



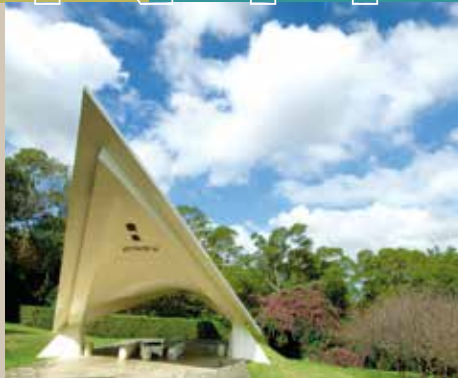
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CONTENTS

- 1 NTHU Researchers at the Vanguard of Clean Energy
- 2 Nobel Laureate Eric Betzig Visited NTHU
- 3 AIT Chairman Moriarty Urges Students to Take Pride in Taiwan
- 4 The Spring of Art Education at NTHU
- 5 NTHU Team Wins iGEM Gold Medal
- 6 Chang Shi-kuo to Teach Science Fiction at NTHU
- 7 Anfu Financial Engineering Research Center to be Established at NTHU
- 8 Baseball Set To Go High-tech at NTHU
- 9 NTHU Establishes Student Exchange Program with NTUA



NTHU RESEARCHERS AT THE VANGUARD OF CLEAN ENERGY

Using water to generate pollution-free hydrogen energy has long been the dream of energy researchers. With this goal in mind, a research team led by Professor Yen Ta-Jen of the Department of Materials Science and Engineering, has recently found a way to increase the efficiency of water splitting by using a plasmonic nano-antenna incorporated with bilayer molybdenum disulfide (MoS₂), thereby boosting the efficiency of hydrogen production by nearly 30 times. Their findings have recently been published in the top journal *Advanced Energy Materials* and was also highlighted as an inside cover.

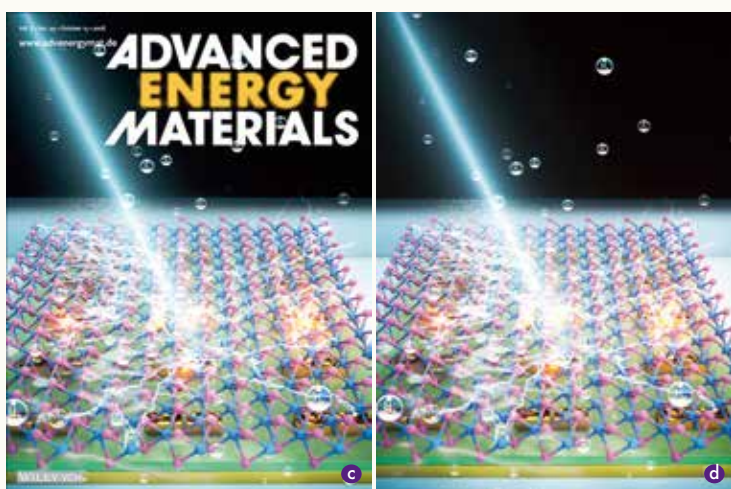
Hydrogen is a clean energy. In the past, it was mainly obtained by electrolyzing water, which is costly. Recently, photoreaction has gradually become the preferred way to split water, but such method is hampered by its low efficiency. Thus researchers worldwide have been searching for a low-cost and high-efficiency catalyst for splitting water.

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- a Sriram said that the academic atmosphere at NTHU is very conducive to her research and that she enjoys living in Taiwan.
 - b Yen (center) with his doctoral students Pavithra Sriram (left) and Jiang Ruihan (right).
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More recently, a team of Yen's doctoral students has successfully discovered an efficient way to split water for hydrogen evolution reaction and completed a paper entitled "A Plasmonic Nano-antenna with Double-layer Molybdenum Disulfide for High-efficiency Hydrogen Splitting."

Increasing efficiency by eating spinach

Yen explained that when the nano-antenna captures light, it generates a plasmonic oscillation. Plasmons are the collective oscillating behavior of free electrons on a metal-dielectric surface. When the distance between the two metals is on the nanometer scale, the collective oscillation of the electrons strengthens the electrical field, which facilitates the capturing of more light and produce an efficient hydrogen-splitting reaction. "It is like when Popeye the sailor eats spinach!", explained Yen. Once the plasmonic nano-antenna and the double-layer molybdenum disulfide are combined, there is an amazing effect. Yen explained that there are two key points to improving the efficiency of hydrogen splitting. The first is that once the layout of the nano-antenna has been optimized, this optimized nano-antenna can produce a super-strong plasmon with a quadruple resonance. Second, the large surface-area of molybdenum disulfide makes this method more commercially viable. This research has major implications for the green energy industry.



The magic of Taiwan

Team member Pavithra Sriram said that the academic atmosphere at NTHU is very conducive to her research; in addition, she also enjoys the living environment in Taiwan. Although she also gained admission to top graduate programs in the United States and South Korea, on the advice of one of her classmates, she chose to enroll at NTHU. With her suggestion, now Sriram's younger sister is studying for a master's degree at NTHU's Department of Economics, and she hopes to work in Taiwan after graduation.

Sriram said that her parents have always told her that no matter where she goes, it's safer to go with a companion. But she has found that in Taiwan it's safe to go by herself pretty much anywhere, and if she gets sick, she can always count on receiving help from her classmates and teachers. Sriram also said that Taiwan has a sort of magic that makes her feel safe and peaceful. She also mentioned that she knows lots of other students who studied in Taiwan; after graduation they went to work in Europe or the United States, but always ended up missing Taiwan.

- c A research team led by Prof. Yen Ta-Jen of the Department of Materials Science and Engineering has recently had its work published in *Advanced Energy Materials*.
- d Yen's research team has found a way to increase the efficiency of water splitting by using a plasmonic nano-antenna.

In love with research

Jiang Ruihan, another doctoral student in Yen's team, recently completed a paper on optical probes, which has appeared in the top US journal *Nano Letters*. Jiang has developed a method for enhancing both the optical and topological resolutions of nano-detection technology by up to 10 nm, which can be applied to such areas as material analysis, disease detection, and the observation of human gene sequences. Patents for this technology have been applied for in China, America, and Europe, and commercial applications are expected in the near future.

Jiang loves research. In 2016, she won third place in the Materials Innovation Contest of the Materials Research Society. She said that her research was completed in cooperation with Academia Sinica and the Industrial Technology Research Institute, and that she plans to remain in research after graduation.



NOBEL LAUREATE ERIC BETZIG VISITED NTHU

On October 19 Eric Betzig gave the 2018 Nobel Laureate Lecture at NTHU. In his talk he encouraged students to study and work hard, engage in constructive self-criticism, and develop good character. Dr. Betzig, who won the 2014 Nobel Prize in Chemistry, said that during various phases of his career he received a great deal of help from his colleagues and friends, as a result he has learned the importance of treating others fairly and respectfully, since you never know when you will need to ask someone for help. When answering questions from high school students, he said that if you want to become a good scientist, be sure to acquire strong abilities in reading and writing, and also learn how to accurately express your ideas.

Dr. Betzig's lecture was titled "Imaging Biological Structure and Dynamics from Molecules to Organisms." In addition to more than 300 Tsinghua faculty and students, the lecture was also attended by high school students from all over northern Taiwan. After his talk, Dr. Betzig graciously responded to students' questions and also took selfies with them.

- a** NTHU students chatting with Dr. Betzig after his lecture.
- b** NTHU vice president and chief of staff Lyu Ping-chiang presenting Dr. Betzig with a commemorative plaque.
- c** Chiang Ann-shyn, dean of the College of Life Science, presenting Dr. Betzig with a map of the neural pathways of a fruit fly inside a crystal.

Opening a window onto the nano-scale world

NTHU vice president and chief of staff Lyu Ping-chiang said in his introduction that Dr. Betzig won the Nobel Prize by overcoming the diffraction limitations of optical microscopes—a problem that remained unsolved for more than 100 years. He invented the "super-resolved fluorescence microscopy," which uses lasers to make the fluorescent molecules in the target material to emit light at different times, then demarcating and recording the exact position of the molecules in space, and finally combining them into a single image. This new technology makes it possible to observe nano-scale objects.

The invention of super-resolved fluorescence microscopy has led to a number of major breakthroughs in the biological sciences. In the past, scientists could only see the surface of cells, but now they can see the pores in the nuclear membrane and the activity inside the cell. In the field of neuroscience, this new technology can be used to observe the synaptic gap between two nerve cells, which will facilitate the development of new treatments for such neuro-degenerative disorders as Parkinson disease, Alzheimer and Huntington disease.

Prof. Chiang Ann-shyn, dean of the College of Life Science and director of the Brain Research Center, gave a talk at the 2016 International Microscopy Congress along with Dr. Betzig. After the congress, Dr. Betzig said that super-resolved fluorescence microscopy and the biological tissue transparency technology developed by Chiang are the two most important developments in



On October 19 Eric Betzig gave the 2018 Nobel Laureate Lecture at NTHU..

biological research, and urged Chiang to do joint research with his former student Dr. Chen Bi-chang, an assistant research fellow at Academia Sinica. As a result, the Brain Research Center started to use a combination of super-resolved fluorescence microscopy and biological tissue transparency technology to record the position of the brain proteins that control memory formation.

Opening new areas of research

Dr. Chen Bi-chang said that Dr. Betzig is a rather unusual scientist, in that he doesn't teach at a university, and that the Nobel Prize was practically the first prize he ever won. He also said that a motion picture company is planning to make Betzig's amazing story of fortitude and eccentricity into a film.

A gifted and original thinker, while pursuing a Ph.D. in engineering physics at Cornell University, Dr. Betzig published an important paper on near-field optics in the journal *Science*. After obtaining his Ph.D. in 1988, he began working at Bell Labs. When the lab was closed in 1996, having grown tired of the academic environment, he began working for his father's company, Ann Arbor Machine Company, but his enthusiasm to do research remained undiminished. Ten years later, together with his old friend Harald Hess, working in his living room with a budget of little more than US\$20,000, he developed an imaging method called "photo-activated localization microscopy" (PALM), which laid the foundation for winning the Prize.

Dr. Betzig also gave a memorable synopsis of his colorful career. While working at his father's company, he spent four years developing a high speed motion control technology based on an electrohydraulic hybrid drive with adaptive control algorithms. He then spent three years marketing it, but in the end sold only two sets, precipitating a midlife crisis, during which he spent a few years as a house husband. Eventually, his enthusiasm for research

led him back into academia, and the rest is history.

For a number of years the College of Life Science and the Brain Research Center have been using advanced optical microscopy to decipher the functions and neural structures of the brain, including groundbreaking research on the neural pathways of the fruit fly. In addition to presenting his own research, during his visit Dr. Betzig also took the opportunity to meet with NTHU faculty to discuss their research projects.

After the talk, high school student Hsiao Ching-jih said that he appreciated how Dr. Betzig was able to make complex subjects easily understood by ordinary high school students, and that his talk was very helpful for students interested in pursuing careers in academia.

Zhang Shibiao, a High school teacher said that he brought 30 students to the lecture, and that "even if they can't fully understand all the details of Dr. Betzig's research, it's still very inspiring."



AIT CHAIRMAN MORIARTY URGES STUDENTS TO TAKE PRIDE IN TAIWAN

On November 7th Ambassador James F. Moriarty, Chairman of the American Institute in Taiwan (AIT), visited NTHU and gave a speech on the topic of US-Taiwan Relations. Nearly 100 faculty members, students, and alumni were in attendance, and after the talk there was a lively question-and-answer session. With his candid language and charming style, Moriarty quickly captured the hearts of the entire audience, and following the discussion session joked with many students who came forth to take selfies with him.

Moriarty said that he has been a diplomat for 36 years, and that in retrospect, he can't think of anything else he would rather be doing than serving his country in an important front-line position. When Chuang Yu-ching, a freshman in the College of Humanities and Social Sciences, asked how to best prepare for a career in diplomacy, Moriarty replied that making a meaningful contribution to Taiwan begins with being proud of Taiwan. Moriarty also

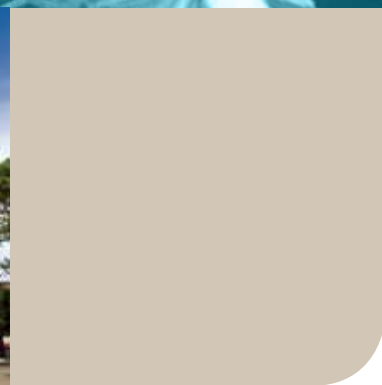
- a Moriarty and president Hocheng with a group of audiences
- b NTHU president Hocheng Hong presenting Moriarty with a bronze commemorative plaque.
- c Moriarty speaking on US-Taiwan Relations.

gave three suggestions to the students present: study hard, be straightforward and sincere, and enjoy life. The questions raised by the audience included US-Taiwan relations, US-China relations, Indo-Taiwan relations, Indo-Pacific strategic partnerships, trade disputes, and mid-term elections in the States.

After greeting the audience in fluent Mandarin, Moriarty began by saying that Hsinchu is Taiwan's most important science and technology hub and that NTHU represents the future of technology in Taiwan. Therefore an important part of his role as chairman of AIT is to maintain a sustained dialogue with NTHU on the future of US-Taiwan science and technology relations. Moriarty also affirmed Taiwan's role in the United States' Indo-Pacific strategy and stated that he believes that the spirit of freedom and equality is the greatest strength of Taiwan. As for the U.S. mid-term elections, he said that both parties in the United States recognize the potential threat posed by the rising power of China, so the long-standing U.S. policy on Taiwan won't be affected by the results of the mid-term elections.

After the talk, NTHU president Hocheng Hong thanked Moriarty for his engaging speech and gave him a bottle of plum wine and a bronze commemorative plaque printed with NTHU logo.

Upon learning that Moriarty would be speaking at NTHU, more than a dozen students from the Global Program prepared



their questions by initiating a discussion group on the role of the United States in the global political economy, the future development of US-China trade and economics, and the political relationship among Taiwan, the U.S., China, and Japan. One of NTHU's four residential colleges, the Global Program is dedicated to cultivating students' international perspective and their ability to participate in international affairs.

Another group of students who posed questions after the talk was a discussion group studying Indo-Pacific defense strategy under the guidance of Prof. Fang Tien-sze of the Center for General Education.

NTHU alumnus Shih Ta-ching played an important role in organizing this special lecture. He encouraged all the students present to make the most of this rare opportunity to interact with a career diplomat face-to-face.

Lin Hsin-ting, a sophomore in the College of Humanities and Social Sciences, said that she was impressed by Moriarty's advice to take

pride in Taiwan, and said that being able to attend a talk by such an important official and to ask questions has been an invaluable experience



- d** AIT Chairman James F. Moriarty answering questions.
- e** After the talk lots of students came forward for selfies with Moriarty and Hocheng.
- f** Students chatting with Moriarty after his talk.

THE SPRING OF ART EDUCATION AT NTHU

On November 13 the Spring Foundation founded by Madam Hou-Wang Shu-chao donated NT\$100 million to NTHU to establish the Tsinghua Spring Development Fund for Art Education, which includes provisions for hiring first-class teachers, providing awards to outstanding students, and organizing various art exhibitions and events. At the inauguration ceremony NTHU president Hocheng Hong thanked Madam Hou-Wang for sowing the beautiful spring seeds of art in the hearts of NTHU faculty members and students.



Madam Hou-Wang (fifth from left), Hocheng (sixth from left), and VIPs at the inauguration ceremony.

- a Chen Yanlun, a student in the Department of Music, sang "Faith in Spring" to express NTHU's gratitude to Madam Hou-Wang.
- b Chen Xuanren (left), a senior in the Department of Music, presenting Madam Hou-Wang with a bouquet of flowers.
- c Madam Hou-Wang (left) presenting Hocheng with her embroidered work Ten Thousand Arrows Shot at Once as a representation of her generous donation to NTHU.

Over the course of ten consecutive years the Fund will provide NT\$10 million annually to the College of Arts. Each year the Fund will sponsor 15 lectures by scholars and experts on such topics as art, crafts, digital aesthetics, interactive art, computer music, kinetic art, virtual reality, computer animation, and experimental imagery. The lecture series will constitute part of a course compulsory for all new students of the College of Art. The Fund will also be used to provide scholarships covering tuition and fees for four years to two outstanding freshmen each year in three programs: Undergraduate Program of the College of Arts, the Department of Music, and the Department of Arts and Design. Moreover, the Fund will also be used to appoint 2 to 3 well-known local and foreign artists to work and teach at NTHU every year.

Madam Hou-Wang presented Hocheng with her embroidered work Ten Thousand Arrows Shot at Once as a representation of the donation. She explained that in the embroidery the four arrows shooting towards the center symbolizes that "everyone is returning to the heart or center," and encouraged promising art students to study at NTHU.

Chen Yanlun, a student in the Department of Music, sang "Faith in Spring" by Uhland and Schubert to express NTHU's gratitude to Madam Hou-Wang.

President Hocheng said that just as "Faith in Spring" emphasizes that spring is the season when all things take a favorable turn, Madam Hou-Wang's generous donation is a



major boon to art education at NTHU and in Taiwan as a whole.

In addition to serving as the chairperson of the Spring Foundation, Madam Hou-Wang is also the honorary dean of NTHU's College of Arts. She said that she has a special inner antenna she uses to determine what she does and doesn't like, and that as an avid patron of the arts she hopes to make the beauty of art more accessible to people from all walks of life.

During the event, former NTHU president Chen Lih-juann praised Madam Hou-Wang as the foremost patron of the arts in Taiwan, and that her support will help the College of Arts advance by leaps and bounds.

The Dean of College of Arts, Prof. Hsu Su-chu said that although the College of Arts is young and small, it has adopted an ambitious mission focusing on beauty, excellence, innovation, and interdisciplinary work, and that the Spring Foundation's support will make it possible to fulfill this mission and to go even further.

Ms. Lin Ping, director of the Taipei Fine Arts Museum, said, "although it's now autumn, for NTHU today surely feels like a spring day!" and that the Tsinghua Spring program is like a beautiful story, bringing students an endless artistic spring.

Ms. Yang Lifen, the chairperson of Reliable Source Industrial, said that she regards Madam Hou-Wang as a "female giant" who has had a major impact in both corporate and artistic circles, and that NTHU must be very special to receive her support.

The Spring Gallery, the forerunner of the Spring Foundation, was founded by Madam Hou-Wang in 1978 to promote international art exchanges and to provide much-needed support to artists during an era of scant artistic resources.

Since 2013, in collaboration with the Taipei Museum of Contemporary Art and other art institutions, the Spring Foundation has been organizing the Spring Project lecture series, in which both local and overseas artists, curators, and critics have participated in lively discussions on contemporary art. In 2014 the Foundation launched a six-year research project titled "The History of Contemporary Art in Taiwan," which is creating an archive of Taiwanese contemporary art and literature.



Madam Hou-Wang (right) and Hocheng holding up the letter of agreement for establishing the Tsinghua Spring Development Fund for Art Education.



NTHU TEAM WINS IGEM GOLD MEDAL

The initial diagnosis of diabetes and various types of cancer currently requires taking a blood sample.

However, an interdisciplinary student team at NTHU has recently developed a wearable device similar to a wristwatch which can perform the same functions of a blood test. Their work has earned them a gold medal from the International Genetically Engineered Machine (iGEM) competition, the world's largest synthetic biology competition.



a NTHU Formosa team won a gold medal at the iGEM competition held in Boston at the end of October.

b NTHU Formosa Team consists of students from the Institute of Systems Neuroscience and from the departments of Medical Science, Applied Science, Life Science, Electrical Engineering, and Biomedical Engineering and Environmental Science.

The iGEM competition was founded in 2004 by the Massachusetts Institute of Technology (MIT). Assistant Professor Frank Lin of the Department of Medical Science led the NTHU Formosa Team consisting of 14 students from various departments to compete at the event held in Boston, USA, at the end of October. The competition attracted 340 teams with more than 5,000 participants from around the world, and in addition to winning a gold medal, NTHU Formosa was nominated for Best Presentation and Best Project in the diagnostic category.

NTHU Formosa used synthetic biotechnology to transplant sensitive proteins that recognize specific biological factors in the blood onto the surface of blood cells, and designed a genetic loop that causes cells which bind to biological traits to emit a long-wavelength luminescence which passes through tissues and can be detected by a special wristwatch they have dubbed the "BioWatcher." This makes it relatively quick and easy to detect and measure the proteins, viruses, nucleic acids, and other factors in the blood. If a particular factor exceeds a certain limit, the BioWatcher issues a warning to remind the wearer to seek medical assistance.

Prof. Lin Yu-Chun said that this device will be a godsend to those who are afraid of needles. Because most people are reluctant to take blood test out of fear of needles, they could inadvertently miss the optimal window for medical intervention. By contrast, the non-invasive BioWatcher enables early detection of diabetes, high blood pressure, fatty liver, and various types of cancer. Moreover, in addition to counting one's steps and taking one's heartbeat, the BioWatcher can also detect the symptoms of various other conditions. "The team is currently preparing to publish a paper on the design and to apply for a US patent.



Lin said that NTHU Formosa was formed while the team members were taking his course titled Synthetic Biology, and that their enthusiasm to ask questions and working together to find solutions led to this award-winning design.

The team consists of students from the Institute of Systems Neuroscience and from the departments of Medical Science, Applied Science, Life Science, Electrical Engineering, and Biomedical Engineering and Environmental Science. In order to prepare for the iGEM competition, the team consulted with a number of experts, including Dr. Chang Shing-jyh of the MacKay Memorial Hospital.

Team leader Nicole Cheng, a dual major in the Department of Medical Science and the Department of Foreign Languages and Literature, said that the iGEM competition encourages participants to get out of the lab and to network with the public and industry, and to use synthetic biology to find solutions to key problems in such fields as environmental protection, medical care, and pharmaceuticals. The overall purpose is to make the world a better place.

Tommy Shen, a team member majoring in Electrical Engineering and Computer Science, said that it was very interesting and rewarding to be a part of the cross-disciplinary team and contributed to the establishment of the website required for entering the competition (http://2018.igem.org/Team:NTHU_Formosa).

Prof. Chen Lin-yi of the Department of Medical Science said that NTHU Formosa was established in January 2018 under the auspices of the Ministry of Education's Medical Innovation Program, which gives students the opportunity to participate



a Team leader Nicole Cheng explaining NTHU Formosa's entry to the iGEM judges.
b Assistant Professor Frank Lin (first on left) with NTHU Formosa at the iGEM competition.

in international competitions. In less than a year the team accomplished a lot, including planning the project, consulting with experts and physicians, conducting experiments, and publishing their research results.

Prof. Chen also thanked all the experts, physicians, and organizations who have provided guidance and support to the team, including the Shen Liyang Memorial Foundation, the Taiwan ImagingTek Corporation (TITC), Integrated DNA Technology (IDT), LifeOptimal, the Taiwan Strategics Intellectual Property Office (TSipo), the Alumni Association of the College of Life Science, and the Ministry of Education



CHANG SHI-KUO TO TEACH SCIENCE FICTION AT NTHU

On December 10th, the Institute of Sinophone Studies appointed Chang Shi-kuo, the father of Taiwanese science fiction, as an honorary chair professor. Professor Chang delivered a series of lectures titled "Both Sides of Chang Shi-kuo: The Romance of Science and the Reality of Fantasy" covering such themes as utopias and parallel universes. Chang also held a workshop for NTHU students on writing science fiction.

The two key elements of science fiction are science and fantasy, and Chang is distinguished in both. Chang is a professor in the Department of Computer Science at the University of Pittsburgh, and by virtue of his rich background in science and engineering the scientific arguments in his works are particularly solid. His literary career began while he was still an undergraduate at National Taiwan University (NTU), and in addition to science fiction he also wrote fables and realism. His famous novel *The Chess King* was translated into various languages, including English and German, and was also adapted into a film, a

- a Chang introducing his lecture series and workshop.
- b Huang Shu-min, the dean of the College of Humanities and Social Sciences, presenting Chang with a silk banner of the College.
- c NTHU president Hocheng Hong presenting Chang with his official appointment letter.

musical stage play, and a TV series.

At the appointment ceremony Chang said that he is very happy to return to Hsinchu as an honorary chair professor. He explained that many schools invited him to lecture in the field of computers and information technology, but NTHU is the first one to hire him to teach literature, adding that "perhaps this means that I've finally made a name for myself as a writer!"

Chang said that his connection with NTHU actually goes back to his boyhood, when he attended the Experimental Elementary School of National Hsinchu University of Education (NHCUE), which has been merged with NTHU in 2016. While introducing the topics he covered in his workshop, he said that he enjoyed the opportunity to work with the participants and would like to stay in touch with them afterwards.

While presenting Chang with the official appointment letter, NTHU president Hocheng Hong quipped that "Chang writes computer programs with his left hand and novels with his right hand." He also recalled that during the martial law era in Taiwan, Chang's science fiction was a breath of fresh air for lots of people, and that he especially enjoyed reading Chang's works *Reverend Pi* and *Forest of Merriness*.

Huang Shu-min, dean of the College of Humanities and Social Sciences, said that Chang is a long-time friend of his, and that when they were both studying at NTU Chang was well known for



Chang Shi-kuo autographing his work for NTHU students.

his talents in playing violin, writing articles, and writing computer programs. He said that during the strict censorship of the martial law era, reading Chang's work was like taking a furtive glimpse of a forbidden world, and that his lecture series is sure to be an interesting one.

Professor Lin Chia-yi, the director of the Institute of Sinophone Studies, said that Chang's works are highly readable, and are noted for their creativity, clear plots, and well-developed characters. Most of his works are set in a society under martial law, and often read like a historical romance reflecting human desires and fears.

Du Chiuyun, a junior in the Department of Chinese Literature, said that Chang's science fiction motivates readers to imagine how science and technology are shaping the future, especially his collection of essays *V-Topia* and *"The City of the Bronze Statue"* in his short story collection *Nebula Suite*.

After graduating from National Hsinchu Senior High School with excellent grades, Chang completed his undergraduate studies in electrical engineering at NTU, and then earned a doctorate in electrical engineering at the University of California, Berkeley. He has taught at Cornell University and the University of Illinois, and

he is the founder the Knowledge Systems Institute (KSI), which promotes joint research in information science, systems science, and the social sciences.

Chang began writing science fiction in the mid-1970s, and in the 1980s the publication of his *Nebula Suite* marked the beginning of the golden age of science fiction in Taiwan. Always keen to promote Chinese science fiction, he has founded a publishing house and edited three anthologies of contemporary science fiction. He once said that even though he wears various hats, literature is his favorite endeavor, and that he hopes the word "novelist" will appear on his epitaph.

When former NTHU president Shen Chun-shan passed away in September 2018 Chang commemorated him with a series of speeches, and wrote, "I've been in contact with Shen Chun-shan for some 30 years, and a few of my characters have been modeled after him, such as the robot in my short story *"The Yangxian Scholar"* and the pundit in my novel *The Chess King*; he always took it in stride."



ANFU FINANCIAL ENGINEERING RESEARCH CENTER TO BE ESTABLISHED AT NTHU

In recent years, the emergence of financial technology has transformed the financial industry. On November 22 NTHU received a donation of NT\$10 million from the Global Social Science Institute (GSSI) for the establishment of the Anfu Financial Engineering Research Center (AFERC). AFERC will promote the use of financial technology to enhance the cooperation between industry and academia, and in March 2019 the Center will begin to publish a monthly *Tsinghua Anfu House Price Index*, and will also set up a free housing valuation network.

Prof. Lin Che-chun, the director of the Department of Quantitative Finance, said that through big data analysis, quantitative modeling, artificial intelligence, GPS, and comparison of the market information provided by existing networks, the *Index* will provide information on real estate values on a monthly basis. Moreover, the *Index* will provide accurate valuations down to the district level (such as Taipei's Da-an District), whereas existing Indexes are limited to the county and city levels, and updated only four times a year.

Lin pointed out that the current official appraisal system is based on zones comprised of 30 housing units. However, in an area with lots of high-rise buildings of the same age and height, it can be difficult to determine which building the valuation applies to. Also, the appraisal system used by real estate companies is mainly based on recent sale prices, but such a limited amount of data reduces accuracy. By contrast, the *Index* to be published by AFERC will be more precise, and it will be able to provide appraisals for townhouses as well as individual floors in the same building.

Lin also said that by making real estate values more transparent, the *Index* published by NTHU will help banks and the public to better assess the risks and benefits of investments and loans. Furthermore, the Center is planning to develop an application which will allow us to use a smart phone to easily make appraisals on the spot, and also to compare the loan terms offered by different banks correlating to the customer's profession, age, and other factors.

GSSI president Tyler Yang has worked for many years on Wall Street. In order to give something back to Taiwan, he and Lin have jointly established the AFERC to serve as a platform for the exchange of cutting-edge financial technology between the domestic and international financial sectors and to enhance the education of financial professionals.

For over a decade Yang served as an independent actuary for the US Department of Housing and Urban Development and



- a NTHU president Hocheng Hong (second from right) was also on hand to thank Yang (second from left) for his generous donation.
- b VIPs at the donation ceremony (left to right): Chuang Hwei-lin, Tseng Fan-gang, Chen Sinn-wen, Tyler Yang, NTHU vice president and chief of staff Lyu Ping-chiang, and Lin Che-chun.
- c Senior Vice President Chen (right) and Yang holding a replica of the donation check.

has also been a visiting professor at Johns Hopkins University. As a member of the first generation of financial technology engineers, Yang has been involved in the development of quantitative analysis models and financial innovation products. He has also been the Senior Director of Credit Portfolio Engineering at Freddie Mac, and for many years has been a consultant to various financial regulatory agencies of the US federal government. He now hopes to use his 30 years of experience in finance, industry, academia, and management to make a major contribution to the financial industry in Taiwan.

Yang said that as a financial professional he gives much importance to reliability, and that he spent a long time considering various partners before finally settling on NTHU. Representing NTHU at the donation ceremony was senior vice president of academic affairs Chen Sinn-wen. He said that although the College of Technology Management is one of the newest colleges at NTHU, it has already established a strong reputation for excellent research in the field of financial technology, and that the development of Taiwan's financial industry will be significantly enhanced by Yang's effort.

Prof. Tseng Fan-gang, the director of the Office of Research and Development, said that NTHU has recently established the Blockchain Law & Policy Center, and that the addition of the AFERC will make NTHU a leading authority in the fields of finance and technology management.

Chuang Hwei-lin, the dean of the College of Technology Management, said that she was very impressed by Yang's donation, especially since the College is just 18 years old, and that the addition of the AFERC will greatly contribute to the development of the college and enhance its contribution to Taiwanese society.

Lin said that in addition to integrating NTHU's existing courses relating to financial technology and financial engineering, the AFERC will also cooperate with industry to conduct research projects in such areas as financial engineering, model validation, asset valuation, securitization, portfolio management, economic forecasting, and financial policy.

On December 5 the AFERC held a symposium titled Real Estate Banking Services and the Online Automated Valuation Model, featuring Jesse Abraham, senior vice president of modeling at Wells Fargo Home Mortgage, who discussed how the US financial institutions use online automated real estate valuation to make decisions.



Lee Yun-ju (left) is developing a system to improve batting technique by monitoring the batter's center of gravity and angle of vision.



BASEBALL SET TO GO HIGH-TECH AT NTHU

In recent years NTHU has been giving considerable emphasis on the research of artificial intelligence (AI), and is now planning to promote the application of AI to athletics by establishing a Sports Technology Center. The Center's first project will be the AI Baseball Program, which will find ways to improve the training of baseball players through the application of AI, big data analysis, sensing technology, biomechanics, and other advanced technologies. The training system being

developed will help players at all levels to improve their performance and reduce sports injuries, and is expected to eventually have a major impact on baseball as a sport.

The Sports Technology Center is being organized by Dr. Wu Cheng-wen, distinguished chair professor of the Department of Electrical Engineering, who was a famous pitcher in his youth. In his capacity as project consultant, Wu is recruiting ten faculty members from five NTHU departments (Electrical Engineering, Physical Education, Computer Science, Power Mechanical Engineering, and Industrial Engineering and Engineering Management), plus one orthopedic surgeon and two off-campus researchers.

Wu said that by integrating the skills of experts in various fields, the Center will develop a system for analyzing and evaluating a baseball player's physical condition, which can be monitored by using Bluetooth wireless transmission and a mobile phone. As Wu put it, "Taiwan's sensing technology is first-class, and it will soon be possible to quickly develop products at an affordable price."

Wu mentioned that in Hanyu Pinyin "AI" is pronounced the same as the Mandarin word for "love," so the AI Baseball Program also has the connotation of "love baseball program." In addition to baseball, it is expected that the training system developed by the Center will be extended to include other sports, including boxing, badminton, table tennis, and archery.



Members of the AI Baseball Program.



- a Eye trackers monitor the pitcher's angle of vision, and sensors embedded in the baseball measure the pressure applied by his fingers.
- b Prof. Wu Cheng-wen of the Department of Electrical Engineering coaching pitching technique.

The director of the Center is Prof. Ma Hsi-pin of the Department of Electrical Engineering. He explained that the sensing technology developed by the Center will embed sensors and pressure gauges inside a baseball and use the information thus collected to measure the trajectory and rotational speed of pitches, as well as the strength of the pitcher's fingers. Consequently the pitcher will be able to use this information to adjust the force and angle applied when using various pitching techniques.

In addition, the Center is also planning to develop a kind of biosensor IC technology to measure such physiological functions as heartbeat and breathing, which can be used by a baseball player to assess his psychological state, concentration level, etc., so as to improve his performance in high-pressure situations.

Wu said that the AI training system to be developed by the Center will take into account all aspects of the training needs of baseball players. For example, the "3D posture simulation" developed by Dr. Chu Hung-kuo of the Department of Computer Science uses the signals provided by a single camera to analyze the dynamic movement of the skeleton, and this information can be used to correct a pitcher's posture and reduce injuries. Also slated to play a role in the training system is a bio-sensing insole developed by Prof. Huang Po-chiun of the Department of Electrical Engineering which can instantly measure and display the pressure exerted by an athlete's feet as well as changes in his center of gravity.

Dr. Lee Yun-ju of the Department of Industrial Engineering and Engineering Management specializes in biomechanics and human factors engineering. She is responsible for the development of a system to improve batting technique by monitoring the batter's center of gravity and angle of vision by

using ground force plates and eye trackers. Her system will help batters to improve their ability to focus on the ball right up to the moment when it hits the bat.

The Department of Physical Education was added to NTHU following the merger with the National Hsinchu University of Education (NHCUE), and has become a key element of the school's successful research on the integration of sports and technology. Wu said that the laboratory run by Prof. Chiu Wen-hsin of the Department of Physical Education has long been using such high-tech equipments as high-speed cameras and musculoskeletal simulation systems, and that the Department is now organizing a symposium on the application of the latest technological innovations to baseball training.

NTHU and NTUA have recently entered into an educational alliance, including a student exchange program.



NTHU ESTABLISHES STUDENT EXCHANGE PROGRAM WITH NTUA

On October 25 NTHU and the National Taiwan University of Arts (NTUA) signed an agreement establishing an educational alliance, including a student exchange program. Starting from the 2019 school year, each school could send up to ten exchange students to study different subjects at the partner school without having to pay additional tuition.

At the signing ceremony NTHU president Hocheng Hong said that NTUA is the oldest university of arts in the country, with a long list of distinguished alumni, including film directors Ang Lee and Hou Hsiao-hsien; musician Ma Shui-long; and painter-scholar Huang Kuang-nan. Thus he encourages interested NTHU students to participate in this exchange program.

President Hocheng also said that the main goal of such exchange program is to provide more cross-disciplinary learning opportunity for students on both campuses. Since 2011, NTHU has entered into similar exchange agreements with the Taipei National University of Arts (TNUA) and the



NTHU president Hocheng Hong (left), NTUA president Chen Chih-cheng (right), and Shen Yuting, a junior in the Department of Special Education at NTHU.

Tainan National University of Arts (TNNUA). As a result, in the past seven years 130 NTHU students have enrolled at these two schools to study subjects such as film production, new media art, and theater design, demonstrating that lots of NTHU students are eager to gain an in-depth knowledge in various areas of the arts. As for the students at these two universities of the arts who have come to NTHU, most have taken courses in the departments of Electrical Engineering and Computer Science.

President Hocheng further indicated that NTUA offers a wide variety of courses through its colleges of fine arts, design, communication, and performing arts, and has an outstanding reputation in the areas of visual communication design and multimedia animation. Thus NTUA provides excellent learning



- a A number of art students have already come to NTHU to study electrical engineering and computer science.
- b NTHU president Hocheng Hong (left) and NTUA president Chen Chih-cheng at the signing ceremony.

opportunity for students of science and engineering, as well as for students interested in taking advanced courses in such subjects as western painting, Chinese painting, and calligraphy.

Referring to Chuang-tze's doctrine of "the usefulness of the useless," President Hocheng said that previously people didn't give much importance to arts, but nowadays people in the disciplines of education and medicine have begun to make use of the power of arts.

NTUA president Chen Chih-cheng said that the greatness of a nation depends not only on science and technology, but also the arts and humanities. He added that in addition to its long list of famous alumni, the younger generation of NTUA students are also beginning to shine forth. For example, recently an NTUA student won the Animation Award at the Asia-Pacific Film Festival, and the writer and director of the television miniseries *Teenage Psychic* and the director of the Taipei Film Festival are both NTUA alumni.

Chang Yuan-chieh, director of the Center of Continue Education at NTHU, said that as a member of the University System of Taiwan, NTHU already has extensive academic and research exchanges with domestic universities such as National Yang Ming University, National Chiao Tung University, and National Central University. With this new agreement, NTHU will have student exchange agreements with seven universities, including National Chengchi University and National Dong Hwa University.

Director Chang also said that exchange students are given the same rights and benefits as regular students in terms of housing, facilities, and course selection. He said that this provides exchange students the opportunity to have a more complete learning experience, adding that, "despite of the limited number of tuition weavers, many students are even

willing to participate at their own expense."

Shiau Ming-twen, assistant dean of NTHU's College of Arts, was instrumental in arranging this exchange program, and as a graduate and former teacher of NTUA he is confident that NTUA's curriculum will provide NTHU students with an expanded educational horizon.

Shen Yuting, a junior in the Department of Special Education at NTHU, said that she was overjoyed when she heard about the new exchange agreement. When she was in high school, she won an award for a microfilm she produced, and is now planning to apply to the program so that she can study scriptwriting at NTUA. As Shen puts it, "I want to work in scriptwriting in the future. The special education courses I have studied will not be in vain, since a good screenwriter can also serve as a voice for the disadvantaged."



NTHU



NATIONAL TSING HUA UNIVERSITY WELCOMES INTERNATIONAL STUDENTS

For information on Admission and Financial Aids,
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(Taiwan time)

Application Timeline:

Degree Student

Fall Semester Application Graduate Program: January
1~March 15

Undergraduate Program: November 15~January 15

Spring Semester Application: August 15 to October 16

Exchange Student

Fall Semester Application: February 1~ April 15

Spring Semester Application: September 1~November 1



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