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Science, Technology and Education News from Taiwan
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Taiwanese inventors won 97 medals and 6 special prizes, including 30 gold medals, at the 41st International Exhibition of Inventions in Geneva (725 exhibitors from 45 countries), an annual fair considered the world's largest marketplace for inventions. A 74-member Taiwanese delegation showcased 101 inventions. The Taiwanese inventors also won 53 silver medals and 14 bronzes. Last year, Taiwan won 45 gold, 52 silver and 25 bronze medals, as well as 8 special prizes. According to the Taiwan Invention Association, Taiwan's six winners of special prizes in the 2013 show are all conventional inventions for daily life, such as a "lifesaving electric socket" that shuts off automatically when a fire breaks out and activates a red guiding light to show the exit direction in dense smoke. Others include an interactive plant pot that can automatically gauge the amount of water needed to maintain the plant and a dietary supplement purported to relieve depression and suppress appetite. One of the inventions was a carbon monoxide sensor which could activate both open a window and turn on an exhaust fan if it detects dangerous levels of carbon monoxide. This invention could potentially safe lives, debuting at the invention fair to great acclaim. The product, which also won a gold medal, is named "Happy Banana" and is made from banana skins. It was developed and produced by Taipei-based biotechnology company TCI Co. The interactive water-saving picture frame for plants was an eye-catching exhibit at the fair.

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A joint study by National Cheng Kung University and Ohio State University found vitamin E to have properties to prevent and treat cancer – The National Science Council nominated 40 candidates for startup grants, comprising teams from 22 research organizations and universities, covering fields such as biotechnology, cloud computing, industrial design and technical services – Researchers located a gene that causes neuromuscular disorder – National Tsing Hua University presented the results of their latest research on biological and bio-inspired materials – National Chiao Tung University built a new type of high electron mobility transistor (HEMT) that has the highest oscillation frequency in the world – Taiwan Semiconductor Manufacturing Co. (TSMC) spend most in R&D among Taiwanese companies – Taiwan Biomaterial Company is working on novel brain surgery material – the National Applied Research Laboratories' (NARL) Instrument Technology Research Center announced an important breakthrough in producing large-diameter aspheric lenses for FORMOSAT 5 – National Taiwan University Hospital discovered the mechanism controlling the pigmentation of bird feathers, which could lead to a cure for graying hair.

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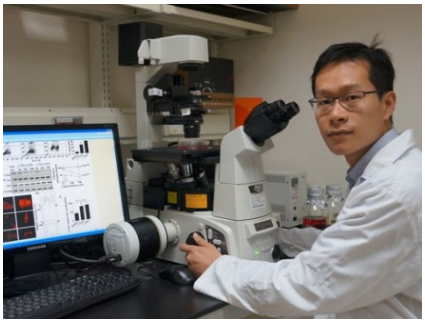
1. Vitamin E can help prevent cancer: study

(Central News Agency, 01 04 2013)



A joint study by National Cheng Kung University and Ohio State University in the United States has found vitamin E to have properties that can prevent and treat cancer, Cheng Kung University said. The university said the study was published in the March 19 issue of the journal Science Signalling. In the study, which was conducted at Ohio State University, researchers showed that in prostate cancer cells, one form of vitamin E inhibits the activation of an enzyme that is essential for their survival. The loss of the enzyme, called Akt, led to tumor cell death, according to the results of the study. "This is the first demonstration of a unique mechanism of how vitamin E can have some benefit in terms of cancer prevention and treatment," said lead author Chen Ching-shih, a professor at both Ohio State University and Cheng Kung University. But he cautioned that taking typical vitamin E supplements will not offer these benefits for at least two reasons: Most of the vitamin E supplements available on the market are synthetic and based on a form of the vitamin that does not fight cancer as effectively as the type used in the study, while the body cannot absorb the high doses that appear to be required to achieve the anti-cancer effect. "Our goal is to develop a safe pill at the right dose that people could take every day for cancer prevention," he said. Huang Po-hsien, an assistant professor at National Cheng Kung University, said the scientists optimized the structure of vitamin E and found that the effectiveness of this new agent they created was 20 times higher than the vitamin itself. The agent reduced the size of prostate cancer tumors in mice, he said, but added that human clinical trials have yet to be carried out.

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2. NSC selects 3 industry-academia alliance plans

(Taiwan Today, 02 04 2013)

NSC Minister Cyrus C. Y. Chu expects technology research projects in an industry-academia alliance to boost Taiwan's competitiveness.

Three research projects have been selected for the final stage of review in the government's industry-academia alliance targeted at groundbreaking technologies, the ROC National Science Council announced April 1. "The purpose of the alliance is to develop leading edge technologies with the potential to make Taiwan a world leader and consolidate our industrial competitiveness," NSC Minister Cyrus C. Y. Chu said. The projects were chosen by government, industry and research experts from among seven applications. National Taiwan University will cooperate with Taiwan Semiconductor Manufacturing Co. Ltd. to produce 7-to-5 nanometer semiconductor technology nodes, which are expected between 2024 and 2027, or earlier. The development of such technology will reinforce Taiwan's position as a key player in the semiconductor sector, the NSC said. The plan is headed by NTU President Lee Si-chen. The NTU Graduate Institute of Electronics Engineering, in a project directed by professor Lu Shey-shi, is set to work with MediaTek Inc. on next-generation smart devices and applications, to strengthen strategies on key patents, establishment of industry standards and systems integration. "This research is expected to help maintain Taiwan's No. 2 standing in information and communications technology design," NSC Deputy Minister Hocheng Hong said. Hwang Weng-sing of National Cheng Kung University's Department of Materials Science and Engineering will lead the third project, collaborating with China Steel Corp. on next-generation steel and green steel production processes. "Steel with enhanced qualities will reduce production costs and make for better final products, such as more responsive and longer-lasting motors," Hocheng said. The research teams must now submit detailed plans by April 30, with projects expected to get under way August 1 for a period of five years. Injecting annual subsidies of NT$70 million (US$2.38 million) to NT$80 million into each plan, the NSC hopes to bring about technological upgrades and create a spillover effect to benefit related industries. The industry-academia alliance was unveiled November 2012 by the NSC and Ministry of Economic Affairs to promote cooperative research and development, with industry raising issues for academics to help resolve.

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3. Taiwan researchers locate gene causing neuromuscular disorder

(Central News Agency, 08 04 2013)

A team of researchers from two medical centers in Taipei has discovered a gene, identified as GNB4, that triggers hereditary motor sensory neuropathy (HMSN) if its DNA chain is incomplete. The group discovered the gene after

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spending years studying a family whose members suffered from HMSN, a heterogeneous group of various inherited neuromuscular disorders. Lee Yi-chung, an attending physician at Taipei Veterans General Hospital's Neurological Institute, said Monday that a man surnamed Lin was diagnosed at the hospital several years ago with HMSN, also known as Charcot-Marie-Tooth Disease or Progressive Peroneal Muscular Atrophy. Lee said that according to the patient, his leg muscles began showing signs of atrophy at the age of 13, and the atrophying process lasted until he was 46 years old, when he could no longer walk. Several members of Lin's family also showed symptoms of the muscular disorders, including deformation of their arms and legs and weakness in their leg muscles, Lee said, noting that many HMSN patients end up using wheelchairs as the disorders progress. Before checking into Taipei Veterans General Hospital, Lin had visited many doctors and specialists around Taiwan after he was no longer able to walk, but they all failed to find the cause of his illness, Lee said. With the participation of Lin and his family, the research team, composed of National Yang Ming University's Brain Research Center and Taipei Veterans General Hospital's Neurological Institute, found the gene in the patients that induced the disorders after years of research. HMSN is an inherited, progressive disease of the nerves with weakness and numbness more pronounced in the legs than the arms. The nerves stop sending messages to different areas of the body, such as the hands and feet, because the nerve cells deteriorate. The muscles in the hands and feet get weak because they no longer receive messages from the nerves and are therefore not used, according to the American Association of Neuromuscular and Electrodiagnostic Medicine. According to Lee, HMSN often appears when patients are in their childhood or when they reach puberty. One out of every 2,500 people suffer from the ailment, and at least 9,000 people in Taiwan have it, he said. Because few physicians in Taiwan know about the illness, many patients have not been properly diagnosed, Lee said. The finding of the Taiwanese team was published in the American Journal of Human Genetics on March 7.

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4. Scientists look to nature for ways to fill material needs

(Taipei Times, 11 04 2013)

Researchers from National Tsing Hua University presented the results of their latest research on biological and bio-inspired materials to the National Science Council, which showed that the study of biomaterials could have invaluable applications, such as by mimicking the texture of shark skin to develop bacteria-resistant surface materials. Chen Po-yu, an assistant professor in the school's Department of Materials Science and Engineering, said that with intensive analysis of biological materials, materials science and engineering researchers are able to mimick the natural biomaterials' characteristics to synthesize new materials or improve existing ones to fulfil specific needs. Citing as an example the structure of the large, but lightweight, beak of toucans inspiring work on aviation materials, or the mimicking of the structure of sponges to produce softer glass, Chen said there was great promise in looking to the natural world for solutions to modern society's needs. Chen said that the university is also conducting research on how to produce bacteria-resistant surface materials by mimicking the structure and characteristics of shark skin and lotus flowers. In addition, he said that the school's research on abalone shells has shown that although the main component of the shells — calcium carbonate — is the same as that found in chalk, the shell's texture is much tougher because of its unique multilayer structure and other substances that are mixed into it. These findings could lead to breakthrough inventions in the synthesis of protective materials. Duh Jenq-Gong (杜正恭), a chair professor from the same department, said that in contrast to some of the earlier methods employed in materials science and engineering research, such as trying to produce tougher materials by combining various non-organic substances, studying natural biomaterials and structures has given researchers a new perspective. Meanwhile, university president Chen Lih-juann commended Chen Po-yu for having been invited to co-write a paper on structural biological materials by the internationally renowned Science magazine. Chen Po-yu may be the first Taiwanese professor to have been received such an honor, he said. The research paper, titled Structural Biological Materials: Critical Mechanics-Materials Connections was published in February.

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5. Taiwan develops new superfast transistor

(Central News Agency, 15 04 2013)

A research led by a professor from National Chiao Tung University (NCTU) said it has built a new type of high electron mobility transistor (HEMT) that has the highest oscillation frequency in the world. The research paper on the latest HEMT technology, which could be applied in the fields of imaging system and biomedical testing, was published by the Japan Society of Applied Physics, the team said. The new device could be reduced to as small as 40 nanometers, the researchers said, noting that 3C products are trending toward high speed and small size. HEMTs play an important role in speed performance, they explained. With a high frequency of 710 GHz that could almost be converted into light, the new HEMT can decrease the total power consumption of 3C products and improve image resolution in remote atmospheric sensing and space exploration applications, the researchers said.

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The team said it has signed on to various cooperative projects with Panasonic Corp. of Japan and aerospace companies in the United States and hopes to work with local firms to apply the technology to everyday products. The research team was led by Edward-Yi Chang, a professor at NCTU's Department of Materials Science and Engineering, and included Hsu Heng-tung, associate professor at Yuan Ze University's Department of Communications Engineering, and Yasuyuki Miyamoto from Tokyo Institute of Technology in Japan.

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6. TSMC spends most in R&D among Taiwanese businesses

(Central News Agency, 15 04 2013)

Taiwan Semiconductor Manufacturing Co., the world's biggest contract chip maker, spent NT$38.8 billion (US$1.4 billion) in research and development in 2012, according to the Ministry of Economic Affairs (MOEA). The TSMC maintained its top position in R&D spending among Taiwanese businesses for the fifth consecutive year since such a survey was first compiled in 2008, the MOEA said. To learn more about the operations of the businesses, the ministry had based its survey on the financial statements of 1,358 listed and over-the-counter companies, excluding financial holding, insurance and stock brokerage firms. The ministry said that listed and over-the-counter companies spent a total of NT$329.5 billion in R&D last year, an increase of 2.5 percent year-on-year. The manufacturing industry accounted for 95.9 percent of the R&D expenditures. Among them, electronics parts and components accounted for more than half at NT$171.3 billion, and computer and electric products and optical products accounted for NT$106 billion. The service industry only contributed to 4.1 percent of the R&D expenditure last year. Overall, the TSMC's R&D expenditure at NT$38.8 billion last year topped all other companies, accounting for 7.8 percent of its revenues and an increase of 22.8 percent year-on-year. It also was the third straight year to record a double-digit growth. Meanwhile, HTC Corp., a major smartphone maker, had an R&D expenditure totaling NT$13.8 billion in 2012, accounting for 5.1 percent of its revenues, down 18.7 percent from the previous year. Economics officials attributed the sharp decline to the high basis of comparison when the R&D expenditures of the company in 2011 were as high as NT$17 billion. MediaTek Inc.'s expenditures in R&D were NT$13.1 billion, ranking third among the businesses. Economic officials noted that MediaTek's R&D expenditures showed a decline over the past two years, noting its R&D was as high as NT$17 billion in 2010, but was cut to NT$13.4 billion in 2011. In the service industry, the ministry said that Chunghwa Telecom invested the most in R&D at NT$3.6 billion, accounting for 1.9 percent of its revenues. The ministry also announced the revenues of the listed and over-the-counter companies, as well as their net after-tax profit margin , and fixed asset investment in 2012. Among them, the revenue of the listed and over-the-counter companies totaled NT$18.8 trillion in 2012, up 2.0 percent year-on-year. After-tax profit totaled NT$760.3 billion, down 11.6 percent annually. Fixed asset investment by the companies totaled NT$767.8 billion, a 10 percent decrease year-on-year. Among them, the manufacturing industry pitched in the most at NT$646.1 billion, accounting for the most at 84.1 percent.

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7. Science council announces successful research teams

(Taipei Times, 16 04 2013)

The National Science Council (NSC) announced the 40 research teams selected to participate in the first round of its “From IP [Intellectual Property] To IPO [Initial Public Offerings]” project initiated this year as a platform to encourage young entrepreneurs. The council said a total of 232 teams from 68 universities and seven teams from research institutes had submitted proposals to be chosen for the program. Forty teams have been selected in the first round, representing an approval rate of 16.5 percent, the council said. Among the 40 teams, 15 are in the innovative technology and design group, 15 in the biotechnology and medicine group and 10 in the cloud and technology services group. National Applied Research Laboratories (NARL) director Chen Liang-gee said that from past experience as a judge at invention fairs, many winning innovative ideas cannot be converted into salable products. However, hopefully with chief executives from successful companies serving as instructors and the council’s platform for gathering young innovators, the innovations can create value. In the innovative technology and design group, a research team named “Cool-Poneer” led by professor Ma Hsiao-kan from National Taiwan University’s (NTU) Department of Mechanical Engineering received the highest score for its application of heat dissipation technology in its “ECO-BREEZE,” making use of ICT and LED to replace traditional spinning fans. A research team led by assistant professor Chang Fuh-yu from National Taiwan University of Science and Technology’s Department of Mechanical Engineering, got the highest score in the biotechnology and medicine group for integrating the technology of pressure detection, Bluetooth communication and cloud computing, to monitor the pressure exerted on wounds when patients are being bandaged. In the cloud and technology services group, the highest score was achived by a inter-departmental team led by assistant professor Tian Wei-Cheng of NTU’s Department of Mechanical Engineering for developing a two-way teaching tool incorporating an Interactive

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Response System. The teams will attend training courses in the following months and be judged on their realization of proposed innovation plans.

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8. Taiwanese company working on novel brain surgery material

(Central News Agency, 16 04 2013)

A Taiwanese biomedical company said that it is working on a technology that it hopes will make doctors' jobs easier when they perform brain surgery. Liao Chun-jen, CEO of Taiwan Biomaterial Company, said his company is developing a new substitute for dura, the outermost of three fibrous membranes sheathing the brain and lining the inner surface of the skull. The dura is often damaged when the skull is opened, and surgeons use dura substitutes to repair the damage. Liao said his company has obtained two patents from the Industrial Technology Research Institute in a technology transfer. "In the initial stage, we'll target developing the technology and then enter clinical trials in two to three years," he said at the opening of his company's new facility in the Hsinchu Biomedical Science Park in northern Taiwan. The company, which has paid-in capital of NT$35 million (US$1.7 million), has a staff of five. Two kinds of dura substitutes are already commercially available on the market, said Taiwan Biomaterial COO Chen Ping-chuan, but they have disadvantages. One, made of a non-degradable polymer, has to be sutured to surrounding dura, "which is very technique-sensitive, time-consuming and labor-intensive for the clinical surgeon," Chen told CNA. The other, composed of a biodegradable collagen with a porous structure, is directly applied on the top of the brain without sutures. But according to Chen, "there are issues such as displacement and CSF (cerebrospinal fluid) leakage in actual clinical applications." The foamy dura substitute technology developed by Liao and his team is a mixture of neutral collagen gel and liquid gas, the COO said. The foamy structure is created by the rapid expansion inside the collagen gel after it is released from its high pressure container, forming a dura substitute with high porosity. "This technology (will) not only overcome the displacement issue," Chen said, but will also be more reliable because of its simplicity and more user-friendly in terms of reducing risks and raising the success rate of surgery.

Photo courtesy of the Industrial Technology Research Institute

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9. Research center makes satellite-lens breakthrough

(Taipei Times, 17 04 2013)

The National Applied Research Laboratories' (NARL) Instrument Technology Research Center marked another milestone when it announced an important breakthrough in producing large-diameter aspheric lenses for FORMOSAT 5. The center said that large-diameter aspheric lenses are mostly used in aerospace technology, astronomical telescopes, semi-conductors or precision measuring equipment, and they are high-priced components manufactured under strict regulations for international trading. The lenses must be able to endure the harsh environment in space, such as drastic temperature changes and harmful high-energy radiation, as well as violent shaking when a satellite is launched on top of a rocket. They also have to fulfill high-resolution requirements to conduct detailed observations, so highly advanced technology is needed to manufacture the lenses, the center said. A division chief at the center and project leader Hsu Wei-yao said that large-diameter lenses can produce clearer images with higher precision, but the technological skills needed for manufacturing the lenses are highly advanced and have to be extremely precise. These include ultra-precision measuring skills, ultra-precision polishing technologies, precise gripping designs and precise metallic-membrane plating skills. In addition, giving an example of the lenses' ultra-high resolution, the center said "it would not be a problem to clearly see an ant on the ground from the top of the Taipei 101 building." The Taipei 101 skyscraper is 508m tall. Instrument Technology Research Center Director Yeh Jer-liang said the large-diameter aspheric lenses are the largest lenses manufactured in Taiwan for use in outer space. He added that their quality is on a par with those produced in other countries using advanced technologies, so the achievement has the potential to help upgrade the industry in Taiwan. The FORMOSAT 2 was launched in May 2004 and was originally intended to operate for five years, but its work-life has been extended and it is now in its seventh year in space. The Formosa Satellite 5 will soon replace the aging FORMOSAT 2, the center said, adding that the successful production of large-diameter aspheric lenses was therefore a crucial development.

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10. NTUH team makes breakthrough in hair research

(Taiwan Today, 30 04 2013)

A researcher at National Taiwan University Hospital has discovered the mechanism controlling the pigmentation of bird feathers, a development that could lead to a cure for graying hair, NTUH said April 26. The research by Lin Sung-jan, head of the Department of Dermatology at NTUH, and known as an expert in hair restoration, was published in the latest issue of Science. The pigmentation of bird feathers is controlled by melanocyte stem cells hidden in the base of the feathers, the team discovered rather than in the center or outer walls of the follicles, as had been previously thought. “Many researchers have tried to detect the precise location of the melanocyte stem cells, but failed because the cells are unpigmented,” Lin said. Lin, also an associate professor at the NTUH Institute of Biomedical Engineering, led a cross-disciplinary research team in cooperation with the University of Southern California and Indiana University that spent three years working mainly on Taiwan’s native black chickens. Fibroblasts in the inner part of the follicle secrete Agouti proteins that inhibit the action of melanin, producing the striated patterns of feathers of such birds as owls and eagles, Lin said. Production of black hair or feather color in both humans and birds is due to the activity of melanocyte stem cells. However, as humans age they lose these cells, causing hair to turn white. Lin said his team’s findings could provide a new direction for research on graying in humans.

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