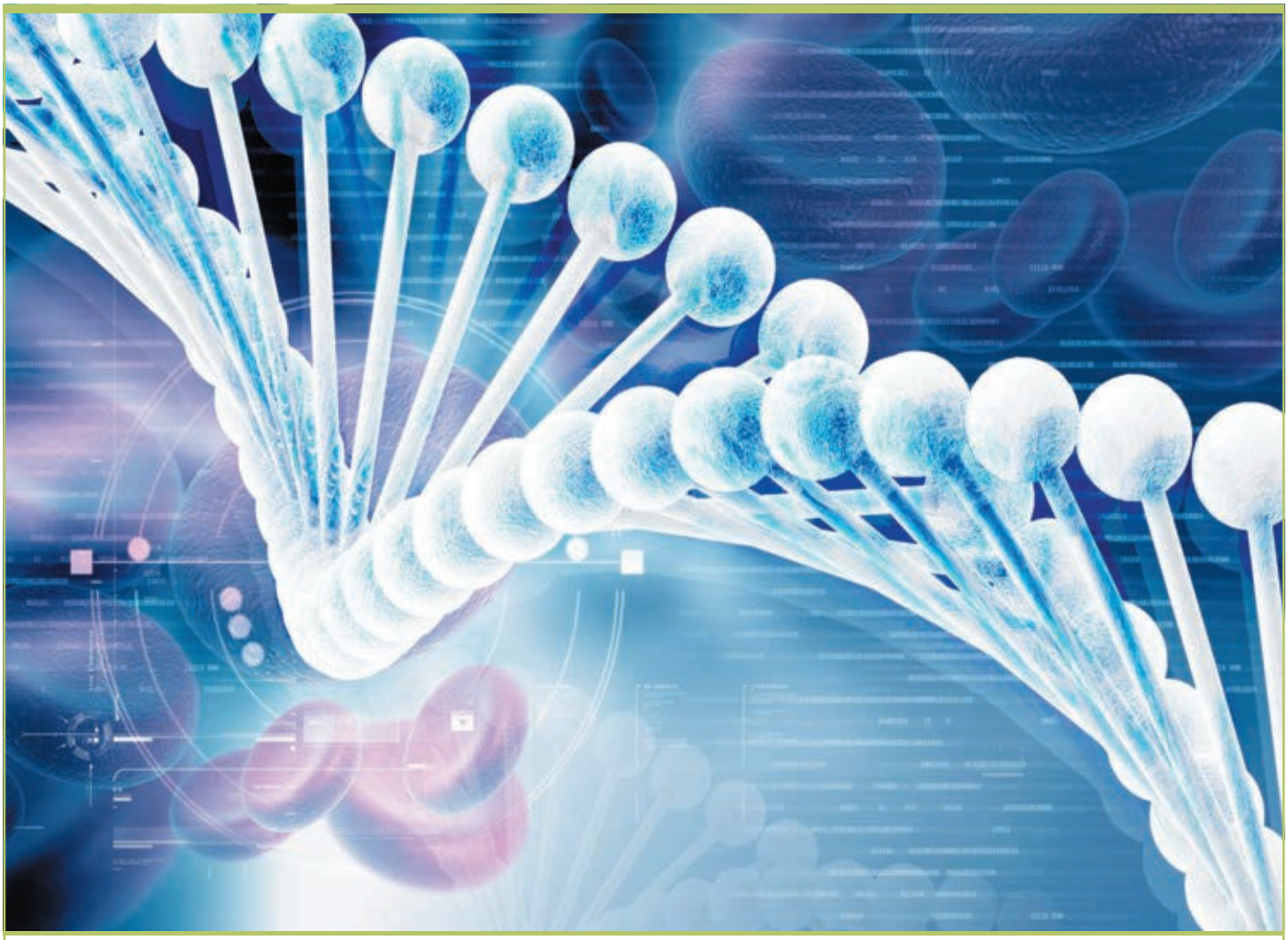
Researchers at the Universiti Malaysia Sarawak and the University of KwaZulu-Natal in South Africa will measure the metabolic rate, core body and skin temperatures of captured tarsiers and tree shrews over a range of weather conditions. Before its release, each animal will be implanted with a data logger programmed to record body temperatures every 30 minutes. The animal will also be outfitted with a radio collar to record its activity patterns and behaviours in the wild over a minimum of four months.

Tree shrew

Tarsier

Wikipedia

For further information contact:
Professor Andrew Alek Tuen
Director, Institute of Biodiversity and Environmental Conservation
Universiti Malaysia Sarawak
Email: aatuen@ibec.unimas.my



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