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**Science, Technology and Education News from Taiwan
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Research and development expenditures in Taiwan reached NT\$431.3 bio. (US\$14.4 billion) in 2012 (up 4.4 % from 2011), accounting for 3.06 % of the Taiwan's gross domestic product (GDP) for that year. This marked the 2nd consecutive year in which R&D spending topped 3 % of GDP, the Directorate General of Budget, Accounting and Statistics (DGBAS) said. 75 % of the R&D spending took place in the business sector, and 24.8 % in the government sector. The rest was in the higher education and non-profit sectors, the DGBAS said. In terms of research type, spending on technological development accounted for the largest portion, at 67 %. In terms of research field, the majority -- 76 % -- was related to engineering. There were 179,000 R&D personnel in 2012, up 2.9 % from the previous year. The number of female R&D employees increased by 3.9 %, higher than for males, at 2.6 %.

The Industrial Technology Research Institute (ITRI) of Taiwan and Fujitsu Laboratories Ltd. of Japan announced that they are collaborating in the field of disaster prevention to develop **autonomous sensor-network technology that can communicate information between devices without human intervention**. The focus of the research collaboration is the application of disaster-prevention systems that use autonomous sensor-network technology. ITRI and Fujitsu Laboratories will work to develop technologies that will collect environmental data from a wide-area grid through numerous wireless sensors that are linked, so that even if some are knocked offline due to damage or insufficient power, the system as a whole can continue to operate. The partners are also constructing a test system, which will be field tested, for disaster mitigation and prevention that targets landslides and avalanches.

Moreover, ITRI is formally launching **Asia's first globally recognized and certified Power Module Testing Laboratory**, which will provide related industries a variety of customized service and offer testing and validation for domestic and foreign manufacturers seeking quick access to global markets. Dr. CT Liu, VP and General Director of ITRI's Electronics and Optoelectronics Research Laboratories, said that based on a survey by Japan's Yano Research, the power electronics market will be worth an estimated US\$29.01 billion by 2020. As ITRI entered into development of high-efficiency power electronics modules since several years ago, it has developed several collaboration projects with domestic train industry, including Taiwan High Speed Rail as well as the Taiwan Railway and Transit Authority and helped them to develop high-power motor drivers for rail transportation system that will allow trains to instantly accelerate and steadily control current and improve the stability and reliability of motors inside trains. The laboratory has been certified by the Taiwan Accreditation Foundation (TAF) as a neutral communication and service platform and is Asia's first internationally certified power module testing platform to provide testing services to domestic and international manufacturers. The laboratory will help domestic power electronics manufacturers enter markets for smart grid, solar, electric car and smart home applications by accelerating the localization of power modules.

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1. ROC joins mouse phenotyping consortium

(Taiwan Today, 05 02 2014)

The ROC's recent membership of the International Mouse Phenotyping Consortium will enhance cooperation between local and international researchers while expanding knowledge of diseases, according to National Applied



Research Laboratories Feb 5. Genetically modified mice have to be tested and analyzed time and again before they can be used for drug testing and development, an NARL official said. IMPC, with its outstanding teams of analysts, is a powerhouse in this area, helping facilitate the development of disease therapies through a series of standardized analysis procedures, the official added. The ROC is the 16th member of the IMPC, joining such nations as Japan, South Korea, the U.K. and U.S. By participating in the consortium, the nation will work with other members in further optimizing research on genetically modified mice in the global biomedical industry. The NARL said IMPC membership also allows the country's researchers to fast-track the development of the local biomedical industry, deepen ties

with the international biomedical sector, facilitate relevant clinical applications and chalk up new achievement in the international biomedical field.

<http://www.taiwantoday.tw/ct.asp?xItem=214062&ctNode=445>

2. Taiwan research sheds new light on autism treatment

(Taiwan Today, 05 02 2014)

Taipei City-based Academia Sinica researchers recently identified an autism causative gene, T-box brain 1 (TBR1), which might offer new insight into the treatment of autism spectrum disorders. Led by Hsueh Yi-ping, a research fellow at Academia Sinica's Institute of Molecular Biology, the team discovered that autism spectrum disorders are caused by abnormal neural development. Hundreds of mutations have been identified in autistic patients, but it is unclear whether the mutations cause the disorder. In previous studies, TBR1 has been suggested as a hot target for autism. Yet, it is unclear how mutations in TBR1 gene may cause autism, according to Academia Sinica. Hsueh's group demonstrated that loss of a copy of TBR1 gene results in the disappearance of the posterior part of anterior commissure, a white matter structure in the brain that links the two amygdalae in the two hemispheres. The team also found that TBR1 heterozygous mice are characterized by autism-like behaviors, such as reduced social interaction, reduced communication ability, cognitive inflexibility and impaired associated memory. These behavioral defects can be ameliorated by treatment with D-cycloserine. This study emphasizes the significance of the amygdala in autism and suggests that D-cycloserine might be useful for autism therapies. Academia Sinica said the findings will help in the design and development of new drugs to treat the disorder in human patients, since it is found by the team that injecting D-cycloserine in the brains or abdomens of the TBR1 mutant mice can significantly improve the social, communication, learning and memory abilities of the mice. The team's findings were published last month in top U.S.-based scientific journal Nature Neuroscience.



<http://www.taiwantoday.tw/ct.asp?xItem=214058&ctNode=445>

3. Taiwan develops new fiber for heat-generating clothing

(Central News Agency, 02 02 2014)

The Industrial Technology Research Institute (ITRI) has developed a fiber that it said is ideal for heat-generating apparel because of its ability to absorb light and turn it into heat. The research body said the fiber will mainly absorb infrared light from sun rays and lighting and even from body heat. Researchers who worked on the project incorporated inorganic nano powder in the fiber and used surface chemistry techniques to help the fiber absorb or reflect infrared light more evenly. As a result, the fiber is exposed to the infrared light for a longer period of time, which generates more heat and helps the resulting fabric keep people warmer. The ITRI said it has transferred the technology to manufacturers to mass produce clothing with fabric using the new heat-generating fibers.

<http://focustaiwan.tw/news/aeco/201402020013.aspx>

4. Taiwan develops rice cooker to make brown rice healthier

(Central News Agency, 02 02 2014)

The Council of Agriculture (COA) has developed Taiwan's first domestic rice cooker to be able to create healthy germinated rice from regular brown rice. Despite potentially important health benefits, germinated rice is not



popular because of the inconvenience of having to germinate it in warm water for extended periods of time and changing the water periodically before the brown rice grows sprouts. The Kaohsiung District Agricultural Research and Extension Station under the COA said its new cooker automatically washes the brown rice four times over 18 hours to help it sprout before cooking it. The resulting rice has 10 times more γ -aminobutyric acid (GABA), ferulic acid and inositol hexaphosphate (IP6) than regular white rice, giving it excellent calming, anti-oxidant and anti-arterial sclerosis properties, the station said. Germinated brown rice currently costs about NT\$150 per kilogram on the market, but using the cooker will lower the cost to between NT\$90 and NT\$100 per kilo, compared with NT\$60 to NT\$70 for unprocessed brown rice, the station said. The new cooker's technology will soon be transferred to a local company, according to the station, which estimated that the device would sell for about 20 percent more than regular electric cookers. Germinated rice cookers are currently available from Japan but at a more expensive price, the station said.

<http://focustaiwan.tw/news/aeco/201402020010.aspx>

5. Taiwan develops heat-resistant bioplastics

(Central News Agency, 03 02 2014)

After eight years of research, Taiwan's Industrial Technology Research Institute (ITRI) has managed to develop a plastic made from cereal grains that can withstand temperatures of up to 100 degrees Celsius without deforming due to the heat. The polylactic acid (PLA) plastics derived from renewable biomass sources are heat-resistant, non-poisonous and biodegradable, according to the state-funded institute. Normally, PLA loses its shape when exposed to heat of 50 degrees or above, ITRI explained. The new heat resistant plastic was derived from cereal grains such as corn and is reportedly completely biodegradable. ITRI has shared its achievement with companies which will produce heat-resistant tableware, it said. Other possible uses named by ITRI include bags, disposable cups, lids, food containers and components for electronic devices. Around 120,000 metric tons of PLA were consumed globally in 2010, mainly in Western Europe and North America, according to statistics from ITRI's Industrial Economics and Knowledge Center. PLA consumption in Asia has been shown to be on the rise as well, mainly in packaging materials and biomedicine, the statistics show.

<http://focustaiwan.tw/news/ast/201402030013.aspx>

6. Academic efforts in edible fungi development bearing fruit

(Central News Agency, 04 02 2014)

A research center in central Taiwan's Asia University is stepping up efforts to develop edible and medicinal mushrooms, as its initial investment in the field has generated an output value estimated at hundreds of millions of Taiwan dollars. Established six years ago, the center said it will launch more trials on the development of bamboo fungus, popular in Taiwanese cuisine, following its success in cultivating maitake mushrooms and tremellas, known in English as snow fungus. It is hoped that the center can contribute to the cultivation of mushrooms, particularly snow fungus, as the country depends heavily on Chinese imports due to local restrictions on pesticides, said center head J.Y. Lin. Lin said the center has learned the right formula to control the humidity, temperatures and the concentrations of carbon dioxide required to mass produce several kinds of mushrooms and hopes to extend the study.



<http://focustaiwan.tw/news/ast/201402040009.aspx>

7. Taiwan promotes new green, healthy plastic

(Taiwan Today, 06 02 2014)

A special polylactic acid resistant to temperatures of more than 100 C has been developed by Taiwan's Industrial Technology Research Institute, with possible applications including food and drink containers that promise to contribute greatly to food safety and the environment. According to the government-funded R&D body in Hsinchu County, researchers spent eight years perfecting the use of non-toxic nucleating agents in producing the special PLA to create molded plastic that is heat and deformation-resistant, non-toxic and rapid-setting. PLA can be manufactured from a variety of biological sources, such as corn starch. Without nucleating agents, PLA typically crystallizes slowly, producing an end product that already begins to deform at temperatures above 50 C, ITRI said. The modified PLA also readily





decomposes into carbon dioxide and water in soil, making it environmentally friendly. According to statistics from ITRI's Industrial Economics and Knowledge Research Center, total global PLA consumption stood at about 120,000 metric tons in 2010, with most users in Western Europe and North America, and biomedicine and packaging as primary applications. Manufacturers are already cooperating with ITRI in commercialization of the new technology to create safe, heat-resistant utensils for children. Other applications, such as high-density electronic devices, transparent plastic bags, as well as coatings for paper cups and wooden lunchboxes, are also in the pipeline

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8. Academia Sinica member to head U.S. Institute of Medicine

(Central News Agency, 21 02 2014)

Victor J. Dzau, an academican at Taiwan's prestigious Academia Sinica, has been named the next president of the Institute of Medicine (IOM), the health arm of the U.S. National Academy of Sciences. Dzau's six-year term will begin July, 1, 2014, the National Academy announced. Born in Shanghai and raised in Hong Kong, Dzau was elected an academican of Taiwan's top research institute in 2000. He is currently a professor of medicine at Duke University and president and CEO of the Duke University Health System. A trailblazer in translational research, Dzau pioneered gene therapy for vascular disease, being the first to introduce DNA decoy molecules to block transcriptions as gene therapy in humans. He was elected to the IOM in 1998 and has served on several leadership committees. Established in 1970 by the National Academy of Sciences, the IOM offers independent analysis and recommendations on health issues.

<http://focustaiwan.tw/news/asoc/201402210020.aspx>

9. FDA touts Taiwan's medical R&D strength

(Taiwan Today, 21 02 2014)

Taiwan is the first country to approve the anti-cancer drug Afatinib for use, demonstrating that the country is building up strength in biotechnology, the Food and Drug Administration under the ROC Ministry of Health and Welfare said Feb. 20. "Taiwan's biotech industry has become firmly established in the past decade or so, with record numbers and quality of clinical trials in 2013, proving that the hard work of industry, officials, academics and researchers has paid off," the FDA said. The bureau said that Afatinib, which targets lung cancer, has been undergoing clinical trials around the world, with National Taiwan University Hospital playing a leading role in second and third stage trials. "This is the first time that Taiwan was ahead of Europe and the U.S. in approving Afatinib." The nation is also active in the global response to the H7N9 bird flu outbreak originating in mainland China. Domestic firms and research bodies are heavily involved in vaccine R&D and production, with National Health Research Institutes most likely to begin human clinical trials later this year. The FDA said it has initiated a rolling review system to better facilitate vaccine development. Work is also progressing on vaccines to treat meningococcal disease, especially the country's most prevalent B strain, for which there is no effective vaccination, unlike the A, C, Y and W135 strains, the FDA said. Taiwan research bodies have produced an experimental vaccine and two years ago applied to conduct the first trials in humans. They were given the go-ahead by the FDA last year. International drug companies are also choosing Taiwan as a base for multination, multicenter clinical trials, further proof of international recognition of the nation's high standards. A record 258 such applications were made to the FDA in 2013, of which about 70 percent were multicountry, multicenter studies.

<http://www.taiwantoday.tw/ct.asp?xItem=214691&ctNode=445>

10. Academia Sinica academican named IOM president

(Taiwan Today, 24 02 2014)



Dr. Victor J. Dzau

The next president of the Institute of Medicine under the U.S. National Academy of Sciences will be Dr. Victor J. Dzau, an academican with the ROC's top research institute, Taipei City-based Academia Sinica. Dzau, also chancellor for Health Affairs at Duke University and president and CEO for Duke University Health System, is set to assume the IOM presidency July 1 when the incumbent Dr. Harvey V. Fineberg completes his second six-year term. "We welcome Dzau's appointment and believe it will pave the way for ethnic Chinese scientists to further contribute to medical research on diseases and other public health issues common among Chinese people," Academia Sinica Vice President Chen Chien-jen said Feb. 21. According to Academia Sinica, Dzau is highly regarded as a trailblazer in translational research, health innovation and global health care strategy and delivery. His seminal research laid the foundation for the development of angiotensin-converting-enzyme inhibitors, which are used for the treatment of high



blood pressure and congestive heart failure around the world. Dzau also pioneered gene therapy for vascular diseases, being the first to introduce DNA decoy molecules to block transcriptions as gene therapy in humans, Academia Sinica added. The incoming IOM president holds numerous awards and honors, including the Gustav Nylin Medal from the Swedish Royal College of Medicine; Polzer Prize from the European Academy of Sciences and Arts; Distinguished Scientist Award from the American Heart Association; and 2010 AHA Research Achievement Award for his contributions to cardiovascular biology and medicine. Established in 1970, the IOM advises U.S. government policymakers, medical professionals and the public on various issues spanning health care delivery, obesity, vaccine safety and veterans' health

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11. Nation's first space-based GPS receiver developed

(Taipei Times, 26 02 2014)

Taiwanese scientists have developed the nation's first space-based Global Positioning System (GPS) receiver, which boasts several improvements over versions obtainable from overseas and can help cut the country's reliance on foreign imports. The first locally developed space-borne GPS receiver, which helps satellites navigate in space, is expected to offer more freedom and independence for space missions, as exports of such products are normally kept under tight control by countries around the world, National Space Organization (NSPO) head Chang Guey-shin said. Taiwan has relied on European countries, including Germany and France, for such devices in previous missions and for a mission scheduled for next year. The newly developed device is also expected to drive the development of space missions, which used to suffer serious delays due to the time required — from as long as three to six months — for Taiwan to gain approval for imports, NSPO section chief Lin Chen-tung said. The newly developed device will join the FORMOSAT-7 program, a collaboration between the NSPO and the US National Oceanic and Atmospheric Administration. The FORMOSAT-7 program is comprised of a group of 13 weather satellites — 12 mission-specific orientated satellites and one NSPO-built satellite. The locally developed GPS receiver is to be loaded onto the NSPO-built satellite, which is scheduled to be launched in 2018 or 2019. Developed by the NSPO over three years, the device boasts several improvements over existing versions as it is lighter, more energy-efficient and cheaper to build. Compared with existing versions, which weigh between 2kg and 3kg and cost about NT\$20 million (US\$658,400) to build, the new device weighs just 0.8kg and costs NT\$6 million to manufacture, Lin said. Other advantages of the new device are greater ease for designers to tweak the functions, which takes only 40 days, compared with the 220 days scientists used to need to spend redesigning the chips in the receiver. The new device also takes less time to boot up — 1.5 minutes compared with eight minutes in the past, Lin said. As Asian countries such as Japan and South Korea are developing their own space-based GPS receivers, Lin said the NSPO will continue to work to make its device lighter, smaller and even more energy-efficient.

<http://www.taipeitimes.com/News/front/archives/2014/02/26/2003584363>

<http://focustaiwan.tw/news/ast/201402250023.aspx>

12. Taiwanese astronomer helps make space discoveries

(Central News Agency, 26 02 2014)

A Canadian-Taiwanese program co-sponsored by Taiwan's National Science Council has made discoveries far out in space beyond Neptune that are expected to help solve some of the mysteries of the solar system. In four years of observation using the Canada-France Hawaii Telescope, the team of scientists discovered a sizeable object in the inner Oort Cloud, in addition to more than 90 smaller ones, said team member Chen Ying-tung, a research assistant of the Academia Sinica Institute of Astronomy and Astrophysics. The recently discovered object is about 300 kilometers in diameter and is second only to a dwarf planet named Sedna identified in 2003 in the inner Oort Cloud, said Chen. Based on the newly observed heavenly body, coupled with previous discoveries, scientists now put the number of objects in the inner Oort Cloud at at least 10,000, or 10 times more than previously estimated, he said. The study can help scientists learn more about the process by which the solar system was formed and specifically how planets such as Saturn, Jupiter and Neptune came into existence, said Chen. It can also help shed light on the origins and the evolution of planets beyond the solar system, he added. The doughnut-shaped inner Oort Cloud and the spherical outer Oort Cloud are believed to have come from materials ejected to the perimeter of the solar system when Uranus and Neptune were still taking shape. It is in the Oort Cloud that comets are formed. Because of its distant location, the cloud is still shrouded in mystery. The Oort Cloud, named after Dutch astronomer Jan Oort, is between 50 and 50,000 astronomical units from the Sun. Each astronomical unit equals the average distance between the Sun and the Earth, which is 149,597,870 km.

<http://focustaiwan.tw/news/ast/201402260038.aspx>



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14. Taiwan's new battery applications attract interest in Japan

(Central News Agency, 28 02 2014)

Some new lithium-ion (Li-ion) battery applications developed by Taiwan's largest high-tech research and development institute have attracted interest at the world's largest battery exhibition in Japan, according to the institute. The Industrial Technology Research Institute (ITRI) said in a statement Thursday that it debuted a heavy-duty motorcycle battery, emergency backup power supplies and motor power batteries, based on its self-terminated oligomers with hyper-branched architecture (STOBA) battery technology, at the ongoing 5th International Rechargeable Battery Expo. STOBA is a material technology developed by ITRI and is used to enhance battery safety. The technology won the R&D 100 Award in Energy Devices in 2009. Japanese manufacturers such as NEC, NTT, Yuasa Battery, Panasonic, Hitachi and Maxell all showed great interest in the ITRI products at the fair, according to the statement. The institute said it hopes to expand cooperation with its Japanese counterparts and businesses. "We look forward to the day when ITRI's STOBA technology is adopted for Japan's high-value batteries," said Jing-Pin Pan, division director of ITRI's Material and Chemical Research Laboratories. The high-safety STOBA lithium batteries can be used as high-capacity and high-density mobile emergency power supplies, medical backup power supplies, and electric vehicle power supplies, he said.

<http://focustaiwan.tw/news/ast/201402280004.aspx>