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Science, Technology and Education News from Taiwan
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The Science & Technology Policy Research and Information Center (STPI) of the National Applied Research Laboratories (NARL) has released the "Yearbook of Science and Technology Taiwan ROC 2012" (272 pages). It highlights multiple perspectives about science and technology development in Taiwan and provides comprehensive information about the rationales, policies, programs, activities, and achievements of the governmental, academic and industrial sectors dedicated to the advancement of science and technology. The Yearbook consists of special reports on nuclear safety measures in Taiwan, e-government services, food security policy, research program for biopharmaceuticals and for intelligent electronics. It provides a science and technology policy overview and also includes basic research in science and technology activities and achievements on natural sciences, engineering and applied sciences, life sciences, humanities and social sciences and science education. The last part of the yearbook is dedicated to applied research and technology development on a variety of research fields such as networked communication programs, biopharmaceuticals, e-learning and digital archives, intelligent electronics, nano technology, energy. The full text of this Yearbook can be downloaded from the website: http://yearbook.stpi.narl.org.tw/pdf/2012/2012e.pdf

STPI also keeps updating the "Science and Technology Organization Directory" which can be also found in the website (http://hrst.stpi.narl.org.tw/search/simple/find.htm). The Directory stores all information related to S&T research institutes under the Office of the President and the Executive Yuan, universities and colleges, public corporations, and innovation incubation centers, while "search & browsing" functions are also provided.

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1. Physician reveals stem cell breakthrough research

(Taipei Times, 01 10 2013)

Induced pluripotent stem (iPS) cells can now be generated by reprogramming somatic (or differentiated) cells without the risk of inducing cancer, said Chiou Shih-hwa, an attending physician at the Taipei Veterans General Hospital's Department of Medical Research and Education. IPS cells are generated through cellular reprogramming, which de-differentiates somatic cells, or converts adult cells to a stem cell-like, or pluripotent, state. Like embryotic stem cells, iPS cells can develop into any kind of cells that make up an adult organism and thus have the potential to be used in treating various illnesses. The reprogrammed cells, or iPS cells, are a biomedical breakthrough made in 2006. The reprogramming is made possible by introducing four genes to the somatic cells, among which the c-Myc gene, however, is a proto-oncogene that increases the risk that reprogrammed somatic cells will turn cancerous, according to the article published in the Journal of Experimental Medicine by Chiou and nine other authors. "The embryonic stem cells are without question with the greatest potential, but most of us don't have access to our own, while stem cells from bone marrow or cord blood are more easily attainable, but don't work as well," Chiou said. "IPS cells have the advantages of both, and our contribution is making iPS cells safer for use."

http://www.taipeitimes.com/News/taiwan/archives/2013/10/01/2003573435

2. Taiwan ranks world's fourth-largest nanotechnology patent holder

(Central News Agency, 02 10 2013)

With the opening of the 2013 Taiwan Nano Week and Exhibition at the Taipei World Trade Center [on 2 Oct], an industry expert said Taiwan is ranked fourth-top in the world in terms of the number and share of granted nanotechnology patents in 2012. Wu Chung-yu, head of the National Program on Nanotechnology (NPNT), said that nanotechnology is expected to be a main driver for the technology industry. Wu said that currently, the European Union, the United States, Germany, Japan and South Korea are mapping out plans for the development of nanotechnology by 2020. The NPNT was initiated in 2003 and since the plan entered the second phase of implementation in 2009, the country has earmarked up to NT$14.6 billion (US$494.14 million) in budget for the plan and has published 6,100 nanotechnology-related articles in international journals, while having won 1,500 patents, according to Wu. Nearly NT$14.5 billion has been invested in 860 nanotechnology transfer projects, 630 of which have been completed, Wu said, adding that an initiative for a brokerage of technology transfers has recently been launched to encourage innovation in the area. Wu expressed hope that the industry's production value can breach NT$1 trillion. This year's nanotechnology exhibition highlights a theme pavilion of nano-innovation for nanotechnology and products that include nanoelectronics and optoelectronics techniques, energy and environmental applications, instrument and equipment development, biomedical and agricultural applications, nanomaterials and traditional industry, nanotechnology education and training, and advanced studies of nanoscience and technology, according to an event organizer

http://focustaiwan.tw/news/aeco/201310020016.aspx

3. NTU study sheds new light on speleothem banding

(Taiwan Today, 03 10 2013)

The results of a study conducted by Taipei City-based National Taiwan University research team could force a rethink on the understanding of speleothem banding and climate change, according to the ROC National Science Council Oct. 2.Overseen by Shen Chuan-chou, professor of NTU Department of Geosciences, the study used high precision Uranium-Th dating techniques developed by the researcher to analyze the laminae formation on a 300-year-old stalagmite collected from Xianren Cave in southwestern mainland China. Samples were dated with a precision level of plus or minus six months, showing that the annual bands can be under or over-counted by several years during different multidecadal intervals. "The study suggests that the age of speleothem may not be directly correlated to laminae formation," Shen said. "Irregular formation of missing and false bands indicates that the assumption of annual speleothem laminae in climate reconstruction should be approached carefully without a robust absolute-dated chronology." Shen said the findings have important implications for speleothem studies. "Even a bias of just a few years in a time series may adversely impact estimates of the timing and duration of abrupt events, as well as studies of annual-to-interannual dynamics of climate systems." Since the chronologies of speleothem laminae, as well as those found in many other natural objects such as trees and marine sediments, are widely used to reconstruct annual-resolved climate histories, the bulk of existing research on climate change may have to be re-examined with prediction models modified, he added. According to Shen, another study on samples collected from the Pacific region also yielded similar results, which may lead to a different understanding of the El Nino

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phenomenon. While many other leading institutions worldwide have conducted similar studies, none achieved the same precision level as NTU, the researcher said. Results of the six-year study, supported by the NSC and NTU, were published in the Sept. 16, 2013, issue of Nature Scientific Reports. Shen said his team has been approached by many leading institutions around the world for collaboration, including Australian National University, Beijing University, California Institute of Technology and Tokyo University.

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http://www.chinapost.com.tw/taiwan/local/taipei/2013/10/03/390383/Researcher-develops.htm

4. 4 Taiwan academics elected to TWAS

(Taiwan Today, 04 10 2013)

Four distinguished research fellows of the Taipei City-based Academia Sinica were elected to Italy-based Academy of Sciences for the Developing World (TWAS), Academia Sinica said Oct. 3.Three more Taiwan scholars, including one from Academia Sinica, received TWAS prizes, and one research fellow was elected a TWAS Young Affiliate at the 24th TWAS General Meeting that ended Oct. 4 in Buenos Aires, Argentina. The four academicians are Cheng Soo-chen, director of the academy's Institute of Molecular Biology; Hsieh Tao-shih, director of the Institute of Cellular and Organismic Biology; Lee Shih-chang, of the Institute of Physics, and Liu Shaw-chen, of the Research Center for Environmental Changes. The three TWAS prize winners are Chang Mei-hwei, distinguished professor of the Department of Pediatrics, College of Medicine at National Taiwan University and Chairperson of the Hepatitis Research Center, National Taiwan University Hospital; Lin-chao Sue-duan, distinguished research fellow of the Institute of Molecular Biology and director of the International Affairs Office of Academia Sinica; and Mou Chung-yuan, professor of NTU Department of Chemistry and deputy minister of the ROC National Science Council. In addition, Chai Jeng-da, an associate professor of NTU Department of Physics, was elected a young affiliate, an honor awarded annually to exceptional scientists under 40 years old. Cheng's research focuses on the spliceosome, or how genetic markers are split up and distributed along ribonucleic acid (RNA) molecules. Hsieh has made many contributions to the field of DNA topoisomerases and chromatin dynamics, and his work provided a mechanistic basis for the induction of DNA breaks by many powerful anticancer drugs. Lee led a Taiwan team in the Collider Detector at Fermilab discovery of the top quark, in the A Toroidal LHC Apparatus (ATLAS) discovery of the Higgs boson-like particle and in the precision measurement of positron fraction spectrum in space by the Alpha Magnetic Spectrometer. Liu has published more than 160 papers which have received more than 6500 citations in the fields of atmospheric chemistry, air pollution and climate change, making him one of the few Taiwan scientists listed in the Institute for Scientific Information list of highly cited researchers. Lin-chao Sue-duan's research interest is in the molecular mechanisms of message RNA in E. coli gut bacteria. Chang Mei-hwei studies the effect of the hepatitis B vaccine in preventing liver cancer and promotes the concept of anticancer vaccines. Mou Chung-yuan researches the synthesis of mesoporous silica materials and their catalytic and biomedical applications. TWAS has more than 1,000 members from 90 countries, more than 85 percent of whom are from the Global South. The academy's main mission is to promote scientific excellence and the capacity for sustainable development.

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5. ITRI teams up with Finnish research institute

(Taiwan Today, 08 10 2013)

Taiwan's Industrial Technology Research Institute signed a memorandum of understanding with VTT Technical Research Centre of Finland Oct. 7 in Hsinchu County, paving the way for cooperation across a broad range of fields. Inked by ITRI President Shyu Jyuo-min and VTT President and CEO Erkki Leppavuori, the pact calls for both parties to jointly develop applications spanning biomedicine, clean technology and health care, as well as nanoelectronics and semiconductors. "This marks the first innovation-oriented R&D cooperation between Taiwan and Finland and part of an ongoing ITRI effort to strengthen its international profile," Shyu said. In order to network with research

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organizations around the world, ITRI also inaugurated an office in the Netherlands in late June, following ones in Germany, Japan, Russia and the U.S., Shyu added. "Such partnership will help sharpen Taiwan's overall technical capabilities and promote job creation in targeted sectors." For example, ITRI hopes to access VTT's microchannel process technology to develop high-end in vitro diagnostic devices for rapid detection of heart-related diseases. Shyu said VTT will be invited to take part in ITRI research alliances in organic light-emitting diode systems and flexible electronics, among others. Given VTT's solid capability in fundamental research and proven track record as an incubation center for high-tech startups, Shyu expects the cooperation to bear fruit very soon. "By harnessing both organizations' strengths, the partnership will help ITRI and Taiwan firms make greater inroads into European and international markets," he added. Calling the tie-up a major step forward in promoting innovative R&D between Taiwan and Finland, Leppavuori said the cooperative platform will help fast-track commercialization of research efforts at the two organizations, generate business opportunities and spur bilateral cooperation between the countries' respective private sectors. Established in 1942, VTT is a leading multi-technological applied research organization in northern Europe, and operates under the auspices of the Finnish Ministry of Employment and the Economy.

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6. Researchers find use for fungi in vegetable cultivation

(Central News Agency, 08 10 2013)

A genus of fungi has been found to have better control of soil pathogens than conventional pesticides and to help breed vegetable seedlings, a local researcher said. "Trichoderma has a better effect on enhancing plant growth, such as seed germination rate, root extension and plant growth rate," said Chen Chien-wei, an associate researcher at the Taichung District Agricultural Research and Extension Station. With only "one dose" of the fungi, the flower number and production of vegetable seedlings can be enhanced and the harvest stage can be prolonged for one to two months, Chen told CNA, adding that he has found good results in growing tomatoes, cabbages, cucumbers and peppers. The survival rate can even be increased to at least 95 percent from some 60-70 percent, he said. Currently, only three out of 10 nursery farms are using this method, but all have seen good results, Chen said. "We would like to promote this to reduce the use of pesticides," the researcher said, adding that pesticide usage could be reduced by at least 20 percent through use of the fungi. The station has already licensed the technology to a local biotechnology company, which is expected to commercialize it by the end of the year, Chen said.

http://focustaiwan.tw/news/ast/201310080025.aspx

7. Team develops cancer therapy nano capsules

(Taipei Times, 17 10 2013)

A research team funded by the National Science Council (NSC) said it has developed a new method using nanotechnology to deliver drugs directly to the cancer cells — like a missile being guided to a target — while reducing side effects to a minimum. National Science Council Deputy Director-General Hocheng Hong told a press conference in Taipei that while chemotherapy often causes side effects because the drugs used can damage healthy cells as well and targeted therapy is too expensive for many patients, the team's new method could provide a new option. The team, led by Chen San-yuan, a professor in National Chiao Tung University's materials science and engineering department, developed a drug carrier with iron oxide nanoparticles that can encapulsate more than one type of drug — such as Adriamycin and Paclitaxel —reducing the harm caused by the toxic drugs to other parts of the body as they are delivered through the veins. An iron oxide nanoparticle carrier is small enough to travel through the veins to enter the area where cancer cells are rapidly growing, and since it is magnetic it can be guided to the targeted cancer cells using a magnet, Chen said. The new method can solve one of the traditional problems with chemotherapy, which is that only about 10 percent of the drugs actually reach the targeted cells. The "Nano-MagCapsule" acts like a rocket that releases objects in different stages, Chen said. It can release the one type of drug when it first reaches the tumor tissue, and release a second type of drug later to fight the more difficult-to-reach cells in deeper parts of the tissue, such as the cancer stem cells and tumor hypoxia, he said. Animal experiments have shown the method to be very effective. It can also reduce the amount of drugs needed to about one-fifth of the usual chemotherapy doses, he said. Experiments are underway to test the method on breast

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cancer, brain tumors and lung cancer, he said. As the drugs used in the trials have already been certified by the government, the team's method is likely to be approved for clinical trial and usage rather than in the development of totally new drugs, Chen said. The method has already been patented and the technology transferred to a Taiwanese biotechnology company, the council said.

http://www.taipeitimes.com/News/taiwan/archives/2013/10/17/2003574715

8. NCCU team invents superfast biochemical sensor

(Taiwan Today, 22 10 2013)

A biochemical sensing platform that gives almost instantaneous test results with widespread applications has been developed by an interdisciplinary research team from Chiayi County-based National Chung Cheng University.The calibration-free diffractive nanoparticle biochemical sensing platform produces accurate screening results within five to 10 minutes and can be customized for biomedical, food, agriculture and environmental testing, NCCU said Oct. 21. Professor Chau Lai-kwan, head of NCCU's Department of Chemistry and Biochemistry, professor Hsieh Wen-hsin of the Department of Mechanical Engineering and Hsu Wei-ting, chairman of the Department of Chemistry and Biochemistry Alumni Association, spent nine years creating the testing platform. "Traditional screening of blood or urine typically takes several hours or days," Chau said. "A fast, accurate method can be of great help in the detection and prevention of infectious diseases." Hsu said, "With many infectious diseases you can't wait around for test results. Like the severe acute respiratory syndrome epidemic 10 years ago, if detection had been fast enough, patients could have been immediately quarantined and the outbreak controlled." The platform integrates the fields of biochemistry, materials science, mechanics, medicine, optoelectronics and physics to create biomedical chips. It has been granted Taiwan and U.S. patents, and recently beat 580 inventions from 37 countries to win a gold medal and special contribution award at the Ukraine's International Salon of Inventions and New Technologies. The chip incorporates a tiny channel along which the blood, saliva, urine or other test fluid can travel into contact with the sensing field, speeding the process and boosting sensitivity. Chau said one drop of fluid is enough for the test, much less than the test tube of blood drawn during a standard hospital procedure. "If testing for H1N1, for example, a drop of saliva can be introduced into a chip carrying the H1N1 antibodies. If the saliva contains H1N1 virus, it will react with the antibodies and affect the signal coming from the diffraction, allowing for immediate detection of the disease." Other uses for the sensor include customized applications such as food testing, and detection of environmental pollutants as well as plant and animal diseases. The NCCU team has used it for applications as diverse as diseases of orchids and heavy metal pollution of water. According to Chau, other advantages of the sensor are miniaturization, low production cost, disposability, small sample requirements and high sensitivity. "Although the development of the chip has been a long and complex process, we hope it will serve the rich and the poor and become convenient enough for everyday use. People just have to read the instruction booklet to be able to use it," he said.

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9. ITRI releases advanced automotive laser head-up display

(Central News Agency, 23 10 2013)

Taiwan's Industrial Technology Research Institute (ITRI) on Wednesday released a module for automobile use that projects the widest laser head-up display (HUD) to date, touting the new product and technology as the most advanced of their kind in the international market. The HUD module is expected to "help local makers of automobile electronic devices enter a niche market," the institute said. The laser HUD module, based on laser micro-imaging technology, comprises high-frequency scanning components, a pico projection laser engine, super-wide distance imaging optics and other key components. This allows it to project an HUD display made up of real-time images, navigation and traffic data, according to the ITRI. The existing HUD on imported German-made automobiles can show only driving speed and navigation content and is one third the size of the ITRI-developed device, the institute said. It said the components and technologies used to make the state-of-the-art device are the most advanced in the world and it is now applying a patent for the product. Apart from the HUD module, the ITRI also publicized several laser technologies it has developed over the past years, including laser source and 3D printing applications. The nonprofit ITRI, headquartered in Hsinchu County, is Taiwan's top R&D organization and is engaged in applied research and technical services. With the

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transfer of its innovative technologies, the institute has helped establish many high-tech companies such as Taiwan Semiconductor Manufacturing Co.

http://focustaiwan.tw/news/ast/201310230035.aspx

10. Taiwan, U.S. experts make breakthrough in fighting gray mold

(Central News Agency, 243 10 2013)

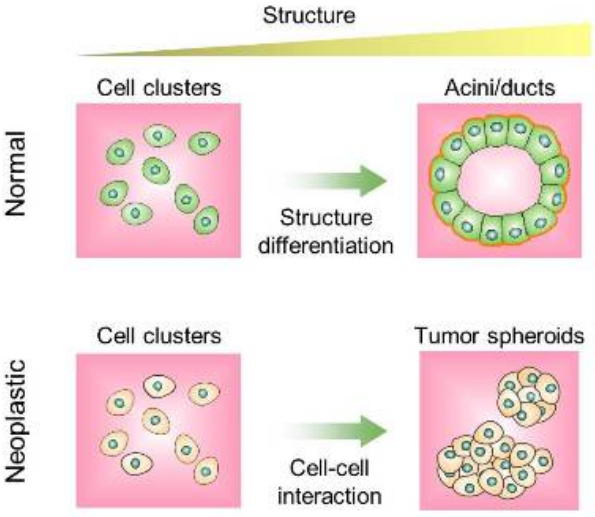
A team of researchers based in Taiwan and the United States have discovered how grey mold infects crops and flowers, a significant step in finding methods to prevent the common plant infection. It took researchers two years to determine how botrytis cinerea, the causative agent of gray mold, suppresses immunity genes, according to professor Huang Hsien-da, vice dean of Biological Science and Technology at National Chiao Tung University in Hsinchu City. They infected over 200 plant species including orchids, an important crop in Taiwan, Huang said, before concluding that b. cinerea uses RNA interference to "hijack" host RNA and make it susceptible to infection. The study was published in the October issue of the international journal Science. This discovery is the first time that scientists have successfully gained insight into the mechanism behind infection, something that had previously evaded academia, according to Huang. The research team will next investigate the mechanisms behind skin disease infections such as athlete's foot, Huang said.

http://focustaiwan.tw/news/asoc/201310240033.aspx

11. Taiwan team makes pancreatic cancer breakthrough

(Taiwan Today, 29 10 2013)

A Taiwan research team has discovered genetic markers that can predict the likelihood of surviving pancreatic cancer with 95 percent accuracy, opening up possibilities for targeted therapy, Miaoli County-based National Health Research Institutes said Oct. 28. The team was led by NHRI pancreatic cancer research head Chen Li-tzong; former head Chang Jang-yan , who is dean of National Cheng Kung University College of Medicine; and Kelvin K. Tsai, principal investigator at NHRI Laboratory for Tumor Epigenetics and Stemness, as well as Shan Yan-shen of the upper gastrointestinal cancer medical team at Tainan City-based NCKU, the NHRI said. Their findings will be published next month in the prestigious international journal Gastroenterology. Pancreatic cancer has one of the worst prognoses of all cancers, as its symptoms are rarely recognized before the cancer has spread throughout the body, the NHRI said. More than 40,000 are diagnosed with the disease each year in the U.S., making it the fourth biggest cancer killer, while in Taiwan it ranks eighth. According to the NHRI, only about 20 percent of sufferers are diagnosed at a stage where localized surgery is feasible, and more than 80 percent who do have an operation die from relapse within five years. The discovery of genetic markers linked to prognosis creates possibilities for patient-specific chemotherapy or other targeted interventions. The team used animal trials to identify six genetic markers that were important to pancreatic cancer stem cell multiplication and predicted prognosis, the NHRI said. The 95 percent accuracy is much higher than for traditional clinical and previously known genetic markers. A provisional U.S. patent application for the methodology was also filed. A very small number of samples would be sufficient to detect the presence of the six genes using methods such as polymerase chain reaction, array or immunohistochemistry, the NHRI said. The invention can be applied to clinical tumor biopsy or surgical samples. Its clinical use is therefore convenient and flexible. The high prognostic accuracy means that patients at high risk of relapse will be able to choose more aggressive methods of treating the tumors, the NHRI said.



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12. Discovery improves cancer prognosis

(Taipei Times, 29 10 2013)

A research team at the National Health Research Institutes (NHRI) has identified six genes as molecular markers for effective prognosis prediction in pancreatic cancer patients. Pancreatic cancer is the eighth-leading cause of death in Taiwan and its prognosis has been considered poor due to the fact that it is often diagnosed at a late stage, the team said, adding that less than one in five pancreatic cancer patients are diagnosed with the disease in its early

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stages. The team said as many as 80 percent of those who underwent surgical removal die of recurrent cancer within five years after the surgery. The pancreatic cancer research team at NHRI, in cooperation with the upper gastrointestinal cancer medical team at National Cheng Kung University, has worked on developing postoperative molecular markers for pancreatic cancer prognosis prediction for potential targeted therapies. The group found six genetic markers that play an important role in multiplying pancreatic cancer stem cells and aggravating the cancer. Animal experimentation showed that by inhibiting the gene expressions of the genetic markers, the pancreatic cancer stem cells and cancer metastasis can be effectively suppressed and prolong survival, the research team said. The prognosis prediction using the molecular markers is said to be 95 percent accurate, which is much higher than the prediction accuracy of the clinical pathological indicators and other known molecular markers. A provisional patent application for the research result has been filed in the US, the team said, adding that the research findings will be published in next month's issue of Gastroenterology.

http://www.taipeitimes.com/News/taiwan/archives/2013/10/29/2003575658

13. Taiwan researchers develop efficient biodiesel production method

(Central News Agency, 31 10 2013)

Using microwave heating, researchers at National Cheng Kung University (NCKU) have developed a way to turn waste cooking oil into biodiesel, a method they say they will share with local businesses for mass production of biodiesel within a year. NCKU Distinguished Professor Liao Jiunn-der and visiting professor Aharon Gedanken of Israel announced their finding, which relies on strontium oxide as a catalyst, on Thursday from the university in Tainan, southern Taiwan. With the catalyst, kitchen waste can be transesterified into biodiesel and glycerol in a modified microwave oven in 10-40 seconds, they said. The strontium oxide can then be reused, making the production method highly efficient, according to Liao. The process can turn waste into a resource that contributes to the environment and economy, especially in Taiwan, where cooking and eating habits mean local restaurants, homes and schools produce a considerable amount of waste oil, noted Gedanken. Liao hopes that the new method will help Taiwan, where diesel fuel currently consists of 2-3 percent biodiesel, to meet the predictions of the European Union, which forecasts biodiesel will make up 20 percent of deisel by the year 2020. NCKU is working on filing a patent for the technique, he said. The modified microwave developed by Gedanken is able to handle an estimated 500 kilograms of waste oil per day, according to Liao. The results proved that 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://focustaiwan.tw/news/asoc/201310310037.aspx