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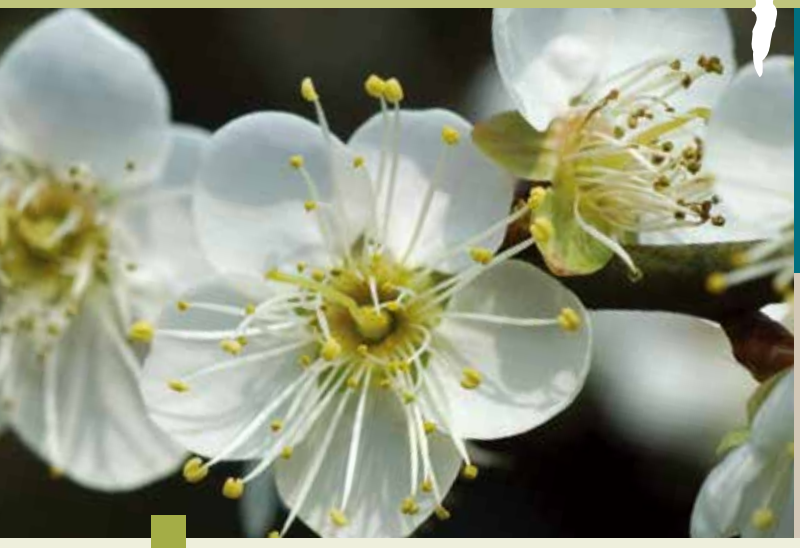


NATIONAL TSING HUA UNIVERSITY

CONTENTS

NOBEL LAUREATE TAKAAKI KAJITA VISITS NTHU

Dr. Takaaki Kajita of the Institute for Cosmic Ray Research (ICRR) at the University of Tokyo, and recipient of the Nobel Prize in Physics 2015, recently visited NTHU. Together with members of his research team, Dr. Kajita met with NTHU researchers to discuss academic cooperation and to probe into the mystery of gravitational waves, sometimes referred to as the "holy grail of astrophysics." During a workshop Dr. Kajita introduced the Kamioka Gravitational Wave Detector (KAGRA), a cryogenic gravitational wave telescope installed 200 meters underground in Japan. He emphasized that research into the nature of the cosmos belongs to all humanity, and encouraged researchers in various disciplines to take part in this significant endeavor.

Late last year the Royal Swedish Academy of Sciences announced that the 2015 Nobel Prize in Physics would be awarded to both Dr. Kajita and Canadian scholar Arthur B. McDonald, who has also observed evidence of neutrino oscillation and is recognized for pioneering achievements in particle physics.

In introducing Dr. Kajita's groundbreaking research, Prof. Albert Kong of NTHU's Institute of Astronomy explained that gravitational waves are a key element of Albert Einstein's general theory of relativity, and evidence of their existence can be seen as the final piece of the puzzle. A hundred years ago, Einstein understood gravity to be generated by distortions to time and space caused by objects having mass. When objects with a huge mass (such as black holes) vibrate intensively, adjacent space-time objects are transformed and move outwards, causing gravity waves. However, gravity waves are rather weak, and thus have never been directly observed.

In an effort to unlock the final mystery of relativity, researchers in Europe and the United States have been giving increased importance to gravitational wave astronomy. To directly observe gravitational waves, researchers at the University of Tokyo led by Dr. Kajita initiated

ⓐ Nobel Laureate Takaaki Kajita, Institute for Cosmic Ray Research of the University of Tokyo.

the KAGRA project, the construction of which has cost NT$4.2 billion. Recently the KAGRA team contacted NTHU's Institute of Astronomy to discuss the possibility of joining the project, and on December 23 the Japan-Taiwan Workshop on KAGRA was held at the National Center for Theoretical Sciences at NTHU.

Prof. Kong pointed out the importance of gravitational waves for contemporary astrophysics, as demonstrated by the conferral of the Nobel Prize in Physics to Dr. Kajita and Dr. McDonald. At present the world's top research teams are actively striving to become the first to directly observe gravitational waves.

Professor Shiuh Chao, Institute of Photonics Technologies of NTHU, is using his expertise in optical membranes to develop a way to use a high reflection mirror to reduce thermal noise disturbance in the equipment employed to observe gravitational waves. He says that so far we have been using electromagnetic waves with different wavelengths to observe space and gradually form our current knowledge of the structure of the universe. However, when the existence of gravitational waves is confirmed, this would open another window for observing space and expanding our exploration of the universe.

During the Workshop Dr. Kajita said that the universe is an intriguing subject to study, such that each new discovery leads to new research problems, and that is what has inspired him to continuously work in the basic sciences.

b Participants of the Japan-Taiwan Workshop on KAGRA.

EPOCH-MAKING DISCOVERY OF GRAVITATIONAL WAVES

a One of the mirrors at the heart of the LIGO interferometer (courtesy of LIGO)

On the 11th of last February the US-based Laser Interferometer Gravitational-Wave Observatory (LIGO) formally announced the recent detection of gravitational waves. This was the first time to directly detect gravitational waves—the Holy Grail of physics—and thus represents one of the most significant discoveries in physics over the past century. A research team led by Professor Chao Shiuh of NTHU's Institute of Photonics Technology has been participating in the LIGO project since 2010 and is the only team from Taiwan involved in the project.

On September 14, 2015, at 9:51 UTC, LIGO's observatories located in Louisiana and Washington both detected gravitational waves; the signals were confirmed by four months of rigorous checking of the data. The gravitational waves were caused by the merger of two black holes, one of which is estimated to have the mass of 29 suns and the other the mass of 36 suns. Based on the observed signals, LIGO scientists estimate that the event took place 1.3 billion years ago. About three 3 times the mass of the sun was converted into gravitational waves in a fraction of a second. By looking

at the time of arrival of the signals—the detector in Louisiana recorded the event 7 milliseconds before the detector in Washington—scientists can be certain that the source was located in the Southern Hemisphere.

In the press release Prof. Chao Shiuh said that according to Einstein's 1915 theory of general relativity the force of gravity has a distorting effect on space-time, and in 1916 he predicted that the rapid movement of a massive object results in these distortions being transmitted in the form of gravitational waves. But Einstein believed that such gravity waves could not be detected on Earth, due to the tremendous distance involved. However, in 1974 US scientists Russell Hulse and Joseph Taylor discovered a binary system composed of a pulsar in orbit around a neutron star. For the discovery of the pulsar and showing that it could be used to measure gravitational wave, Hulse and Taylor were awarded the Nobel Prize in Physics in 1993. LIGO's direct observation of gravitational waves fulfills Einstein's legacy on the 100th anniversary of his general theory

of relativity.

Prof. Chao points out that this observation of gravitational waves is of great significance for three reasons. First, it provides direct evidence for the existence of gravitational waves. Second, it involved the direct observation of the merger of two black holes. Third, it opens new era for gravitational waves astronomy, thereby expanding our understanding of the nature and evolution of the universe.

The team led by Prof. Chao included graduate students Pan Huang-wei, Guo Ling-Chi, Huang Shu-yu, and Cheng Jun, and is the only Taiwanese team in the LIGO Scientific Collaboration (LSC). The NTHU team mainly participated in the research on reducing thermal noise disturbance in the mirrors employed to observe gravitational waves. They are now working on developing the next generation of cryogenic mirrors.

Prof. Chao explains that mirrors are one of the key components of LIGO's observation apparatus, and that at the 100 Hz frequency band the level of noise disturbance must be less than 10^{-23} meter. His team made use of an ion beam sputter and mechanical loss test equipment to reduce the thermal noise of the mirrors. They also made use of the semiconductor manufacturing process equipments developed by the Taiwan's National Nano Device Laboratory, and their work has been endorsed by Taiwan's Ministry of Science and Technology.

The report of this discovery has been accepted for publication in the journal *Physical Review Letters*, which mentions the contributions of the NTHU research team and the Ministry of Science and Technology, thereby highlighting Taiwan's participation in this international collaborative research.

b The LIGO observatory in Louisiana (courtesy of LIGO)

NTHU RESEARCH TEAM DEVELOPING THE NEXT GENERATION CRYOGENIC MIRRORS

One of the key components of the apparatus recently used by the Interferometer Gravitational-Wave Observatory (LIGO) to verify the existence of gravitational waves was a high-sensitivity laser mirror, and NTHU's team led by Prof. Chao Shiuh, Institute of Photonics Technology, played a vital role in the team efforts of the LIGO Scientific Collaboration (LSC). The detection instrument, known as "Advanced LIGO," was operated at room temperature. Prof. Chao's team is now working on developing the next generation mirror coatings for the detection instruments, which will operate in temperatures of about minus 250 degrees Celsius. This will further reduce thermal noise, thereby making it possible to capture the "sound of the universe" more sensitively and accurately.

Students participating in the study indicated that they were pleased to have had the rare opportunity to work with thousands of scientists from 15 different countries, and to have played a role in the discovery of the "Holy Grail" of physics. Since optical technology aircraft and missile navigation systems require a very high level of technological precision, according to Prof. Chao, lots of research has been conducted on laser mirrors in relation to laser gyroscopes. In 2010 researchers at LIGO Scientific Collaboration read about his previous publications on coatings for the ring laser gyroscope and invited him to join the team.

Prof. Chao says that even though his research team is "just a small screw in the LIGO team," he was naturally excited and happy to be a part of such a historic discovery.

Mr. Pan Huang-wei, a Ph.D. student at NTHU's Institute of Photonics Technology, has been a member of Prof. Chao's research team for six years. A graduate of the Department Physics,

Pan Huang-wei, Prof. Chao Shiuh, and Guo Ling-chi of the Institute of Photonics Technology (left to right).

Pan Huang-wei and Guo Ling-chi of the Institute of Photonics Technology at the press conference.

he joined Prof. Chao's research team to gain some practical experience. He says that for a long time gravitational waves were merely theoretical, something that would take a very long time to actually observe. Thus his family had difficulty understanding how joining such a research team could be of any practical benefit to his career. Last year, when he heard the news that LIGO had actually succeeded in detecting gravitational waves, he was beside himself with excitement; both he and his family are finally convinced that his six years of hard work was not in vain.

Last year Mr. Pan went to the US to attend a LIGO seminar, where he gained a lot of insight into how the directors of the program integrate the various areas of research and guide the huge multinational research team in the right direction. He says, "to understand what all those experts in various fields are doing is quite challenging. Just think of the difficulty of actually coordinating the work of thousands of physicists, astronomers, materials and mechanical engineers, and computer experts!"

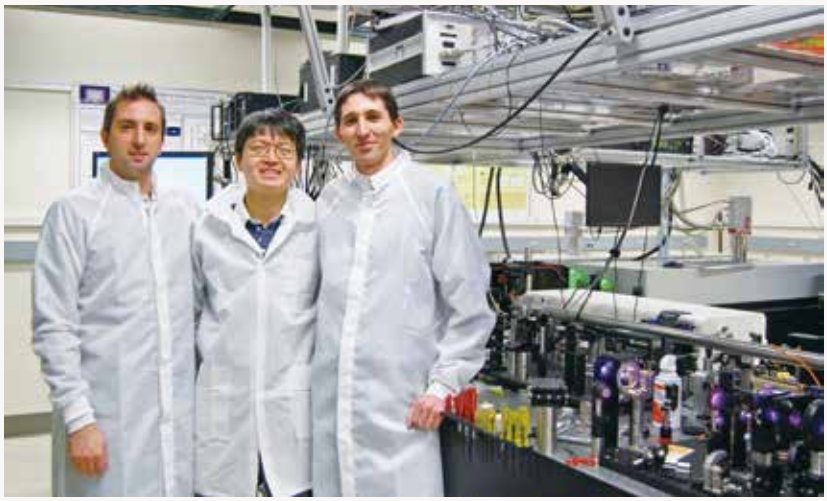
Mr. Guo Ling-chi, also a Ph.D. student at NTHU's Institute of Photonics Technology, joined Prof. Chao's research team three years ago. He says that he was especially impressed by the intensive and fruitful exchanges they had with the research teams in Italy and Australia. Guo also indicates that through his participation in this international research team he has learned a lot about how to apply a rigorous research to solving problems.

MAJOR BREAKTHROUGH IN X-RAY RESEARCH

An international research project including a research team led by Prof. Chen Ming-chang of NTHU's Institute of Photonics Technology has made a breakthrough in the production of a high-brightness, tabletop X-ray device. By using the extremely short wavelengths of a laser, they have succeeded in dramatically increase the conversion efficiency of high order harmonic generation (HHG), coherent X-ray, by more than a thousand times. With a brightness of 13.5 nm, the new light source is expected to play an important role in nano bio-imaging and defect inspections in the semiconductor industry. The results have been published in the December edition of *Science* (*Science*, 350, 1225 (2015)).

According to Prof. Chen, since the 20th century X-rays have been one of the most important light sources in scientific and technological research, and have been widely used in both basic and applied scientific research in areas such as materials, electronics, biology, medicine, physics, chemistry, chemical engineering, geology, archeology, energy, environmental protection, and micro-mechanics.

The common goal of all types of lasers—the large synchrotron radiation center, the free-electron laser, right down to the table-top X-ray light sources—has been the production of a high-brightness, ultrafast, coherent X-ray for use in the development of an ultra-high, ultra-precise, spatially-resolved, time-resolved detector. Since the femtosecond-to-attosecond X-ray pulse enables the dynamics of chemical reactions, nano-materials and bio-molecular systems to be studied with unprecedented temporal and spatial resolution. However, up to now, the brightness



Prof. Chen Ming-chang (center) with his research associates at the University of Colorado at Boulder, Dr. Tenio Popmintchev (right) and Dr. Dimitar Popmintchev (left).

of HHG light source still limits its applications. Research over the past three decades has been limited by the low brightness of the X-ray, so this recent breakthrough is expected to be widely utilized in applied science and industry, such as ultrafast, nano-microscopy applications.

How do electrons move in the nanometer film? How is energy transmitted in the nanometer transistor? How is photosynthesis energy effectively stored? These are some of the research questions on which ultrafast, coherent X-rays play a critical role. This is because X-rays can pass through the structure of cells, facilitating study of how they operate, e.g. four-dimensional X-ray microscope.

The first harmonic HHG, coherent X-ray, was discovered in 1987, but since its conversion efficiency was relatively low, its practical applicability was also limited. Scientists have been trying to find a way to increase the conversion efficiency of the coherent X-ray for three decades.

In addition to Chen's research team, the project included researchers from the University of Colorado at Boulder; the University of Salamanca, Spain; Cornell University; Temple University; and the Lawrence Livermore National Laboratory in California.

Typically, scientists used mid-IR lasers for HHG, the up-conversion efficiency is about 10^{-6}–10^{-9}. The present research used an ultraviolet (270 nm) laser light source to generate HHG, and found a maximum conversion efficiency of 10^{-3}, thereby greatly enhancing the coherent X-ray flux, leading to more research applications of X-rays.

Currently, Prof. Chen's research team is focusing its resources on laser development, student training and research on new ultrafast nano-microscopy technology. His future plans include developing research projects to enhance Taiwan's international visibility in ultrafast lasers and table-top coherent X-ray technology. He also hopes to make Taiwan a world leader in research and development in photonics technology.

Prof. Chen Ming-chang

PROFESSOR HUANG JER-SHING WON THE GOLD-JADE FELLOWSHIP

Prof. Huang Jer-Shing of the Department of Chemistry has been awarded the 10th Gold-Jade Fellowship. This prestigious award was established by the Kenda Foundation to recognize the accomplishments of outstanding young scholars in mathematics, physics, and chemistry. Applicants must be under 40 years of age and have to submit a four-year research plan and samples of research publications.

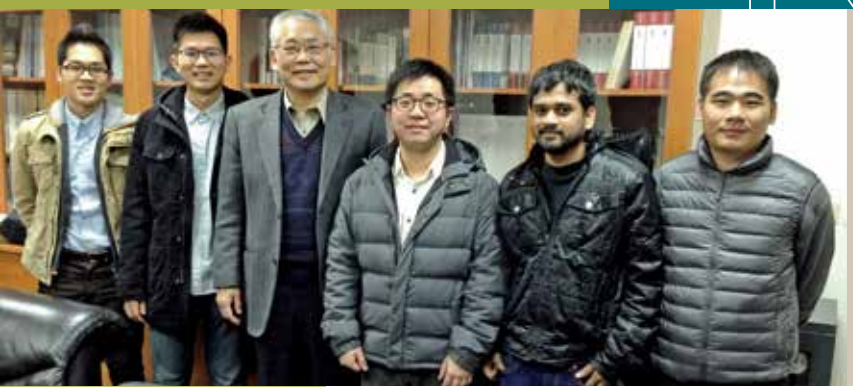
Many talented researchers are tempted to leave Taiwan to accept high-salary positions overseas. Kenda Foundation established the Gold-Jade Fellowship to help stem this ongoing "brain drain" in a hope to increase Taiwan's international competitiveness.

Dr. Huang joined NTHU in 2010, and received the New Faculty Research Award in 2014. After completing his Ph.D. in Chemistry at National Taiwan University he pursued postdoctoral research at Academia Sinica and the University of Wuerzburg, Germany. He specializes in spectral analysis, laser microscopy, and nano-optics.

Dr. Huang's research team focuses on the use of nanostructures to control sub-wavelength optical field and nanoscale light-matter interaction. His research interests include optical nanocircuits, plasmonic optical trapping, and chiral light-matter interaction. Dr. Huang's research not only gains important insight into nanoscale light-matter interaction but also contributes to the development of photovoltaic technology.

At the award ceremony Dr. Huang thanked the Kenda Foundation for its recognition. He also thanked the Department of Chemistry and his competent and conscientious students. He stated that he would like to see more foundations follow in the footsteps of Kenda by providing support to further promote fundamental research in Taiwan.

Prof. Huang Jer-Shing of the Department of Chemistry



Professor Tai Nyan-hwa (third from left) with his research team, including first author of the magic sponge project, Dr. Nguyen Duc Dung (right).

NTHU RESEARCH TEAM WAS SELECTED BY *GOOGLE SOLVE FOR X(SFX)*

The *Solve for X (SFX)* think tank has recently inducted the "magic sponge" designed by a NTHU research team headed by Professor Tai Nyan-hwa of the Department of Materials Science and Engineering. Launched by Google in 2012, *SFX* serves as a platform to promote innovative technologies which have potential to solve major problems facing the world. The magic sponge is the first " moonshot" technology developed in Taiwan to be uploaded by the project. Consisting of commercial sponge evenly coated with graphene, this magic sponge absorbs oil but not water and is designed to clean up oil spills on the open seas. When the sponge contacts an oil-water mixture, the hydrophobic and lipophilic properties of graphene coupled with the capillary structure of the sponge base, results in the oil being instantly sucked into the sponge, but not the water. The magic sponge is reusable and can absorb oil amounting to more than 90 times its own weight, and can absorb chloroform amounting to more than 160 times its own weight.

Moreover, the magic sponge is not expensive. According to Professor Tai Nyan-Hua's estimation, using his current laboratory equipment to produce the magic sponge, the cost would be between NT$20 and NT$30 for each sponge measuring 30 x 10 x 1 cm, but could be mass produced for even less. Thus the magic sponge is expected to become a highly efficient, low-cost way to clean up oil spills and similar types of marine pollution.

The first author of the magic sponge project, a Vietnamese postdoctoral researcher Dr. Nguyen Duc Dung, says that he initially proposed this idea while he was a doctoral student, and feels honored that it has been picked up by SFX. Prof. Tai points out that the technology itself is quite simple, so the main challenge is to develop it into a viable product for solving one the world's most serious environmental problems.

The Industrial Economics and Knowledge Center (IEK) of Taiwan's Industrial Technology Research Institute (ITRI) promotes cooperation between industry, government, academia, and researchers, and severs as *SFX's* local partner. According to IEK, Taiwan currently has two innovative proposals uploaded by *SFX*, demonstrating the nation's world-class abilities in research and development.

The mission of *SFX* is to promote and launch innovative yet simple solutions to pressing issues facing the entire planet. Projects currently being developed by *SFX* include Google Glass and the Self-Driving Car.

New proposals are evaluated according to three criteria: they address a serious and important problem, the solution of which will affect millions, even billions of people's lives; they propose a radical solution to the problem; and they apply existing breakthrough technology and thus have high potential for providing an effective and timely solution.

REWRITING TAIWAN'S PREHISTORY

A research project led by Prof. Chiu Hung-lin of the Institute of Anthropology has recently concluded that the Tso-chen Man was not the earliest human inhabitant of Taiwan; overturning a long-held belief and attracting considerable media attention.

According to Dr. Chiu, pretty much everyone in Taiwan has long believed that Tso-chen Man was the earliest inhabitant in Taiwan, as many text books used in junior and senior high schools so stated. For archeologists, however, such statement has long remained dubious.

The fossils of the Tso-chen Man were discovered in the 1970s by an amateur fossil collector gathering artifacts in the Cailiao River Basin near Tso-Chen Dist., Tainan County. Since no accompanying artifacts were found at the site, it was not possible to carry out additional follow-up archeological research on this discovery that would have had helped to determine the age of the fossils more reliably.

Prof. Chiu Hung-lin (right) examining one of the skull fossils of Tso-chen Man with Prof. Shao Ching-wang of the National Tainan University of the Arts.

Fluoro-manganese testing conducted by Japanese paleontologists in 1973 and 1974 estimated that the fossils were between 20,000 and 30,000 years old. Since the fossils predated the Changbin Culture, and because it was the first major archeological discovery in Taiwan since Prof. Song Wen-xun's 1968 discovery of a Paleolithic site, the dating garnered a great deal of attention. Nevertheless, both geologists and archeologists have questioned the accuracy of fluorine-manganese test.

In recent years additional discoveries of bones of early humans in Taiwan, Southeast Asia, and Okinawa, Japan have convinced researchers of the need to re-exam the Tso-chen Man.

Dr. Chiu points out that in recent years Japanese researchers have been conducting extensive research on the chronology of the Paleolithic Age, resulting in many challenges and revisions of previous dating of human bones and the archeological sites where they were found. This has brought about extensive revisions in the prehistory of Japan. Moreover, today's radiocarbon dating technology is far advanced in comparison to the techniques used to test the fossils of Tso-chen Man back in the 1970s.

As a result of these developments the National Taiwan Museum (NTM) commissioned Chiu to lead a comprehensive re-evaluation of the fossils of Tso-chen Man, including 3D simulation and anatomical reconstruction of the skull fossils. Following over a year of rigorous preliminary investigations, in July 2015, with the permission and support of the NTM, Dr. Chiu used accelerator mass spectrometry (AMS) on carbon-14 to conduct bone collagen dating—presently the most reliable and accurate method for dating artifacts up to 50,000 years old. The results were surprising, but confirmed the research teams doubts on the original estimates.

The results indicate that most of the Tso-chen skull fragments are only about 3,000 years old, and that one of them is only about 250 years old. A detailed report on the results was presented in September, and in December the research team reconfirmed the dating by conducting cross-validation of the results. Since the 1970s it has been widely believed that the first humans came to Taiwan by crossing a land bridge which once connected the island to the mainland, but this re-dating of the Tso-chen Man supports the theory that they originated in Southeast Asia. Thus the findings have a major impact on our knowledge of the prehistory of Taiwan.

To their credit, the early researchers of Tso-chen Man utilized the most advanced dating technology available at the time, and their findings stimulated considerable interest in prehistorical Taiwan. According to Dr. Chiu, while his findings might come as a major surprise to many, they don't preclude the future discovery of fossil evidence aged more than 10,000 years in Taiwan.

Dr. Chiu also points out that even though no human remains have been found amongst them, the Paleolithic artefacts discovered in Taitung County's Baxian Cave provide irrefutable evidence that humans have inhabited Taiwan for at least 30,000 years.

Moreover, the re-dating of the Tso-chen Man in no way reduces the geological and paleontological significance of the fauna fossils also found there. He also believes that Taiwan has quite a few sites which hold much potential for further discoveries of fossils and artefacts. These include areas in the south of the island with large concentrations of limestone, especially those around Sheding and Eluanbi on the Hengchun Peninsula.

Skull fossil of Tso-chen Man recently determined to be around 3,000 years old.

LARGAN PRECISION VISITS NTHU

Several representatives of Largan Precision, including CEO Scott Lin, came to NTHU on November 27 to meet with President Hocheng and to learn more about research being conducted at NTHU in such areas as precision coating technology, polymer micro-structure analysis, automatic control, metamaterial application, and high image processing technology.

After extending a hearty welcome on behalf of NTHU, President Hocheng recounted the school's history and major achievements. Hocheng pointed out that while NTHU may not be the largest in size, it is amongst the best in terms of instruction and research, as indicated in the Shanghai Jiaotong University's survey on the Top 100 Universities in Greater China.

Mr. Lin mentioned that "human resources are amongst a company's most important assets, and a large portion of our personnel are NTHU's graduates." This is why he wanted to visit NTHU to find out more about the school and to explore the possibilities for future cooperation in research and development and joint training projects.

President Hocheng further indicated that in addition to academic performance, NTHU also attaches great importance to the development of industrial technology. This is clearly demonstrated by the number of US patents granted to our faculty members and researchers; NTHU ranked at the 11th worldwide in terms of the number of U.S. patents granted to academic institutions.

Pan Ci-ling, Vice President of Research and Development of NTHU, mentioned that in the 2015 rankings formulated by Quacquarelli Symonds (QS) of Britain, NTHU ranked high in sixteen different areas, especially in the medical and legal fields, even though we don't have a college of medicine or a college of law.

Mr. Scott Lin, CEO of Largan Precision (right) with President Hong Hocheng.

As one of Taiwan's flagship enterprises, Largan has invested heavily in technological research and innovation. Since this is also one of NTHU's strengths, Largan is eager to learn more about the research being conducted at NTHU, especially at the Department of Chemical Engineering, the Department of Power Mechanical Engineering, the Department of Materials Science, and the Department of Computer Science.

ⓐ Huang Pien-chien, professor of John Hopkins University (USA) and the founding dean of NTHU's College of Life Sciences.

THE DEVELOPMENT OF LIFE SCIENCE IN TAIWAN

On December 11, 2015, Huang Pien-chien, the founding dean of the College of Life Science and his wife Huang Chow Ru-chih, both Academicians of Academia Sinica, attended a book signing held at the College of Life Sciences for their recently published memoirs *Heritage and Creativity—Reflections of Two Academicians*. During the event they shared some highlights of their academic work over the years.

Deputy-minister of the Ministry of Science and Technology Jason Lin and former NTHU President Chen Lih-juann were on hand to offer their congratulations. With many past and present members of the NTHU community in attendance, the event had the air of a family reunion.

Professor Tzeng Chyng-shyan of the Institute of Bioinformatics and Structural Biology said that the book recounts Huang's early life, his return to Taiwan, and how he helped to establish NTHU's College of Life Science—the first of its kind in Taiwan. Up to that time life science research in Taiwan was mainly focused on biology. However, by integrating mathematics, physics, and chemistry Huang succeeded in changing the dominant paradigm and established a new research tradition which was quickly picked up by other universities in Taiwan and East Asia.

In Taiwan research in the life sciences (biomedicine, molecular biology, biotechnology, etc.) can be traced back to 1964 when Academia Sinica, National Taiwan University, and NTHU began to

ⓑ (Front row, left to right): Professor Wang Wen-ching of the Institute of Molecular and Cellular Biology; Professor J. L. Yang, assistant dean of the College of Life Sciences; Jason Lin, deputy-minister of the Ministry of Science and Technology; Chen Lih-juann, former NTHU president; Huang Pien-chien; Huang-chow Ru-chih; Wang Zhenbang, author of Heritage and Creativity; wife of Kung Hsing-jien; and Kung Hsing-jien, president of the National Health Research Institute.

jointly invite overseas scholars to participate in summer seminars. Afterwards, with support from the National Science Council, National Taiwan University and NTHU jointly organized a "Seminar on the Latest Developments in Genetic Engineering," inviting distinguished overseas scholars to present their research findings. Then in 1987, about ten researchers in various fields of life sciences held a symposium to discuss how to further promote life sciences in Taiwan.

Professor Tzeng said that as early as 1964, Li Kwoh-ting, Vice Chairman of the Council for International Economic Cooperation and Development, in his capacity as a member of the Sino-American Scientific Cooperation Committee, conducted a survey of bio-related scientific research in Taiwan, including manpower, equipment, and areas of research. The survey was conducted in preparation to set up a scientific research center, thus prompting Huang and Huang-chow to return to Taiwan to learn more about the research environment of the time. In 1983 Li visited the United States to encourage eminent Taiwanese scientists to return to Taiwan and participate in the establishment of the Institute of Molecular Biology at Academia Sinica. Huang-chow was appointed as the director of the preparatory office and her husband served as distinguished fellow in administrative affairs and academic development.

In 1992 Liu Chao-shiuan, the president of NTHU at the time, invited Huang to return to Taiwan and serve as the founding dean of the College life Sciences. Afterwards the department of biological science at other universities in Taiwan also began to apply related research in mathematics, physics, and chemistry to explore the mysteries of biological diversity and the biological mechanisms of genetic regulation.

Professor Tzeng also noted that twenty years ago some people grumbled about the fact that all the departments of biology around Taiwan changed their name following the lead of NTHU. Actually, Huang and Huang-chow fully recognize the great importance of the traditional approach; their aim was simply to incorporate the research methods of mathematics, physics, and chemistry into the exploration of knotty problems in their field. This pioneering approach has resulted in a number of important discoveries over the last two decades, and has also exerted a noticeable influence in neighboring countries.

The life story of Academicians Huang and Huang-chou demonstrates the importance of dedication and diligences in the pursuit of scientific research. Their new book is an invaluable source of information on the development of the life sciences at NTHU and Taiwan.

VISION AND PREPARATION: CHOU TE-YU'S SURE-FIRE FORMULA FOR SUCCESS

Dr. Chou Te-yu, a well-known economist and the new Chairman of Taipei 101, graduated from NTHU's Department of Physics in 1989. For him the journey from physics to economics involved considerable introspection and repositioning. He sees his appointment as Chairman of Taipei 101 as an affirmation of his diverse abilities and an ideal opportunity to put his diverse knowledge into practice.

Although Chou always excelled in his studies, he was never quite sure as to what he should specialize in. As a result, during his sophomore year of high school, when it was time to select a concentration, even though he had a latent affinity with the humanities and social sciences; he went along with the crowd and chose science and engineering. He did well on the university entrance exam and was eligible for admission to the top engineering programs in Taiwan. However, unsure of his aptitude for drafting circuitry design, and not satisfied with his abilities in math and chemistry, he finally decided to major in physics at NTHU.

"During my time in the Department of Physics I was constantly on the defensive," recalls Chou. Lots of his classmates had a passion for physics, several of whom were so good at it that they even skipped a year. "Each of my classmates idolized a particular physicist, while I had never even heard of these people," jokes Chou. He also remembers how enamored his teachers were by the beauty of physics. Nonetheless, he worked hard and managed to get good grades; but he was not sure where his true passion really lay.

Eager to explore various possibilities, Chou took an elective course offered by the Department of Economics, as well as a general education course titled "Contemporary Society," in which the young instructor was actually daring enough to discuss the 228 Incident, previously a taboo subject in Taiwan. While discussing his predicament with various teachers he discovered that he was a "people person" at heart. Thus he volunteered to be the student leader of his department and organized quite a few colorful events. In recognition of his excellent grades and outstanding contributions to campus activities, Chou was awarded the Mei Yih-chi Memorial Scholarship—the highest academic honor of

NTHU alumnus Chou Te-yu.

NTHU.

With the encouragement of Professor Chang Bao-taa, who sparked Chou's interest in economics, he set his sights on earning a Ph.D. abroad and then returning to Taiwan to find a teaching position.

Chou says that the most valuable thing he learned at NTHU was never limit yourself; instead, you should envision your future and then continually make an effort to move in that direction. Although initially he was rather perplexed about his future direction, he found that his teachers at NTHU were quite happy to provide guidance and suggestions. This solicitude and attentiveness to the needs of students is something Chou has striven to integrate into his own teaching career.

Chou eventually earned a Ph.D. in economics from the Virginia Polytechnic Institute and State University. His areas of specialization are patents and intellectual property rights, as well as the use of public resources to solve problems of income disparity.

In recognition of his outstanding professional knowledge, superb foreign language ability, and excellent interpersonal skills, he was appointed general manager of Taipei 101 in March 2015, and in December of the same year he was promoted to the position of Chairman.

In Chou's view, the NTHU spirit means transcending limitations, in whatever form they may manifest, by continually striving to learn. He also points out the importance of foreign language for expanding one's vision, emphasizing that such ability in no way contradicts patriotism, but rather complements it. In this connection, he points out that while lots of young people today are keen on improving Taiwanese society, many don't realize that you have to have a good understanding of the global community before you can make a positive contribution to Taiwan.

NTHU Delegates in Model United Nations.

NTHU DELEGATES AT THE MODEL UNITED NATIONS

The Model United Nations Delegation of National Tsing Hua University was established five years ago. This year the Delegation was invited to compete at McMUN hosted by McGill University in Canada. Out of the two thousand participating students, NTHU delegates won both Honorable Mention and Scholarships. Delegates believe that this competition helps them improve their English, lean the skill of interacting with fellow delegate, and starts a self-learning journey.

Many universities around the world host the United Nations Conference.. Annually more than 120 European and American universities send their teams to attend McMUN, including those noted for having an outstanding law school such as: Georgetown, University of Toronto, and Harvard University. Based on their performance at the conference, delegates are selected for a limited "Best Delegate Award" and "Honorable Mention."

NTHU delegation was led by Head Delegate Eva Lin (Lin, Yueh-chen) a junior from the Department of Economics and included two other juniors Katrine Wang (Wang, Yen-ting) from the Department of Economics and Sabrina Wei (Wei, Yi-rong), Department of Power Mechanical Engineering.

Eva Lin participated in the "Special Committee" which took place back in 1820; as a historical character participating in the early formation of the Government of Colombia (La Gran Colombia). Her character was a well-known expert in economy, law, and politics. Eva expressed that although she has a strong background in economics, "it is not easy to draft a taxation system from zero not to mention the absence of receipts, electronic tax invoices, and legal code. That was a real challenge!"

Eva Lin emphasized that Model United Nations is not only a test of your English ability but also a test of your research skills, and more importantly, the logical and critical thinking to complex problems. Her excellent performance got her the only "Honorable Mention" of the committee.

Sabrina Wei and Katrine Wang attended the well-known, three hundred people "United Nations General Assembly", representing Luxembourg. Sabrina said one needs to use good communication and social skills in order to survive in this type of committee. Persuading different blocks to join your side was no easy task; she said that people tend to vote for the best speakers rather than the best ideas proposed.

In order to raise the travel fund to Canada, the 3 students worked very hard to make the trip possible. Katrine Wang not only tutored English but even taught dancing. Eva Lin took part time jobs. They stayed with their friends in Canada and bought early booking tickets to save money. Their experience demonstrated that students could also go abroad and attend international conferences so long as they have the determination to overcome obstacles.

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