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News Highlights:

An academic group from National Tsing Hua University introduced the latest breakthrough into research on the **smallest plasmonic nanlaser** ever developed, which can theoretically transmit 1'000 times faster than the present series of semiconductor lasers – Researchers developed a new **vaccine against Enterovirus 71** – the National Taiwan University Hospital successfully implanted a living donor kidney using the d**a Vinci surgical robot**, touting it as the first successful use of the procedure in Asia – A National Cheng Kung University research team has made a major breakthrough in the **regeneration of new blood vessels in cardiovascular therapy** using new nanotechnology – Researchers identified a **substanc**e found in the body that is an **anti-inflammatory and tumor suppressant**, which could pave the way for new cancer therapies – the Taiwan Ocean Research Institute launched the "**Ocean Research V" vessel** – Taiwan helps **search space for origins of the universe** – the National Defense University has been using **nano-carbon materials to develop lightbulbs and tubes** that are more energy-efficient and environmentally friendly than currently available products – "Phoenix", Taiwan's **first solar-powered** unmanned aerial vehicle (**UAV)** made its first test flight – Researchers at Academia Sinica found the possible cause for **Lou Gehrig's disease** – Researchers developed a simple **one-step method for simultaneously introducing multiple genes into a yeast host,** which is promising for use in the economical production of ethanol from plant cellulose as well as many other synthetic biology applications – the Chang Gung Memorial Hospital developed **a transgenic zebrafish model** suitable for studying fibrosis and intrahepatic cholangiocarcinoma associated with hepatitis B (HBV) and C (HCV) infection – a national Tsing Hua University research team made a breakthrough in **bio-imaging technology** that will enable researchers to study stem cells more closely and cheaply – Researchers cloned a **marker gene in coral** that is likely to help artificially cultivate endangered coral species – the National Cheng Kung University made a breakthrough in **semiconductor packaging** by developing the Sn-Zn-Ag-Al-Ga solder, a new revolutionary material which excels in terms of reliability and low cost – a National Cheng Kung University research team discovered Near-Infrared Light-Responsive oligonucleotide-gated Au nanoensembles (Au nanorod complex), a **potent new anti-cancer complex.**

Contents:

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1. Team unveil new laser device

(Taipei Times, 31 07 2012)

LIGHT FANTASTIC: The academic group have pioneered a microscopic nanolaser which could allow for the opening up of vast new fields of research. A research team, mainly formed of professors and students from National Tsing Hua University, introduced the latest breakthrough into research on the smallest plasmonic nanolaser ever developed, which can theoretically transmit 1'000 times faster than the present series of semiconductor lasers. The discovery was published in this week's edition of Science magazine, one of the world's most prestigious science journals. The team consists of 15 researchers and doctoral students, eight of whom are from National Tsing Hua University with their research being funded by the National Science Council. The others are from the US and China. Felix Gwo, a professor at the university's department of physics, said worldwide research and development into semiconductor lasers began about 50 years ago, however, efforts to improve transmission speeds have hit a bottleneck in which its size cannot be reduced any further, due to the physical limitations of the Abbe Diffraction Limit. "Data transmitted through fiber-optic communication can be very fast, but when it reaches the computer and is processed in the central processing unit [CPU], the computing is still reliant on electrons [which limits the transmission speed]," Gwo said. "So if we can reduce the size of optical components and make them into optical chips, the speed can be increased to about 1,000 times of current electronic chips," he added. The team's success in going beyond the physical limitations was achieved by forming plasmonic nanolasers to overcome size limits. However, a challenge with current plasmonic devices is that parts of the transmission mechanism gets lost as a result of the scattering which takes place within a transmission medium or from the roughness of a reflective surface. The team's main breakthrough lies in the association of two materials — a single InGaN/GaN core-shell nanorod on an SiO2-covered epitaxial Ag film, Lu Yu-Jung, the lead author of the research paper and a doctoral student at the university's physics department said, adding that "one plus one equals much much bigger than two, we were lucky to accomplish the breakthrough by adding up the long-term research results from two teams." "The research results can be considered as a first step toward optical computing," Gwo said, adding that while people say the end of the last century was dominated by nano-electronics, it has been predicted by scientists that nano-photonics will dominate the current century. However, he said it will still take several years of research and experimentation before the new technology can be applied to commercial products. Shih Chih-kang, professor of physics at the University of Texas at Austin, said the team's discovery is not limited to applications in the semiconductor industry, but can also contribute to other fields of science, such as improving optical microscopes used in the field of biomaterials.

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2. Taiwan researchers introduce vaccine against Enterovirus 71

(Central News Agency, 03 08 2012)

Taiwanese researchers announced that they have developed a new vaccine against Enterovirus 71 (EV 71) and will partner with biotech companies to carry out human clinical trials. The new vaccine, which has proven effective in primates, is expected offer humans better protection against EV 71, a virulent strain of the virus that causes hand, foot and mouth disease, said Chiang Bor-luen of National Taiwan University Hospital. "The vaccine has effectively induced antibodies against EV 71 in the Formosan macaque, a primate close to humans," said Chiang, a professor at the hospital's Department of Pediatrics and Graduate Institute of Clinical Medicine. The next step is to team up with experienced biotech companies to conduct more studies and clinical trials, Chiang said. Hu Yu-chen, a professor at National Tsing Hua University's Department of Chemical Engineering, said the new vaccine is safer and has fewer side effects than most other vaccines. Instead of using inactivated viral cells, Hu said, the new vaccine uses virus-like particles (VLPs) to stimulate immune responses. "Using genetic engineering, we produced proteins that can be assembled into VLPs, which resemble viruses but do not contain viral genetic material like DNA or RNA." he said. The technology is already being used to make the human papilloma virus vaccine that can help prevent cervical cancer, he noted. With the help of biotech companies, the EV 71 vaccine could enter late stage clinical trials in about five years, Hu said. Taiwan has been actively engaged in the research and development of an EV 71 vaccine since a huge outbreak of foot and mouth disease occurred in 1998, taking 78 lives.

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3. Hospital performs robot-assisted kidney transplant

(Taipei Times, 08 08 2012)

National Taiwan University Hospital said it had successfully implanted a living donor kidney using the da Vinci surgical robot, touting it as the first successful use of the procedure in Asia. "The surgery can be seen as a landmark for organ transplants," hospital vice superintendent Lin Ming-tsan said at a press conference. Compared with traditional surgery, robotic-assisted surgery is minimally invasive and can offer patients the benefits of rapid recovery and a small incision, said Tsai Meng-kun, the doctor who performed the surgery. The da Vinci system is an innovative machine used to mirror the movement of the surgeon's hands using two controller sticks. The system

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offers features such as high-definition 3D vision and magnified views. On July 27, a kidney was removed from a 51-year-old man via laparoscopy. It was later transplanted into his 60-year-old sister using the robotic technique. The woman recovered well and was scheduled to be discharged. “The operation went smoothly,” Tsai said, showing a video of the procedure. He said the robotics technology not only lowers the risk of complications for patients, but also enables surgeons to perform with increased precision without leaving large scars. Whereas open surgery leaves a 15 to 20cm scar on the abdomen, the incision on the organ recipient is estimated at just 9cm, he added. “This is no simple task,” said Lai Hong-shiee, director of the hospital’s surgery department, quoting comments from surgeons in South Korea and Hong Kong. “We believe this is the first robotic-assisted kidney transplant surgery to be carried out in Asia,” he said. The hospital has completed 149 other operations using the da Vinci equipment in the past six months.

http://www.taipeitimes.com/News/taiwan/archives/2012/08/08/2003539756

4. Taiwanese university makes breakthrough in heart treatment

(Central News Agency, 09 08 2012)

A National Cheng Kung University research team has made a major breakthrough in the regeneration of new blood vessels in cardiovascular therapy using new nanotechnology, a university associate professor said. The new treatment breaks the 10-year bottleneck that traditional vascular endothelial growth factor (VEGF) in heart repair treatment has faced, said Hsieh Ching-ho, an associate professor at the university's Graduate Institute of Clinical Medicine. Traditional VEGF treatment, which is used for generating new blood vessels, is believed to be also applicable to the treatment of ischemic heart disease -- a medical condition characterized by reduced blood supply to the heart. However, it has failed to produce results in nearly 20 clinical trials over the last 10 years, explained Hsieh. Hsieh made the comments after the research team's paper was published Thursday in the newest edition of Science Translational Medicine, one of the world's leading journals for scientific news, commentary and cutting-edge research. The university's treatment introduces the use of peptide nanofibers combined with VEGF, a signal protein produced by cells to stimulate the formation of new blood vessels, said Hsieh. The research team has found that in animal tests, the technique has led to improvement in heart function of as much as 70 percent. Moreover, the regeneration of microvessels can be elevated by over three folds, and new arteries by over five times, Hsieh added. In the past, it was believed that myocardial cells become unrepairable and die due to reduced blood flow, but the new technology not only creates a favorable microenvironment for revascularization. It can also reduce the area of ischemia as well as side effects, said Hsieh. Currently, there are no approved therapies in regenerative medicine for heart failure. The treatment has not yet entered clinical trials, but the team hopes that in the future, injecting the material into the heart during cardiac catheterization will be able to replace traditional open-heart surgery or be applied to the treatment of other diseases.

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5. Taiwan identifies cancer-fighting substance

(Central News Agency, 10 08 2012)

A team of researchers said they have identified a substance found in the body that is an anti-inflammatory and tumor suppressant, which could pave the way for new cancer therapies. The finding confirms that the body has innate healing energy and a protective mechanism, Kenneth Wu, president of the National Health Research Institutes, said at a press conference. Wu has devoted more than a decade to locating an organic compound called 5-methoxy-hyptophan (5-MTP). The compound has been proven to effectively suppress the proliferation of an enzyme that can cause growth in cancer cells, he added. An experiment was done on mice in which lung cancer had been induced. Fifty days after injection of 5-MTP, the mice had a nearly 50 percent tumor growth reduction and cancer cells had been inhibited from spreading to other parts of the body. This is a "landmark in the search for treatment based on self-healing” and can serve as a valuable lead for new anti-cancer drug development, according to a press statement released by the institute. The finding was published online July 31 in the Proceedings of the National Academy of Sciences of the United States of America.

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6. Taiwan-built ocean research vessel officially launched

(Central News Agency, 10 08 2012)

"Ocean Research V," a domestically designed and built research vessel, was officially launched in Kaohsiung and will begin operations from January next year, the Taiwan Ocean Research Institute said in the southern city. The ship can improve domestic ocean research and development of related industries, and assist in the implementation of the country's policy of "seeking prosperity from the ocean," said Vice President Wu Den-yih at the inauguration ceremony of the vessel, which is being operated by the institute. Taiwan is surrounded by sea and the country's "blue territory,"

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including its exclusive economic zones, are approximately five times the size of the country's land area, Wu said. "Ocean Research V" is one of the largest research vessels to have been designed and built domestically that can engage in comprehensive and systematic ocean surveys, National Science Council Minister Cyrus Chu said. Findings from the vessel's crucial economic and research missions will be uploaded to Taiwan's National Oceanographic Database for public reference, Chu added. Research has found signs that large quantities of methane hydrate are stored in Taiwan's southwestern sea zone, and if the natural gas can be tapped successfully, it can provide Taiwan with an energy source for the next 50-100 years, Chu explained. The vessel is equipped with many advanced scientific devices, including a sonar system and multichannel seismic detection system that can map large areas of the sea floor, analyze strata structures and provide a basis for investigating oceanic land, the institute said. For probing rock beneath the sea bed and detecting natural gas, the ship is equipped with a remote-controlled vehicle that can operate 3,000 meters underwater and take samples with a drill, the institute added. In the future, the Central Weather Bureau will be commissioning the vessel to help maintain underwater cables of Taiwan's earthquake monitoring system near Yilan County's Toucheng, the bureau said. Sturdier than the old, smaller research vessels, the new 2,700-ton vessel, which is 72.6 meters long and 15.4 meters wide, can withstand gale force eight winds and operate for 250 days per year, the institute said.

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7. Taiwan helps search space for origins of the universe

(Taiwan Today, 12 08 2012)

The Alpha Magnetic Spectrometer-02, a particle physics detector on the International Space Station, searches outer space for antimatter and dark matter as part of an investigation into the origin of the universe. Taiwan, a founding member of the project, took on a greater role July 3 with the opening of the program's Asia Payload Operations Control Center at the Chung Shan Institute of Science and Technology in Taoyuan County. Initiated in 1994 and led by Nobel laureate in physics Samuel Chao-chung Ting, the AMS project also performs precision measurements of cosmic rays to provide information on their origin and help plan protective measures for manned space flights, according to Jinchi Hao, general director of the CSIST's International Cooperation Program, in charge of overseeing the center's daily operations. The control center is the second such facility in the world, supporting the one at program headquarters at the European Organization for Nuclear Research (CERN) in Geneva. "While South Korea and mainland China were both highly interested in hosting the POCC, the selection of the CSIST was unanimous, and it had nothing to do with the fact that Ting is an Taiwan expatriate," Jinchi explained. ROC President Ma Ying-jeou said at the opening ceremony, "Taiwan is widely recognized as a major participant in terms of the scale of its contributions to this international collaborative effort. "Involvement in the project will provide a foundation for progress in applied sciences over the next two to three decades, helping to spawn the next generation of R&D talent in the country." William H. Gerstenmaier, associate administrator of the U.S. National Aeronautics and Space Administration's Human Explorations and Operations Directorate, said, "Taiwan should be very proud of its contribution to the AMS project and the team that will be working in parallel with the team in Geneva. "This project wouldn't have existed without the support of Taiwan, and definitely NASA wants to thank Taiwan for the work and for helping us understand more about the universe." The AMS investigation, involving around 600 researchers from 60 institutes in 16 countries, is considered the most important international research undertaking on fundamental science in recent years. Taiwan is represented by Academia Sinica, Aerospace Industrial Development Corp., CSIST, National Central University, National Cheng Kung University, National Chiao Tung University, the National Science Council and National Space Organization, Jinchi said. Given its engineering expertise, the CSIST was charged with developing an electronics system for data transmission, at the same time as a competing European organization. "We were actually the backup option because of our lack of experience in participating in such international endeavors," he pointed out. But the CSIST built a greatly superior and far more reliable system. After passing NASA testing in 1998, it was installed on an AMS prototype designated AMS-01. As a component of the particle physics detector, which was flown into space aboard the space shuttle Discovery in June that year for a 10-day orbit around Earth, the system performed well and helped the CSIST establish itself as a worthy partner in this grand project. During R&D for the advanced version of the system, carried out in collaboration with the Massachusetts Institute of Technology, representatives from the other participating countries visited the CSIST every three months for technical interchange meetings with local experts and engineers. "As the second stage of the program, the AMS-02, will last for 20 years, our system had to be equipped with stronger functions and meet much higher reliability standards," Jinchi said. The AMS-02 was installed on the International Space Station May 19, 2011, and has been transmitting data back to Earth since then. According to Jinchi, the function of the CSIST system is analogous to that of the human body's nervous system. "All signals received by the AMS-02 will be transmitted back to the Earth by the CSIST system, while all commands from the ground will be uploaded through the same route to the space station." As a support facility for CERN, the POCC is responsible for monitoring AMS-02 operations and data transmission when European staffers are off duty. "While the POCC is responsible for an eight-hour shift from 6:00 a.m. to 2:00 p.m. local time, the center is fully capable of 24-hour operations if necessary," he said. In the initial stage, the center is manned by six researchers and equipped with information security equipment, computer and network systems and software provided by NASA.

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Representatives from CERN will make inspection visits every three months, while CSIST members will attend CERN-organized seminars and workshops in Geneva on a biannual basis. Six more staffers are scheduled to report for duty in November and then receive relevant training at CERN in January next year. A complete space project, Jinchi explained, includes the development of launch vehicles, ground control systems and satellite technology. The CSIST is already working with the NSO on the Formosat-5 program, the first self-reliant remote sensing satellite to be developed by the ROC government. “Through managing the POCC, Taiwan can gain in-depth knowledge and hands-on experience in ground control and remote sensor technology, making a giant step forward in space research.” Jinchi also believes the POCC could be a partial solution to Taiwan’s talent shortage. “Research on space can be a demanding and lonely job, as most of the time you’re working at your console at odd hours and stay secluded from people. The monetary rewards cannot be compared to those offered by the high-tech sector, either.” But because the POCC will be in operation for two decades, he expects more college graduates to join his team for the rare chance to interact with top scientists and researchers from around the world. When NASA representatives inspected the center in June, they expressed interest in working with the institute to develop other computer systems for spaceships, Jinchi said. France, Switzerland and Italy have also proposed discussions on the development of similar systems. “These offers are votes of confidence in our engineering capabilities. We believe the experience of running the POCC will bring Taiwan more opportunities to take part in groundbreaking international research.”

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8. Taiwan university develops nano-carbon material for light source

(Central News Agency, 19 08 2012)

A research team at Taiwan's National Defense University has recently been using nano-carbon materials to develop lightbulbs and tubes that are more energy-efficient and environmentally friendly than currently available products. Ger Ming-der, a professor at the university's Department of Chemical and Material Engineering at Chung Cheng Institute of Technology, said he and his team have received a local patent for their invention. "We're seeking more cooperative opportunities with private businesses to improve our invention so that it can be mass produced," Ger told CNA. Unlike LED lighting products, the team's invention boasts nano-carbon materials that can be used to develop a light source in a mercury-free manufacturing process, he noted. The technology also has a simple structure and features a high degree of luminous efficiency, as well as better color rendering, Ger added. Another feature of the new invention is that it can be integrated into the country's traditional lightbulb industry, he said. The team has already completed a prototype for the new energy-saving light source, he said, adding that he expects that it can be put into mass production in the second half of next year, once some minor problems have been addressed.

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9. First flight success for Phoenix drone

(Taipei Times, 19 08 2012)

ICARUS’ OPPOSITE: The unmanned aircraft uses solar panels to power itself through the air, which its creators say makes it ideal for myriad uses, such as aerial policing. Phoenix, the nation’s first solar-powered unmanned aerial vehicle (UAV), successfully made its first test flight in Taipei, showing off the results of three years of research and development by a team from the Department of Aerospace Engineering of Tamkang University. The aircraft, which weighs about 9.3kg, has solar arrays (a group of solar panels) attached to its wings that are 3.7m long and cover 65 percent of the wing surface. The solar panels, which operate at 18 percent efficiency, cannot produce sufficient energy to power the drone, so two lithium polymer batteries provide the remaining energy needed to keep the aircraft aloft. Phoenix has not yet been able to store solar energy in fuel cells for use at night. “The most diff ult part of the project is to design and build a system that utilizes as well as maximizes energy,” said Ma Te-ming (馬德明), an associate professor at the department. “We have developed our own software to achieve the best efficiency possible.” Ma also said Phoenix could harvest all its power from the sun if solar panels that operate at 30 percent efficiency are used. However, the limited funding provided by the university and the National Science Council means that the researchers need to make the most with what funding they have. “A 3x7cm panel that is 30 percent efficient costs NT$10,000. We can’t afford it. The total amount we spent on solar panels is around NT$30,000,” he said. “The total cost of the drone is around NT$100,000.” Composed of about 30 students from two aerial engineering laboratories amd led by three academics, including Ma, the university’s team made a couple of test models before Phoenix. “My job is to develop the solar energy system. It took forever to set up the system. After it was set up, we spent another

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year running tests," 25-year-old team member Liang Chun-kang said. Under the midday sun at the His Sheng Remote Control Aircraft Park in New Taipei City's Sinjhuang, the UAV took off on an airstrip as the research team piloted it by remote control. It flew at an average speed of 34km per hour, circled in the sky a few times and made a slightly rough landing that caused minor damage to one of its tires. The range of the remote control is one to two kilometers, Ma said, adding the aircraft's slow velocity renders it vulnerable to crosswinds. The test flight is expected to provide valuable data relating to battery voltage, electric current, flight height, aircraft motions for further development. The ultimate goal, Ma said, is to make an entirely solar-powered aircraft, with solar panels feeding on batteries that can keep the craft aloft at night or in the rain. One of the main reasons for developing solar-powered UAVs is to extend aircraft flight times because they can use the sun as an unlimited source of energy, Ma said. "Because UAVs don't need human pilots, we want to keep them up in the air as long as possible to carry out operations considered too dangerous for manned aircraft," he added. UAVs have a wide range of uses and mission capabilities beyond military purposes. For example, they can be used for search-and-rescue operations, monitoring drug trafficking and detecting pollution, Ma said.

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10. Taiwanese doctor awarded for outstanding robotic surgeries

(Central News Agency, 20 08 2012)

A gynecologist at Taipei Medical University Hospital on received an international award for doctors performing robotic surgeries, becoming the first Asian doctor to receive the honor. Liu Wei-min, chief of the obstetrics and gynecology department at the hospital, received the da Vinci Distinguished Robotic Surgeon Award from Jeroen van Heesewijk, vice president of the Asia Pacific office of Intuitive Surgical Inc., designers and manufacturers of the da Vinci Robotic Surgical System in 2000. Besides being the first Asian recipient of the award, Liu is also only the third surgeon in the world to receive the honor, which recognizes surgeons for outstanding performances using the company's surgical system. The system is considered a revolutionary development in the field of robotic surgery. The Taiwanese gynecologist had completed 124 surgeries without complications since the hospital began using the system last December, according to the hospital. Patients undergoing robotic operations with the da Vinci system have smaller wounds and less bleeding, Liu said, adding it also takes them less time to recover.

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11. Institute finds possible cause for Lou Gehrig's disease

(Central News Agency, 22 08 2012)

Researchers at Academia Sinica, Taiwan's highest research institute, said that they have found a possible cause of a progressive, fatal and incurable motor neuron disease. The institute said that a cellular protein called TAR DNA binding protein 43 (TDP-43) is probably a cause of the development of amyotrophic lateral sclerosis (ALS), also known as Lou Gehrig's disease. James Shen, who led the research team, said a study on mice found that problems or irregularities in unidentified genes led to a loss of function of TDP-43, which could be one of the things that trigger ALS. ALS patients experience progressive muscle weakness, which eventually leads to loss of movement in voluntary muscles. The finding is significant because TDP-43 is associated with nearly 86 percent of ALS cases worldwide. Prior to this finding, however, scientists had been unable to identify how the protein might play a role in causing ALS, according to Wu Lien-szu, who participated in the research. Mutations in the gene that encodes the TDP-43 protein have also been identified in 4 percent of ALS patients with a family history of the disease, as well as in 1 percent of sporadic ALS cases, the institute said. Although the research team is still far from finding a cure for the disease, Shen said, the next step is to identify which genes have become abnormal to cause the loss of function of TDP-43, thus causing the motor neurons to stop working. According to the institute, the incidence of ALS is 1-2 per 100,000 people each year globally and its prevalence is 4-6 per 100,000 people. The study was published in the Journal of Biological Chemistry in June.

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12. Taiwan Synthetic Biologists Develop Genetic Engineering Method that Allows Yeast to Process Plant Mass into Ethanol

(MEPO Forum, 22 08 2012)

A research group led by Academician Wen-Hsiung Li, Distinguished Research Fellow and Director of the Biodiversity Research Center along with collaborators from National Chung Hsing University recently developed a simple one-step method for simultaneously introducing multiple genes into a yeast host. Such genome technology is promising for use in the economical production of ethanol from plant cellulose, as well as many other synthetic biology applications. The research was published in the journal Biotechnology for Biofuels on July 27, 2012. Much

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interest has been paid to the production of ethanol from plant cellulose because of the abundance of natural plant biomass and the promise of reduction of greenhouse gas emissions with the use of cellulosic ethanol rather than gasoline as a fuel. Among the current possibilities for development of methods for cellulosic ethanol production, bioprocessing is preferred because of its simplicity and potential low cost. The group of researchers hailing from Academia Sinica's Biodiversity Research Center, Genomics Researcher Center and Agricultural Biotechnology Research Center, and National Chung Hsing University recently invented a method by which multiple-genes can be introduced into a host organism genome in a single step. They tested the technique, which they named PGASO (Promoter-based Gene Assembly and Simultaneous Overexpression), on a yeast species called Kluyveromyces marxianus KY3 and found that the genetically modified yeast host was able to efficiently convert several celluoses into ethanol. As PGASO can in principle be applied to a range of hosts and is not limited to yeast, designer microbes engineered by via the PGASO technology may also have the potential to produce bio-fuel, expensive pharmaceuticals, rare natural compounds, and even biodegrade plastic. The researchers, who, in addition to Academician LI, also included Dr. Ming-Che Shih, Director of the Agricultural Biotechnology Research Center Academia Sinica, and Dr. Chieh-Chen Huang, Professor at National Chung Hsing University said that they named their method PGASO in the hope of capturing the spirit of the artist Picasso in their work, which transforms abstract bio-information into a creation. PGASO is superior to current technologies for genome engineering for four reasons; multiple genes can be transformed into a genome in one single step; specific upstream promoter sequences are employed for gene assembly in a pre-designed order without linker sequence; gene cassettes with individual promoters can be co-expressed with different expression levels; and PGASO is applicable to any host whose genome can be engineered via homologous recombination, said first author Dr. Jui-Jen Chang Related Website: http://www.biotechnologyforbiofuels.com/content/pdf/1754-6834-5-53.pdf

http://web1.nsc.gov.tw/techwp.aspx?id=1010816013&ctunit=208&ctnode=287&mp=7

13. Researchers Develop Transgenic Zebrafish Model of Bile Duct Cancer Induced by Hepatitis B/C Virus Proteins

(MEPO Forum, 22 08 2012)

Researchers at the Institute of Cellular and Organismic Biology (ICOB) working with collaborators from Chang Gung Memorial Hospital recently developed a transgenic zebrafish model suitable for studying fibrosis and intrahepatic cholangiocarcinoma (ICC) associated with hepatitis B (HBV) and C (HCV) infection. The research was reported online in the journal *Hepatology* on June 23. Intrahepatic cholangiocarcinoma (ICC) is the second most common liver cancer worldwide. It is an aggressive malignancy with poor prognosis. Liver cirrhosis, HBV and HCV infection are among the risk factors for the disease, but the mechanisms that mediate the initiation and development ICC and its association with HBV and HCV infection are largely unknown. Recently, a research team, led by Dr. Jen-Leih WU, Distinguished Research Fellow at ICOB developed a zebrafish model of ICC by dual expression of hepatitis B virus X and hepatitis C virus core protein in the liver. Animal models are routinely developed and used by scientists to gain a better understanding of human diseases and zebrafish make ideal models because their ability to produce pathological phenotypes comparable to those in humans. This is the first animal model developed to study the relationship between ICC, HCV and HBV, and it provided the first evidence that ICC can be induced by the co-expression of HBx and HCP. The biomarker networks of the model zebrafish ICC were found to be frequently involved in the development of the human cancer, and potential biomarker genes of zebrafish ICC were similar to those in the human bile duct cancer. Using the model, the researchers further revealed that the cytokine TGF-beta1 plays an important role in hepatitis B virus X and hepatitis C virus core protein-induced ICC development. Dr. WU said: "Hepatocytes are the major site of HBV and HCV replication. However, the mechanism by which hepatitis B and C virus induces ICC is still unknown. HBV and HCV are causative agents of liver fibrosis, which is a predominant feature of bile duct disorder in the liver. In this study, we found that conditional dual expression of HBx and HCP in zebrafish liver leads to fibrosis and ICC formation, which demonstrate the potential of this zebrafish model to study HBV and HCV induced fibrosis and bile duct cancer. We hope that the model can be used in the future to enable more detailed study of ICC initiation, progression and to develop new therapies." Related Website: http://onlinelibrary.wiley.com/doi/10.1002/hep.25914/abstract

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14. NCKU Research Team Discovers New Complex in Treating Cancer

(NCKU News, 22 08 2012)

A National Cheng Kung University (NCKU) research team has discovered Near-Infrared Light-Responsive oligonucleotide-gated Au nanoensembles (Au nanorod complex), a potent new anti-cancer complex that is seen as a promising targeted therapy for curing cancer. This medical discovery was selected as an important and urgent paper, becoming the image of back cover in the July 2012 issue of *Advanced Materials*, and has drawn big attention in the academic world and the biotechnology industry as well. The team, led by Chen-Sheng Yeh, NCKU

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Distinguished Professor of Department of Chemistry, focused on the development of NIR light-responsive oligonucleotide-gated Au nanoensembles (Au nanorod complex) for cancer therapy and the result proved that Au nanorod complex could provide better efficiency of cancer therapy by reducing the cancer survival rates by 30%. Au nanorod complex provides a new platform for cancer therapy, a platform which, depending on different diseases, encapsulates different drugs and small interfering RNA (siRNA) which has special functions to achieve chemotherapy and gene therapy, according to Professor Yeh. Professor Yeh pointed out that the surface of Au nanorod complex coated with silica can encapsulate anti-cancer drugs. To avoid the loss of anti-cancer drugs from Au nanorod complex during the delivery process and reduce side effects of anti-cancer drugs, the double-stranded DNA (dsDNA) as a net in covering the surface pores was used to conjugate on the surface pores of silica. When Au nanorod complex was irradiated with NIR light, Au nanorods absorbed NIR light and were transferred to heat. The generated heat transferred from Au nanorods to outside dsDNA induced dehybridization of the dsDNA as the net was destroyed by heat. After dehybridization of dsDNA, the encapsulated drugs were released from mesopores to outside and killed cancer cells. Experimental results show that cancer survival rate can be reduced from 80% to about 50%, confirming the gold nanorods pharmaceutical compound has achieved good therapeutic effect. The advantage of using NIR light to trigger drug release was that NIR was the biological window, where both blood and soft tissues transmission is optimal due to low energy absorption, providing maximum penetration. Therefore, the developed Au nanorod complex has triggered drug release, maximizing the therapeutic properties of both chemotherapy and gene therapy. Moreover, the design of the treatment which can be tailored by the medical needs to load the appropriate drug treatment is believed to be a very curative treatment platform, according to Yeh. Yeh's team has applied for patent in Taiwan and the United States, and will continue to conduct animal testing and human trials.

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15. NCKU Presents Advanced Commercially Viable Material for Electronic Packaging

(NCKU News, 23 08 2012)

A research team led by Kwang-lung Lin, Professor of Materials Science and Engineering at National Cheng Kung University (NCKU), southern Taiwan, has made a breakthrough in semiconductor packaging by developing the Sn-Zn-Ag-Al-Ga solder, a new revolutionary material which excels in terms of reliability and low cost. The promising properties of the new material have raised local industry's interest to trial run the manufacturing of solder ball from the patented alloy, said Lin, who said the investigation has been extended to semiconductor packaging and testing. The new alloy has been awarded patents in Taiwan, Japan, and the United States. The collaborative efforts have successfully produced solder balls of industrial specification with diameters of 0.76mm, 0.50mm, and 0.30mm, according to Lin. It is proved by performance testing conducted by ASE Inc., the world's largest provider of independent semiconductor manufacturing that the solder ball produced from the patented alloy performs better than the currently available Sn-Ag-Cu solder. Lin indicated that the cost of the material commonly used in the industry at present has risen dramatically because of soaring prices of metals, especially cooper (Cu). The newly developed material, which is weighted toward metals that are relatively cheaper, is about 15 percent less expensive than what is available on the market, Lin added. NCKU under the sponsorship from National Science Council (NSC) started the series of research on semiconductor packing material from 1995. After more than 7 years of research, LIN said he hopes to work with manufacturers to develop commercial applications of the new material soon.

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16. Taiwan makes breakthrough in stem cell imaging

(Central News Agency, 29 08 2012)

A National Tsing Hua University research team has made a breakthrough in bio-imaging technology that will enable researchers to study stem cells more closely and cheaply. The research team, headed by Yen Ta-jen, a professor of materials science and engineering at the university, has developed "metamaterials" that can be used for intracellular imaging without damaging or killing living cells, the university announced. It was the world's first successful attempt to use metamaterials -- artificial materials engineered to have properties that may not be found in nature -- in bio-imaging, the university said. "Intracellular" imaging involves looking inside a cell and its different structures and gathering information about them. But these different structures -- called organelles -- are colorless, making it hard to get images of their forms. As a result, intracellular imaging has been done up to now by dyeing cells to help the imaging equipment lock on a target, Yen said, but that time-consuming process had resulted in damaging or killing living cells. Equipment does exist that can get images while maintaining the cells' integrity, but the process is expensive, with the equipment costing millions of Taiwan dollars, and the resolution delivered by these instruments has been less than ideal, Yen said. To get better resolution, Yen and his students Lai Yueh-chun, Lee Hsin-cheng and Chen Cheng-kuang fabricated metamaterials out of regular metal and endowed them with the ability to act as high-performance microscopes in observing cells. What they ended up with can mirror every intracellular element of a stem cell, just as mirrors enable people to see themselves, Chen said. Lai said the team believes this new

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microscopic imaging technique can be developed into a much simpler optical configuration, with better penetration, for whole-cell imaging applications in the future. And it should be much less expensive than currently used approaches or instruments. Chen said the team used the lithography process widely used in the semiconductor industry to make their breakthrough metamaterials, a process that is not expensive in Taiwan. The study was published in the influential journal Advanced Materials on June 19, 2012.

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17. Local researchers discover key gene in coral reproduction

(Central News Agency, 29 08 2012)

Taiwanese researchers have successfully cloned a marker gene in coral that is likely to help artificially cultivate endangered coral species. The National Science Council unveiled the research findings Wednesday after they were published in the latest issue of PLoS ONE, an open scientific journal of the Public Library of Science. The team of National Taiwan Ocean University researchers overcame many difficulties before successfully identifying and cloning the marker gene Vasa, the university's president Chang Ching-fong said. The gene can help researchers observe the growth of coral reproductive cells, he said. Coral usually spawn during a short period in early summer and the eggs then float to surface, where they are fertilized, and they drift to an area suitable for growth, Chang explained. In the future, researchers will be able to boost the growth of coral reproductive cells and stimulate more prolific spawning by means such as injecting hormones into the cells, he said. The possibility of cultivating coral by artificial means is important since many coral reefs around the world have been disappearing due to human pollution, global warming, and poaching, Chang said. Up to 60 percent of the coral reefs on Earth are at risk and new knowledge and techniques are very much needed to better protect the species, which is vital to a healthy marine ecology, he said.

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