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Taiwan's National Applied Research Laboratories' Chip Implementation Center unveiled its MorSensor wireless sensor building blocks. Suitable blocks can be combined to create a miniature but extremely sensitive sensing device, such as forming a breathalyzer with a screen, alcohol sensor and power source. By changing one block in the array, MorSensor can be transformed into a different sensing device. An example would be replacing the alcohol sensor in the breathalyzer with a lens unit to produce a camera.

Tainan City-based Cheng Kung University Department of Psychology professor Hsieh Shu-lan used theta waves to conduct neurofeedback training in senior citizens and proved the method effectively raised their attention span and memory capacity, as well as slowing brain aging, NCKU said. The findings were published in international journal Clinical Neurophysiology under the title "Neurofeedback training improves attention and working memory performance."

"ITRI TODAY", no. 74, 3rd Quarter 2013: 2013 ITRI Laureates: A Tribute to Those who Brought Great Value to Taiwan's Industry; Natural Language Understanding Technology with Conversational Capability; Taiwan's First 3-Dimensional "IC Packaging; Topography Inspection Module"; Taiwan's Technology - Recognized the World over for Innovation; ITRI Establishes Second Presence in Europe, etc.

Contents

1.	NCKU researchers turn waste cooking oil into biodiesel	2
2.	Science council shows off bridge monitoring system	2
3.	Taiwan's institute wins R&D 100 Awards for 6th consecutive year	2
4.	NASA-sponsored science program officially launched in Taiwan	3
5.	Taiwan researcher studies coral pollutants	3
6.	Virus detection just got better: researchers	4
7.	NCKU creates record-breaking supercomputers	4
8.	Taiwan joins 10-year quake research project in Himalayas	5



1. NCKU researchers turn waste cooking oil into biodiesel

(Taipei Times, 02 11 2013)

Using microwave heating, researchers at National Cheng Kung University (NCKU) said they have developed a way to turn waste cooking oil into biodiesel and hope to commercialize the technology within a year through cooperation with local businesses. NCKU distinguished professor Liao Jiunn-der and visiting professor Aharon Gedanken of Israel announced their finding, which relies on strontium oxide as a catalyst. With the catalyst, used cooking oil can be transesterified into biodiesel and glycerol in a modified microwave oven in 10 to 40 seconds, they said. The strontium oxide can then be reused, making the recycling method highly efficient, Liao said. The process can turn waste into a resource that contributes to the environment and economy, especially in Taiwan, where cooking and eating habits mean restaurants, homes and schools produce a considerable amount of waste oil, Gedanken said. Liao said he hoped the method would help Taiwan, where diesel fuel currently consists of 2 to 3 percent biodiesel, to meet the EU's target of having biodiesel make up 20 percent of all diesel used by 2020. The university is working on applying a patent for the technique, he said. The modified microwave developed by Gedanken is able to handle an estimated 500kg of waste oil per day, Liao said. The results proved that the transesterification of waste cooking oil to biodiesel using strontium oxide as a catalyst is a commercially viable way to decrease the costs of biodiesel production, he added.

<http://www.taipeitimes.com/News/taiwan/archives/2013/11/02/2003575977>

2. Science council shows off bridge monitoring system

(Taipei Times, 07 11 2013)

The National Science Council (NSC) announced the development of a new bridge monitoring system — incorporating GPS, electronic telecommunication, wireless transmission and structure monitoring technologies — to improve simultaneous and continuous bridge scour monitoring. The NSC-funded collaborative research project, consisting of researchers from National Taiwan University and National Cheng Kung University, and led by Tserng Hui-ping, a civil engineering professor at National Taiwan University, integrated the technologies from several fields to overcome the limitations of the nation's current bridge monitoring systems. Tserng said the bridge monitoring systems now in use rely on cable connections, so the design, installment and maintenance of wires on the bridge must be carefully considered and usually cost more, take more time to install and are difficult to remove. The research team developed a wireless sensor network — including several sensor nodes — that is small and can be easily installed on the side of a bridge and on top of the bridge piers. The simultaneous bridge-vibration data gathered from the nodes can be transmitted through Wi-Fi to a control room at one end of the bridge, where the timings of the data collection can be adjusted by the GPS system and then sent via the Internet to a server for analysis. Tserng said that because the structure of bridges may be damaged by long-term bridge scour — removal of river sediment around bridge abutments or piers by swift moving river water, especially in extreme conditions like typhoons or heavy rainfall — monitoring bridge vibration frequencies and analyzing them to exclude the influence of traffic and other everyday factors, can provide information on the structure's ability to withstand certain conditions. The system was installed on Chung Sha Bridge for testing and proved effective at monitoring the bridge's scour conditions, he said, adding that hopefully if the system — which is cheaper than the current, imported systems — can be used on more bridges, it could save an estimated NT\$10 billion (US\$340 million) in disaster prevention and perhaps exported.

<http://www.taipeitimes.com/News/taiwan/archives/2013/11/07/2003576339>

3. Taiwan's institute wins R&D 100 Awards for 6th consecutive year

(Central News Agency, 09 11 2013)

Taiwan's Industrial Technology Research Institute (ITRI) has once again won the R&D 100 Awards, making it the only Taiwanese institute that has done so for the sixth consecutive year, a researcher said. The companies earned the R&D 100 Awards, dubbed the "Oscars of Innovation," with three innovative technologies -- FluxMerge (Mechanical Systems category), ButyFix (Energy Technology category) and iAT Technology (Electrical Device category), said Golden Tiao, deputy general director of ITRI's Electronics and Optoelectronics Research Laboratories. "We are delighted to receive recognition for the sixth consecutive year by R&D Magazine and for this year's three breakthrough computer and green technologies," Tiao said. He added that the technologies exemplify ITRI's mission to innovate and provide a better future for society. They include advanced biofuel production, energy efficiency and global carbon reduction, as well as a see-through display with air-touch input technology. The iAT Technology caught much media attention with its air-touch input technologies, which can allow users to operate computers, wearable computers and mobile devices without the physical touch of a touch pad or a keyboard but with a virtual one. They can simply "touch the air," to operate the devices, Tiao said. Widely recognized as the "Oscars of Innovation," the R&D 100 Awards identify and celebrate the top technology products of the year. Since



1963, the awards have spanned industry, academia, and government-sponsored research. ITRI, established in 1973, is Taiwan's largest and one of the leading high-tech research and development institutions in the world

<http://focustaiwan.tw/search/201311090006.aspx?q=ITRI>

4. NASA-sponsored science program officially launched in Taiwan

(Central News Agency, 12 11 2013)

A ceremony was held in Taipei to officially announce Taiwan's inclusion in GLOBE, an international science education program sponsored by the National Aeronautics and Space Administration (NASA) that supports research on the Earth's environment. Representatives from the American Institute in Taiwan (AIT)'s Taipei Office, Taiwan's National Science Council and National Central University were on hand to officially launch the program. GLOBE connects schools around the world and empowers members to use science to address environmental issues, ranging from climate change and wild animal and plant protection to drinking water and recycling, said Christopher Marut, the director of AIT's Taipei Office. "These are common challenges faced by the United States and Taiwan, and they cannot be resolved through politics alone," said Marut, adding that he hopes the program could be expanded to more schools around Taiwan in the future. The program will enable Taiwanese students to conduct environmental studies and upload their data to a GLOBE database, and also gain access to information submitted by other members, said Mou Chung-yuan, the deputy chief of the National Science Council. "It is a good opportunity for our students and other participants to broaden their horizons and scientific knowledge," Mou said, hoping that Taiwanese students can make contributions to the global environment through the program. Membership in the program will also allow Taiwanese students and researchers to participate in meetings, training programs and other events organized by GLOBE, according to the AIT. Taiwan gained membership in GLOBE on Sept. 6 when AIT's Washington headquarters and the Taipei Economic and Cultural Representative Office signed a GLOBE agreement on behalf of NASA and Taiwan's National Science Council, respectively. Six Taiwanese schools, including the Affiliated Senior High School of National Taiwan Normal University, are currently participating in the program. Lin Pay-liam, country coordinator of GLOBE-Taiwan and chairman of National Central University's Department of Atmospheric Science, said five more Taiwanese high schools are expected to join the program by year-end and he hopes the program can include a total of 30 schools over the next three years. GLOBE (Global Learning and Observations to Benefit the Environment) supports students, teachers and scientists in over 110 countries in collaborating on research and investigations of the environment and the Earth. Founded on Earth Day in 1995, the primary and secondary school-based program aims to develop environmental awareness and a sense of global community among its members. Over 58,000 teachers and 1.5 million students around the world have participated in the program, contributing more than 23 million measurements to the GLOBE database.

<http://focustaiwan.tw/news/asoc/201311120012.aspx>

5. Taiwan researcher studies coral pollutants

(Taiwan Today, 12 11 2013)



Research by Pingtung County-based National Museum of Marine Biology and Aquarium on southern Taiwan coral reefs has found high levels of pollutants coming from the land. The study, published in international journal *Environmental Pollution*, looked at the presence of environmental hormones, or endocrine disrupter substance, within coral tissues for the first time. "The waters of Kenting National Park are renowned for their clarity," said Ko Fung-chi, NMMBA researcher and National Dong Hwa University professor of marine and evolutionary biology. "Although no tangible effects from the pollution have yet been observed on the reefs, the increased number of visitors to the park is likely to cause a concomitant rise in the levels of EDS in the environment. As they accumulate within coral tissues, the potential impact on the coral population becomes very significant." According to Ko, NMMBA has been conducting toxicology tests, and that unless human activity in the area is regulated, it could prove a major threat to the local biosphere. Among the most worrying pollutants are polycyclic aromatic hydrocarbons, which number many known or potential carcinogens. An important source of PAHs is partially burnt carboniferous material, such as firewood, charcoal, gasoline and tobacco. They are often produced as a byproduct of grills and barbecues. "Environmental hormones are very persistent pollutants," Ko said. "They are lipophilic, so are readily absorbed by fatty substances and accumulate in creatures' tissues." The



researcher said that of the more than 10 persistent pollutants studied, concentrations of PAHs within coral tissue were highest, and sometimes more than 100 times greater than in the surrounding ambient sediment. PAHs are very stable and highly resistant to degradation or elimination from the environment.

<http://www.taiwantoday.tw/ct.asp?xItem=211541&ctNode=445>

6. Virus detection just got better: researchers

(Taipei Times, 14 11 2013)

A Taiwanese academia-industry collaboration research project has successfully developed biochip systems which can detect some of the most common viruses that can affect banana and potato crops, and improves the efficiency and cost of screening the seedlings, the systems' makers say. The project was funded by the National Science Council and was led by Chang Chin-an, a professor at Chaoyang University of Technology's Department of Applied Chemistry, in cooperation with DR Chip Biotech Inc. "Bananas and potatoes are two common crops around the world. Like people and animals, plants can be infected by viruses, which can have a negative effect on their growth, harvest and quality," Chang said. Asexual reproduction, or plant tissue culture, is used for both crops to produce harvests with the same traits, he said. However, if the seedlings are infected before reproduction, the viruses will be vertically transmitted to the entire crop, so screening for viruses is very important in the process of seedling reproduction, he added. Chang said that the screening methods are developing from the species specific polymerase chain reaction (PCR) detection technology, which is only able to screen one specific virus species at a time — to multipurpose PCR, which is able to screen for more than one virus species. Chang said traditional PCR methods, which use gel electrophoresis to show detection results, can sometimes yield unclear results — making it difficult to determine whether the seedling is infected — take about six hours to return a result, and can have genotoxic side effects. The research team developed biochip detection systems that can detect multiple viruses at once and also have a detection sensitivity about eight times higher than traditional methods, he said. So far, the biochip detection system for bananas has been able to detect the three most common virus species: cucumber mosaic virus, banana bunchy top virus — which can be found in bananas in Taiwan — and banana bract mosaic virus — which is common in the Philippines. Chang said the researchers are still working to include the capability to detect the banana streak virus, which is a common virus in many parts of the world, to their biochip. The researcher's biochip for detecting viruses on potato seedlings can simultaneously detect all five common virus species in Taiwan: potato viruses Y, A, S, M and X from three virus genera, he said. "While the detection methods currently being used take six hours for each species-specific detection process, the biochip detection systems only take five hours to detect several viruses at once, saving time and experiment costs," he said. DR Chip chief executive officer Sino Wang said the company has completed the feasibility evaluation for commodifying the biochip detection systems for bananas and potatoes, conforms to the EU's plant disease testing standards, and can hopefully acquire a worldwide market share of 10 percent and estimated revenue of between NT\$200 million and NT\$300 million (US\$6.8 million and US\$10 million) in two to three years.

<http://www.taipeitimes.com/News/taiwan/archives/2013/11/14/2003576844>

<http://focustaiwan.tw/news/ast/201311130028.aspx>

<http://www.taiwantoday.tw/ct.asp?xItem=211613&ctNode=445>

7. NCKU creates record-breaking supercomputers

(Taiwan Today, 12 11 2013)

Tainan City-based National Cheng Kung University Supercomputing Research Center unveiled Nov. 18 its record-breaking CK-Star flexible topology switchless supercomputer and a high-density node GS-R22PHL supercomputer. Using Acer Altos R380 F2 as the basic nodes, CK-Star was produced by linking eight computers without switches, breaking the performance efficiency record held by Intel Inc. The GS-R22PHL, when equipped with four Intel Xeon Phi coprocessors, can perform at 3.7 teraflops, or 3.7 trillion floating-point operations per second, the world's highest computing power for a single-node server and comparable to 10 conventional servers, NCKU said. According to NCKU, CK-Star was developed by SRC director Hwang Chi-chuan and visiting scholar Deng Yuefan, a professor at New York-based Stony Brook University and a researcher at mainland China's National Supercomputer Center in Jinan, using computer servers provided by Taiwan-based Acer Inc. The GS-R22PHL was jointly created by NCKU and Gigabyte Technology Co. Ltd. "Traditional cluster-based supercomputers require switches to control the nodes and inter-nodal communication," Hwang said. "The drawback is when the number of nodes increases, the switches may become a performance bottleneck. CK-Star does not require switches, thus breaking through this bottleneck and allowing for limitless expansion of computing nodes." "Network communication with switches is also energy consuming, typically using up to 50 percent of total consumption. CK-Star is therefore high performance and energy efficient." According to Deng, CK-Star's network topology can be adjusted according to the application needs to achieve desired performance. Its high performance and flexible framework open a new route for the development of high-performance computing systems, with



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promising research and commercial potential, he added. The GS-R22PHL can be equipped with up to eight double-slot coprocessors/graphics unit cards. Whether for workstations or high-performance computing, the GS-R22PHL holds huge business potential, Hwang said.

<http://www.taiwantoday.tw/ct.asp?xItem=211800&ctNode=445>
<http://focustaiwan.tw/news/ast/201311180026.aspx>

8. Taiwan joins 10-year quake research project in Himalayas

(Central News Agency, 20 11 2013)

Five Taiwan researchers are joining their Indian counterparts in a 10-year earthquake research project in the Himalayas, which is expected to help seismologists better predict earthquakes. The project is being sponsored by Taiwan's National Science Council and carried out jointly with Kumaun University of India. The five-member Taiwanese team, which kicked off the project in the Himalayas recently, will also travel across the Gangetic Plain while conducting research on several major faults lines. Chang Chung-pai, an Earth Science professor and one of the researchers, said they will collect and analyze data then make proposals for precautions against earthquakes. The other members of the team are Chyi Shyh-jeng from National Kaohsiung Normal University; Yang Chin-yi, National Dong Hwa University; Ching Kuo-en, National Cheng Kung University; and Akano Yhokha, National Central University.

<http://focustaiwan.tw/news/ast/201311200035.aspx>