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NTHU

NTHU AND TSMC TEAM UP FOR A NEW PROGRAM IN SEMICONDUCTOR TECHNOLOGY

It has recently been announced that NTHU and the Taiwan Semiconductor Manufacturing Company (TSMC) are planning to set up a semiconductor program on NTHU campus. In addition to traditional classes in electrical engineering, the program will include several new courses in such areas as state-of-the-art memory components, and aims at training the next-generation specialists in component development and advanced process integration. Students who have completed this program will have the opportunity to do an internship at TSMC, and after graduation will have a job interview at TSMC. This is the first time that TSMC has offered a professional training program with a university.

NTHU and TSMC recently held an informational meeting on campus which was attended by more than 100 graduate and undergraduate students from the Department of Engineering and System Science and the Department of Electrical Engineering. The meeting also attracted over 20 students from National Chiao Tung University, National Cheng Kung University, National Taiwan University, National Sun Yat-sen University, and National Central University.

SVP of academic affairs Chen Sinn-wen said that this is the first time in Taiwan for a leading enterprise and a top university to jointly set up a systematic program.

Win-win cooperation

Senior Vice Presidnent of Academic Affairs Chen Sinn-wen said that this is the first time in Taiwan for a leading enterprise and a top university to jointly set up a systematic program, adding that this win-win undertaking will help students get the best education and help TSMC cultivate the best engineers.

The program was planned by the Department of Engineering and System Science and the Department of Electrical Engineering. The director of the Department of Engineering and System Science, Professor Wu Yung-hsien, said that the

program will offer a wide range of courses, including Next Generation Component Development, Integration Technology in Advanced Manufacturing Processes, and Material Analysis. Such courses impart knowledge considered essential for working in the semiconductor industry. Some of the courses will be taught by TSMC senior staff with lots of practical experience to share with students.

Training the next generation specialists in advanced manufacturing processes

Director Wu said that one of the unique classes to be included in the program focuses on a new type of memory with neural operations. In existing computer architecture, the arithmetic unit and the memory unit operate independently, so that when processing data, the data must be repeatedly transmitted to the arithmetic unit and the memory unit, a process which is both time-consuming and power-consuming. This new type of memory uses less time and power, and is able to both run and store at the same time, rather like the human nervous system. This allows a faster responses to commands, which is the key to the development of machine learning and to using integrated circuit technology to accelerate the development of artificial intelligence.

Wu also said that TSMC suggested that existing courses such as Applied Optoelectronics should be augmented with components on short-wavelength light sources such as ultraviolet and extreme ultraviolet (EUV), since familiarity with these subjects is essential for shrinking components down to five nanometers.

The easy way to stay on track

Chiu Cheng-yuan, a student in the Department of Engineering and System Science, was one of the first students to register for the new program. He said that although NTHU offers a wide variety of courses, it can be difficult to know which ones have the most relevance to the future needs of the semiconductor industry. Thus this new program will be very suitable for students who don't yet have a clear plan for the future, since, as Chiu puts it, "as long as they follow the program, they won't have to worry about getting lost."

Chang Wei, a sophomore in the Department of Electrical Engineering, said that her participation in the TSMC Elite Training Camp had already stimulated her interest in pursuing a career in research and development at TSMC, so once she heard about the new program she immediately applied. She said that she is looking forward to the new class on state-of-the-art memory components and plans to conduct research on non-volatile memory in the future.

a Professor Wu Yung-hsien (center) of the Department of Engineering and System Science with two applicants to the new program: Chang Wei (left), a sophomore in the Department of Electrical Engineering, and Chiu Cheng-yuan (right), a junior in the Department of Engineering and System Science.

b The informational meeting for the new program was attended by more than 100 students.

Li Wenbin, a Ph.D. student in the department of Power Mechanical Engineering, won the first prize in the entrepreneurship category for his microfluidic wafer which provides rapid assessment of bacterial resistance.

TSINGHUA STUDENT WINS FIRST PRIZE IN THE ENTREPRENEURSHIP DAY COMPETITION

The sixth annual Tsinghua Entrepreneurship Day was held on May 31 with a total of 47 teams from across Taiwan participating. Li Wenbin, a doctoral student in the Department of Power Mechanical Engineering, won the first prize in the entrepreneurship category for his microfluidic wafer which provides rapid assessment of bacterial resistance. A team consisting of three freshmen from NTHU's Department of Electrical Engineering won the first prize in the innovation category for their environmentally friendly food delivery platform.

This year's competition was divided into two categories: innovation and entrepreneurship. Entrants in the former category only presented an innovative idea, while those in the latter category need to present a business model for manufacturing their product on an industrial scale. In this year's competition two subcategories were added to the entrepreneurship category: artificial intelligence (AI) and blockchain, the results of which were announced on June 1.

This year's Entrepreneurship Day was organized by Prof. Kenneth Hsu. Hsu said that to succeed in business you have to be able to cater to industry trends, and this is why the AI subcategory was added to this year's competition. He said that in recent years NTHU has been promoting interdisciplinary studies including expertise in the fields of AI and blockchain, both of which can be applied to such areas as media, medicine, and agriculture.

President Hocheng Hong pointed out that lots of students dream about starting a business without understanding the risks involved. Thus we initiated Entrepreneurship Day to encourage students to team up with like-minded classmates in coming up with innovative products and workable business plans. He also said that in recent years Tsinghua has been promoting interdisciplinary studies, dual expertise, and customized curriculum, all of which help to hone the skills needed to succeed as an entrepreneur.

Motivated by personal tragedy

Of the 11 teams competing in the entrepreneurship category, five made it to the finals, and the first prize went to Li Wenbin, a doctoral student in Department of Power Mechanical Engineering, for his entry "MedFluid." Li's father once came down with pneumonia and died due to resistance to the antibiotic treatment he received at the hospital. As a result, six years ago Li left his job at TSMC to pursue a doctoral degree at NTHU focusing on the problem of drug resistance.

Li has invented a microfluidic wafer that can detect 12 types of antibiotic resistances. A drop of the patient's blood or

ⓐ The Green Pepper Express team. From left to right: Chen Weizhong, Ma Yuping and Cai Huiyun.

ⓑ NTHU students with their entry "Embrave," a nightlight with a built-in emergency messaging function.

saliva is dropped on the wafer, and within five hours it can be determined which antibiotics he is resistant to, as well as which combinations of antibiotics can effectively kill the bacteria. This helps the physician to prescribe the right medicine timely and save the patient's life.

After confirming that his invention was reliable, Li set about setting up a company for its commercial production with assistance from NTHU's Creativity Garage and Innovation Incubation Center.

Saying goodbye to disposable tableware

Of the 11 teams competing in the innovation category, four received honorable mentions, and the first prize went to a team consisting of three freshmen from the Department of Electrical Engineering—Chen Weizhong, Ma Yuping and Cai Huiyun—for their environmentally friendly food delivery platform called the "Green Pepper Express."

The Green Pepper Express is intended to solve a practical problem on university campuses. Lots of university students living on campus find it rather inconvenient to leave their dormitory to get a meal, and thus rely on local delivery services, which add a mere NT$5 for each order. Team captain Chen Weizhong said that the team's goal was to devise a delivery service which is both more convenient and less wasteful in terms of disposable materials. Next semester the team will begin working with a local delivery service by providing reusable tableware which can be cleaned and make ready for reuse.

The five teams made it into the finals in the entrepreneurship category.

Ma said that each member is planning to raise around NT$30,000 to get Green Pepper Express started, and that they have gained much benefit through their participation in the competition and their affiliation with the Innovation Incubation Center.

Using blockchains to detect fake news

Of the 11 teams competing in the blockchain subcategory, six made it to the finals. This was the first time a blockchain competition has been hosted by a university in Taiwan, and this segment of the competition was co-sponsored by blockchain pioneers Flowchain and EOS, both of which provided guidance and prizes. The first prize went to a team consisting of students from National Chengchi University, National Kaohsiung First University of Science and Technology, and National Taiwan University of Science and Technology for their entry "White Box,"



which uses blockchains to identify fake news.

Team captain Qiu Chuijin, a junior of the Department of Statistics at National Chengchi University, said that their entry is an online news platform which identifies fake news by using big data, exciting legal codes and comparison with other news items. In order to encourage objective and fair news, readers can use tokens obtained on the platform to make evaluations which help the system to gradually improve its ability to distinguish between real news and fake ones.

Qiu said that his team members have great enthusiasm for blockchains and are planning to pursue it further after graduation. In addition to a cash prize, the winning team in the blockchain subcategory also received a prize in crypto currency from EOS and Flowchain.

Using AI as a fashion consultant

Of the 14 teams competing in the AI subcategory, five made it to the finals, one of which consisted of students from NTHU's departments of Computer Science, Industrial Engineering and Engineering Management, Power Mechanical Engineering, and Economics for their entry "Beaut-AI-Ful," a mobile application which applies AI to fashion styling.

Amongst the finalists in the AI subcategory was an NTHU team which devised a mobile application called "Beaut-AI-Ful" which applies AI to fashion styling.

Team member Jian Ruqian, said that their entry is designed for people who don't want to waste time thinking about what to wear each day. After uploading photos of oneself and one's wardrobe, all that's required is to select one of the styles in the mobile app, and it will recommend what to wear. The app also keeps inventory of your wardrobe to refresh your memory when buying new clothes. She also said that they are planning to add a function for providing recommendations for the optimal sun protection factor (SPF) for sunscreen on a given day based on the current temperature, humidity, and UV index.

SHUJI NAKAMURA DELIVERS THE 2019 NOBEL LAUREATE LECTURE AT NTHU

Professor Shuji Nakamura, winner of the 2014 Nobel Prize in Physics, recently delivered the 2019 Nobel Laureate Lecture at NTHU, during which he discussed the approach he employed in inventing the blue LED, as well as Soraa lighting company he established.

Over 400 people came to listen to Nakamura's candid and engaging lecture, which was followed by a lively question-and-answer session. Freshman Ou Yuen of the College of Nuclear Science asked him why he chose to work in academia rather than industry, to which he humorously replied, "Because when you work for a company you have too many bosses; but in academia you can arrange your own schedule, and you don't have a boss!"

Ji Dayou, a first-year graduate student in the Department of Materials Science and Engineering, asked about the key to success in the field of materials science engineering, to which Nakamura replied, "Work on whatever you find most interesting, rather than what others find most interesting! East Asians tend to be highly conformist and regimented, but if you want to be an innovative researcher, then you have to strive to think independently and to find you own true voice."

The virtues of solitude in nature

Widely regarded as "the father of blue LED," during his lecture Nakamura gave a brief account of how he started from scratch, as recounted in detail in his book *Brilliant*!

Nakamura was born in the small fishing village of Ikata on the island of Shikoku, Japan. As a child he would spend hours at a time just staring at the mountains and sea. He said that this childhood experience honed his concentration and taught him how to look at things in a different way; thus he is a firm believer of solitude.

Not surprisingly, Nakamura advocates subverting the dominant paradigm; he also extols the benefits of following your intuition. As he sees it, one of the keys to carrying out fruitful research and developing new products is simply being mindful of whatever information you receive through your sense faculties. During childhood he never excelled at school, and the only subjects that interested him were mathematics and physics. Following his interests, he entered the Department of Electronic Engineering at the University of Tokushima. Upon graduation he had difficulty finding a job, and finally settled on a position in the research and development department of the Nichia chemical company in Tokushima Prefecture.

Turning adversity into an advantage

It was while working at Nichia that Nakamura became interested in light-emitting diodes (LED), which had already begun attracting worldwide attention. Yet he was the only person at Nichia working full-time in research and development, and he was hampered by an extreme lack of resources. Nonetheless, instead of getting dejected, he took it as a challenge, and plunged into his work with lots of zeal.

Due to the lack of basic experimental apparatus, Nakamura went around collecting discarded equipment which he used to cannibalize what he needed. He also learned the virtue of frugality. For example, the quartz tubes necessary for his experiments are very expensive, so he found a way to reuse them many times over by repeatedly welding them together. As a result of working in these difficult circumstances, he came to realize the importance of making things by hand. Evincing his Luddite sympathies, he said that automated mass production fosters a sense of alienation between people, whereas making things by hand brings a sense of accomplishment and connection with others.

Guided by his intuition and employing his unique hands-on approach, during his first ten years at Nichia, Nakamura invented three new products, and although none of them were hugely successful in terms of profits, they established his reputation as a talented researcher and inventor. As a result, he received an opportunity to pursue advanced studies at the University of Florida in semiconductor crystal technology, an area closely related to blue LEDs.

Taking the road less traveled

Upon returning to Japan, Nakamura immediately began working on blue LEDs. Rather than using the zinc selenide used by most researchers, he chose to use gallium nitride (GaN), widely considered difficult to work with because it doesn't readily form into crystals. And despite the ridicule he received from his colleagues, Nakamura felt that he was onto something, and steadfastly proceeded along the path less traveled.

What's unique about the blue LED is that blue light has the highest frequency of all visible light, and combining it with red and green LEDs results in the highly efficient white LEDs which are now widely used.

Nakamura soon became so engrossed in this research that he had practically no interaction with any of his coworkers, and when the management ordered him to discontinue his research, he paid no attention, for he sensed that he was onto something big. To facilitate his work, he fabricated an improved version of the MOCVD (metal organic chemical vapor deposition) reactor, thereby solving the problem of a unidirectional heat convection which is so strong that it impedes crystallization, thus making it possible to use gallium nitride for effective crystallization. Three years after returning from the United States he officially announced that he had successfully developed a blue LED. Looking back on the whole process, he said it was like "climbing Mount Everest wearing wooden clogs."

At the vanguard of illumination technology

His invention was met with both surprise and doubts, and since then he has been working on improved versions of the blue LED, and it is now used worldwide. In recognition of his groundbreaking research, he won the 2014 Nobel Prize in Physics, along with Isamu Akasaki and Hiroshi Amano.

Afterwards, Nakamura became a professor at the University of California, Santa Barbara, and set up the LED lighting company Soraa. Nakamura said that one of Soraa's main projects is the development of artificial lighting which is closer to the natural light spectrum, so as to avoid unwanted side effects, such as insomnia. He said that the sun also contains blue light, which helps the human body to operate normally. However, in the white LEDs currently in use, the blue light content is higher than that in sunlight; this excessive amount of blue light inhibits the release of melatonin in the brain, which causes insomnia. Thus Nakamura says that it's best to avoid using a mobile phone before going to bed.

Soraa is also developing various blue laser products. The advantage of a blue laser is that it emits lots of light from a small area, making it well suited for such applications as laser scanners, televisions, automobile headlights, and light fidelity (Li-Fi) wireless communication technology using electromagnetic waves. Nakamura said that the efficiency of the 5G network that is currently being developed around the world is 10Gb per second, but with Li-Fi this can reach 1000Gb per second. In addition to increasing the speed of information transmission and improving security, it can also be used in places where it's difficult to transfer signals, such as underground and deep in the water.

The power of faith

While introducing Nakamura, former NTHU president Chen Lih-juann said that apart from being a dark horse and an inventor, what really impresses him about Nakamura is that he completed his doctorate in one year, and a mere 20 years later he won the Nobel Prize.

After the speech, Nakamura was visibly pleased as students rushed to the stage to get his autograph, take a selfie with him, and to ask further questions.

EXPLORING THE FRONTIERS OF ART AND BIOTECHNOLOGY

a Chou Chiao-chi (left) and Hu Youyang with their device for growing plants into various shapes.

b The process is called "biosignal cybernation," and uses phototropism to control the shape in which a plant grows.

Chou Chiao chi, a graduate student studying biotechnology and art at NTHU, has designed a globe-like device which rotates 360 degrees to control the angle of light in such a way that pea seedlings are made to grow in various shapes, including triangles, spirals, and even heart-shaped patterns. The process is called "biosignal cybernation," and the device has recently been exhibited at the Ars Electronica event in Linz, Austria.

The 22-year-old Chou is a first-year student in the Interdisciplinary and International Master's program. She developed the process in collaboration with her university classmate Hu Youyang, working under the team name "Y2K."They were the youngest Taiwanese participants at Ars Electronica.

First held in 1979, the Ars Electronica festival is known as the "Oscars of Science and Technology." This year's theme was "Out of the Box: The Midlife Crisis of the Digital Revolution," and the event attracted thousands of talented participants from around the world. What made Y2K's entry stand out was its unique combination of electronic art and biotechnology.

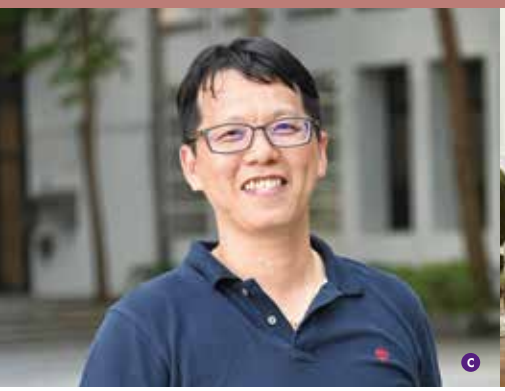
A bright idea born of a chance conversation

In addition to biotechnology, Chou is also good at woodwork and machine fabrication, while Hu's specialty is computer programming, such that their respective talents perfectly complement one another.

Chou said that the inspiration for biosignal cybernation came from a conversation she and Hu had when they were riding on a bus. They were chatting about how Japanese farmers have been using molds to grow square watermelons, and they began to wonder if it might be possible to sculpt the shape of a plant without the help of molds and wires, but rather by controlling the light it receives. They soon hit upon the idea of mounting a sphere on a frame so that it can rotate 360 degrees, with an electric light mounted above; a pea seedling is placed inside the sphere and a computer program precisely controls the direction of the light it receives.

In order to determine the growth pattern of peas, Hu took a picture of the pea seedling every 5 minutes and used artificial intelligence to analyze the data. Based on the results, they developed a three-axis motor which rotates the pea seedlings at regular intervals, so as to control its growth in a preset direction.

They chose to use pea seedlings because they grow fast. With 16 hours of daily sunlight, a pea seedling will grow between 0.6 and 1.0 centimeter every day, so that most shapes can be completed in about ten days. Chou likens the instrument



c Professor Lee Ray-kuang of the Institute of Photonics Technologies is also the director of the Interdisciplinary and International Master's and Doctoral Program.

d Lin Ziyang (right) of the College of Life Science taught Chou how to prepare specimens.

to a 3D printer for plants; all you have to do is draw a pattern and enter it into the computer, and the plant will grow in practically any shape you want. The shapes they have already successfully made include triangles, squares, diamonds, pentagons, and hexagons. The device uses a waving red light to make the peas grow with longer stems and shorter leaves.

A serendipitous invitation

The invitation to participate in Ars Electronica came quite unexpectedly. In February of this year Chou and Hu went to Japan to participate in the YouFab Global Creative Awards. Amongst the jury was Gerfried Stocker, who is also one of the directors of Ars Electronica, and he was so impressed with Biosignal Cybernation that he wrote it up in a review. As a result, much to their surprise, late one night in May Chou and Hu received an e-mail inviting them to participate in Ars Electronica.

With guidance from Professor Li Chia-wei of the Department of Life Sciences and technical support from classmate Lin Ziyang, Chou prepared pea seedling specimens of various shapes using a process which includes soaking the seedlings in a copper-infused solution to replace the easily lost magnesium ions in the plant chlorophyll. The result is a lifelike specimen which preserves the original color.

Prof. Li said that he hasn't accepted any new graduate students in the past few years because he is preparing to retire, but he was so impressed with Chou's enthusiasm and talent that he decided to make an exception. Although phototropism (the growth of an organism in response to a light stimulus) has been well known for a long time, "Who would have thought of using it to create art?" said Li with obvious admiration.

Interdisciplinary studies at NTHU

Chou is amongst the first batch of students in NTHU's Interdisciplinary and International Master's and Doctoral Program; she has advisors in both the College of Life Science and the College of Arts.

Prof. Li Ruiguang, director of the new interdisciplinary program, said that the doctoral program was established in 2015 as the first of its kind in Taiwan, and in 2017 a master's program was added. Drawing on the resources of all the colleges at NTHU, students in the program design their own coursework and choose their own advisors. Amongst the other students currently in the program are one combining medicine and big data, and another working on design and the human-machine interface. There are currently 85 doctoral students in the program.

Prof. Tao Ya-lun of the College of Arts said that NTHU has always been strong in science and engineering, so there are lots of resources and support available for students with a background in art to combine their existing specialization with such fields as biotechnology, information engineering, machinery, and chemical engineering.

(left) with centenarian Kong Xiangze, who copied the "Feiyizhai Collection" back in the early 1940s.

LONGSTANDING PHILOLOGICAL MYSTERY SOLVED BY NTHU RESEARCHER HUANG YI-LONG

The Qing dynasty writer Cao Xueqin is best known as the author of the celebrated novel *Dream of the Red Chamber*, but he is also reputed to have written or illustrated several other works. Huang Yi-long, distinguished chair professor of NTHU's Institute of History, has been researching this topic for some time. Employing a hybrid methodology combining traditional philology and big data, Huang has determined the real-life identities of three of the characters in *Dream of the Red Chamber*, and has also verified that Cao was indeed the author-illustrator of a manuscript on craftwork in eight volumes titled the *"Feiyizhai Collection."*

Huang, also an Academician of Academia Sinica, said that solving this controversy which had been going on for nearly half a century also enhances our understanding of Cao, who turns out to have been not just a romantic novelist, but also a down-to-earth craftsman with extensive knowledge of a wide range of craftwork and practical skills, including kite making, horticulture, and cooking. Cao was also a humanitarian, for this little-known work of his was actually written as an instruction manual for teaching disabled people practical skills that they could use to make a living.

Huang's groundbreaking findings have attracted considerable attention, and his article *"Authenticating Cao Xueqin's Authorship of the 'Feiyizhai Collection'"* has recently been featured in the journal Chinese Culture published by the Chinese National Academy of Arts in Beijing.

A half-century controversy

Huang explains that the *"Feiyizhai Collection"* consists of eight fascicles, each covering a different craft: carving woodblocks for printing; making kites; weaving; molding; darning; textile printing and dyeing; horticulture; and cooking. The volume titled *"Southern Hawk, Northern Eagle: A Survey on Kite Fabrication"* gives detailed instructions on how to build a wide variety of kites, along with diagrams, color illustrations, and mnemonic verses. The illustrations are reminiscent of a

Huang has shown that one of the people mentioned in the "Feiyizhai Collection" is actually one of Qianlong's maternal uncles, a portrait of whom can still be seen at the National Palace Museum in Taipei.

passage in chapter 70 of *Dream of the Red Chamber,* in which Jia Baoyu flies a kite.

This craft book first came to light in 1943 in Japanese-occupied Beijing. At that time Kong Xiangze was a young art student. His teacher, a Japanese kite enthusiast, heard about a Japanese antique dealer in Beijing with a set of eight manuscripts which included a volume devoted to Chinese kites, and he sent Kong to make a copy of the manuscript.

The owner refused to allow Kong to photograph the manuscript collection, but did allow him to borrow it for one month to make a hand-written copy, with one condition: every day Kong had to prepare for the owner one of the dishes described in the last volume of the collection. Having readily agreed, Kong set about copying the text and using tracing paper to duplicate the diagrams and illustrations, beginning with the volume on kites. However, after only 26 days, when the copy was still incomplete, the owner suddenly took back the manuscript and sent it to Japan, and its present whereabouts remain unknown.

In 1973 Wu Enyu published an article purporting that the inscription at the end of the preface of the *"Feiyizhai Collection"* identifies Cao as its author, thereby setting off a heated controversy amongst redologists (scholars specializing in the *Dream of the Red Chamber)*.

Prof. Huang Yi-long of NTHU's Institute of History has recently verified that Cao Xueqin was the author-illustrator of the "Feiyizhai Collection,"

Three mysterious characters

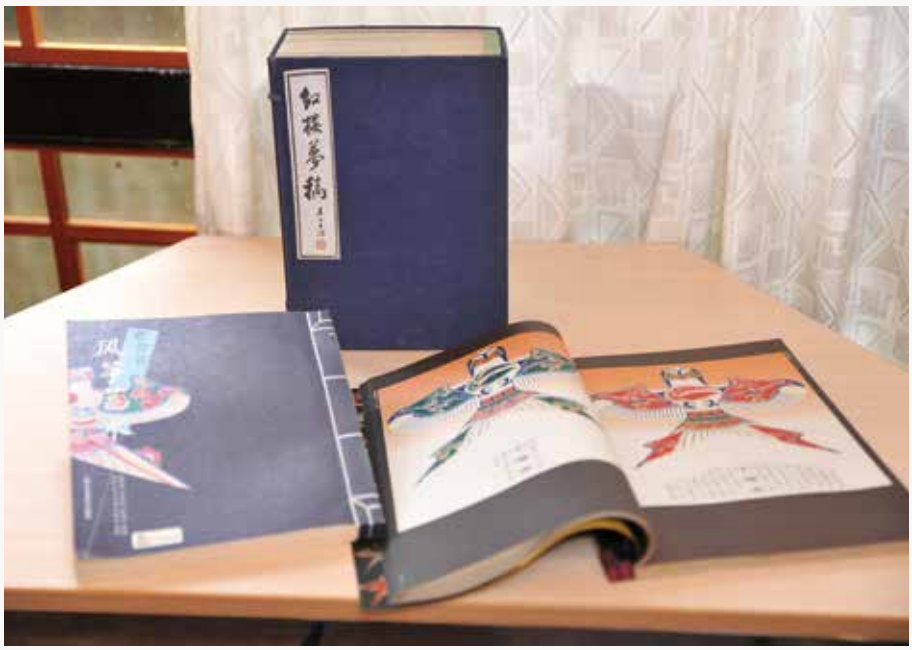
At the beginning of 2019 Huang went to Beijing to visit the centenarian Kong, and it was through their discussions that Huang came up with "e-critique," a hybrid philological methodology combining big data and traditional philology.

Huang said that in the volume on kites there is an essay titled *"Pinghu Maozhai Jisheng."* Written by Cao's friend Dunmin, the essay describes a banquet Dunmin held at Taiping Lake at the southwest corner of Beijing's inner city during the 23rd year of the Qianlong Emperor, during which the host invited the famous painter-calligrapher Dong Bangda and several friends to admire some paintings and appreciate the exquisite kites made by Cao Xueqin. Huang asserts that several of these guests were actually characters who appear in *Dream of the Red Chamber,* and that verifying that these characters were real people known to Cao would prove that Cao was the author of the *"Feiyizhai Collection."*

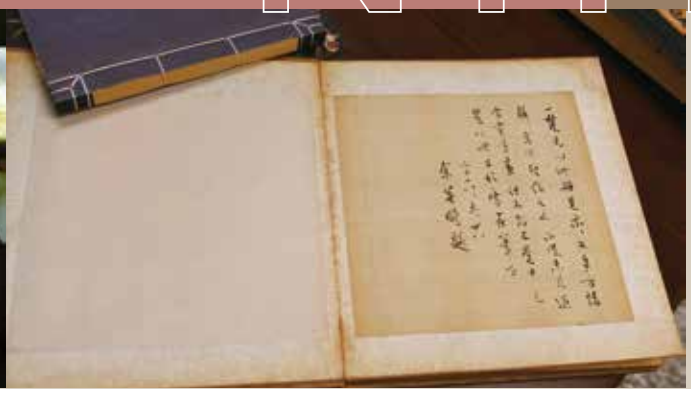
The first person amongst the guests to be identified by Huang was one whose name was partly illegible in the manuscript, and

who was previously believed by some to be Dunmin's maternal uncle. Huang, however, suspected that he was in fact the prince's maternal uncle in *Dream*, and by applying his e-criticism methodology he was able to identify a real person who was identical in terms of age, class, and position in the family, and who had been given a mansion—one of Qianlong's maternal uncles, one of whose descendants is known to have married the son of Cao's cousin.

The second mysterious character at the banquet was Guo Sanye, whose courtesy name was Zihe. The *Pinghu* essay states that Dunmin went to the Tongzhou district of Beijing to receive a certain Guo Zihe, who had arrived via the Grand Canal. This mode of transportation led Huang to surmise that Guo may have come from the south, and that since Dunmin went personally to receive him, he must have had a high social status, perhaps as a scholar. Based on these considerations, Huang made a search for scholars of the period surnamed Guo who lived near the route followed by the Grand Canal as it passed through the provinces of Shandong, Zhejiang, Jiangxi. As a result, he came up with a scholar named Guo Bingjun. The third mysterious character at the banquet who also appears in *Dream* was Hui Min. Although a member of royal clan, he is described as lame, orphaned, and widowed, and therefore Dunmin hoped that Cao would teach him how to make kites. Huang was able to show that Hui Min was actually Dunmin's cousin.



The volume in the "Feiyizhai Collection" titled "Southern Hawk, Northern Eagle: A Survey on Kite Fabrication" gives detailed instructions on how to build a wide variety of kites, along with diagrams, color illustrations, and mnemonic verses, and has been made the basis of several recent publications.



Philological detective work

Employing the same methodology, Huang has also been able to solve a number of other related mysteries, including Cao's authorship of the *"Painting Album of Cao Zhan the Celery Farmer."*

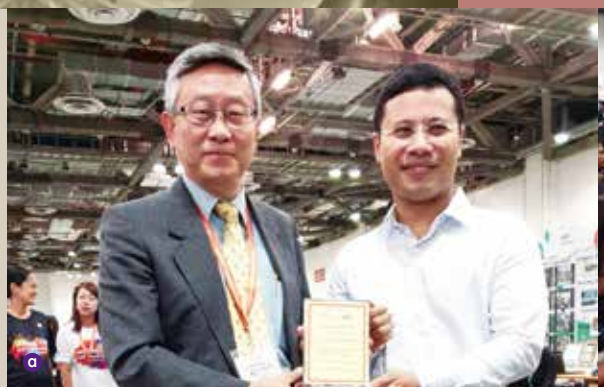
Huang's research has resulted in the digitization of a huge amount of historical records—more than ten billion characters to date—but the traditional approach to philology and textual criticism is still indispensable. As Huang puts it, "A good scholar must know how to ask a good question and how to effectively find the answer. It's not a matter of simply entering some keywords and making a blind search."

After graduating from the Department of Physics at NTHU, Huang obtained a Ph.D. in astronomy from Columbia University in New York. After working several years as a radio astronomer, he began conducting research in the history of science and technology, and now specializes in redology.

In carrying out his philological detective work Huang relies on a solid knowledge of literature and history, rich associative thinking, and big data to solve knotty textual issues. In fact, recognizing his extraordinary detective skills, some of the largest private investigation agencies in Taiwan have sought to hire both Huang and his students.

Huang recently went to Beijing to congratulate Kong Xiangze on his 100th birthday. During his visit he presented Kong with a copy of his latest research report and said that he hopes that before long it will be possible to have the entire *"Feiyizhai Collection"* published.

Cao's kite named "plump swallow" features lions on the wings and tails.



COOPERATION ESTABLISHED BETWEEN COLLEGE OF EDUCATION AND SINGAPORE PUBLIC PRESCHOOLS

The Tsinghua STEAM School has recently been in the news. The recently established STEAM school is distinguished for its innovative approach to interdisciplinary education at the preschool, primary, and secondary levels. Its name is an acronym for the main subjects it teaches: science, technology, engineering, arts and mathematics. As part of the ongoing development of the STEAM curriculum, NTHU has recently entered into a cooperative project with the Singaporean public preschool chain "My First Skool" (MFS) to develop localized textbooks and conduct teacher training. The STEAM School's curriculum and methodology are based on the STEM program implemented by the National Science Foundation (NSF) in the United States, with art as an additional subject. The emphasis of the STEM program is on interdisciplinary education, practical experience, and hands-on learning—an approach which has rapidly become a global trend in education.

The three-year agreement was signed on July 19 at a ceremony held at the Learning and Sharing Festival at the Marina Bay Sands Convention Center in Singapore. The agreement was signed by NTHU President Hocheng Hong and Professor Lin Chi-hui, dean of the College of Education. MFS was represented by Chen Zhicheng and Cheng Ailing of NTUC Singapore.

Hocheng said that Chinese societies have always attached great importance to education, and that even while the birthrate continues to fall in Singapore, the quality of preschool education continues to improve. He also stated that the cooperative project with MFS is expected to make a major contribution to the quality of teacher training provided by NTHU's College of Education. During his speech, Hocheng said that one of the goals of STEAM School is to provide students with excellent education in science, engineering, and the arts, thereby obviating the need for supplemental classes after school and on weekends.

Assistant Professor Chiu Chia-hui of NTHU's Department of Early Childhood Education participated in the Learning and Sharing Festival along with ten of her students.

Also attending the ceremony was Singapore's Minister for Social and Family Development, Desmond Lee, who said that as a father of three children, he gives much importance to early childhood education and that public preschools help disadvantaged children get off to a good start in life by providing them with equal access to quality education.

Wang Tzu-hua, associate dean of College of Education said that MFS was established as a public preschool by NTUC in 1977 and currently has more than 140 kindergartens. He also said that the overall plan is to integrate the MFS approach into the current curriculum of the STEAM School, as well as the College of Education's teacher training program. He also mentioned that the STEAM School has already developed two localized English courses which are gradually being introduced into other kindergartens.

Also attending the three-day Learning and Sharing Festival was Assistant Professor Chiu Chia-hui of NTHU's Department of Early Childhood Education, along with ten of her students. A total of 1,800 preschool teachers from Singapore participated in this grand event emphasizing the joy of learning and sharing.

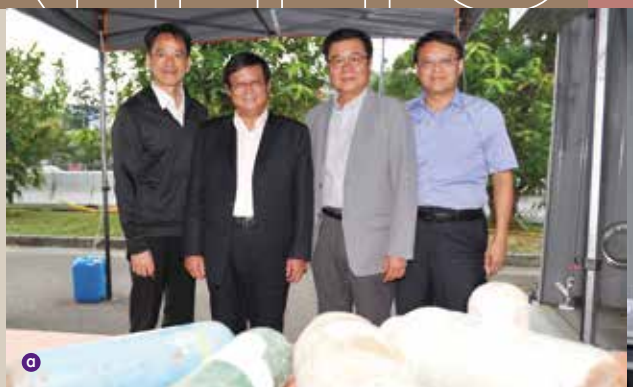
The math-learning game designed by Department of Early Childhood Education helps children to develop a sense of numbers, order, and space, and also enhances their ability to reason and to solve problems.

ⓐ Singapore's Minister for Social and Family Development Desmond Lee presenting NTHU president Hocheng Hong with a plaque commemorating the cooperation between NTHU and MFS.

ⓑ Demonstration at the Learning and Sharing Festival of the nutritious lunch provided at public preschools in Singapore.

ⓒ Hocheng (left) and Lee (right) trying out the math-learning activity designed by the NTHU's Department of Early Childhood Education.

NTHU was the only foreign University invited to present a panal on teaching methodology at the event, and Chiu and her students demonstrated a game they developed for teaching math to children aged 3 to 5 years old. Chiu said that in this game students learn computational thinking by taking no more than eight steps on floor pads of different colors while avoiding various obstacles. She explained that this game helps children to develop a sense of numbers, order, and space, and also enhances their ability to reason and to solve problems.



ⓐ The disposal project's supervisory team (left to right): Chiu Jen-chieh, Chang Tzi-chin, Lyu Ping-chiang, and Hsieh Yein-rui.

ⓑ Senior vice president Lyu Ping-chiang (left) personally thanking Chang Tzi-chin for the EPA's assistance in the disposal project.

NTHU TAKES THE LEAD IN THE SAFE DISPOSAL OF OLD GAS CYLINDERS

In many university laboratories we can find numerous old gas cylinders, often corroded and lacking clear labeling, and sometimes these hidden time bombs explode. With guidance and subsidies provided by the Environmental Protection Agency (EPA) and the Ministry of Education (MOE), beginning last year NTHU has safely disposed 61 such cylinders by puncturing them and neutralizing the toxic gases inside. During the process NTHU has also established a standard operating procedure for the safe disposal of old gas cylinders, and this is being made available to other universities and laboratories in Taiwan.

Ten years ago when one of NTHU's labs was being dismantled, and in the depths of one of the storerooms about a dozen unidentified gas cylinders were discovered, some of which were covered with rust and had valves that couldn't be opened. Further investigation revealed that many of the laboratories on campus had such "orphaned" cylinders, some of which were placed in busy corridors, constituting an accident waiting to happen.

Hwang Kuo-chu, the deputy director of NTHU's Environmental Protection and Occupational Safety Center (EPOSC), said that the gas remaining in old cylinders can be roughly classified into three categories: combustible, corrosive, and toxic. For example, a leaking fluorine gas cylinder tends to produce highly corrosive hydrofluoric acid. Even more dangerous are the colorless and odorless phosphine and arsine—the key ingredients of nerve gas, a single whiff of which can be fatal. Moreover, the high pressure inside a cylinder means that it can easily explode if not handled properly. In principle, each gas cylinder should be clearly labeled, and when it's empty or no longer needed it should be returned to the supplier for processing. However, it sometimes happens that the supplier is unknown or has gone out of business; in light of such inevitabilities, there should be a centralized processing facility, but currently such a facility doesn't exist in Taiwan. To deal with this hidden danger, NTHU turned to the EPA and MOE for assistance.To assist this project, the EPA has provided a variety of imported equipment, including a device for safely puncturing cylinders with frozen valves and transferring the contents into a new container, as well as a chemical analysis device for determining the contents.

After the old cylinder is sealed within the airtight vessel, an inert gas is introduced into the chamber; then the cylinder is punctured with a spike fitted with a special gasket which prevents the production of sparks. Once the contents of the old cylinder is transferred into a new container and positively identified, the procedure for safely neutralizing it is determined:

c An old cylinder being inserted into an airtight rupture vessel for safe processing.

d After removing the contents, some cylinders have to be soaked in water to neutralize any residual toxins.

combustion, washing with water, adsorption, or chemical reaction. The whole procedure resembles that used for disabling unexploded bombs.

EPOSC engineer Tu Chia-lin said that even when using proper procedures and specialized equipment, there is always a certain sense of apprehension when puncturing a cylinder holding an unknown substance. Thus they began the operation by dealing with relatively low-risk cylinders, gradually honing their skills before finally dealing with the 21 cylinders containing highly toxic gas. During the process they actually discovered that some of the cylinders were mislabeled.

The project was made possible by funding and technical guidance provided by the EPA and MOE; NTHU itself spent NT$3.5 million on the clean-up project. Vice President of General Service Yan Dung-yung said that the project could not have been brought to a successful completion if not for the diligent efforts of his last three predecessors, especially Lee Min and Lyu Ping-chiang, who solved a variety of difficult legal and technical problems.

The handling of cylinders with unknown contents was personally supervised by Minister of EPA Chang Tzi-chin, Toxic and Chemical Substances Bureau general director Hsieh Yein-rui, and MOE's senior specialist Chiu Jen-chieh. Chang said that the most difficult part of the operation was convincing faculty members to hand over the old cylinders, adding that Tsinghua has done a particularly good job in this respect, and that its approach can also be used by other universities.According to Hsieh, many universities in Taiwan have stockpiles of unidentified chemicals, many of which are toxic or explosive, which need to be properly disposed of—sooner rather than later.

Senior vice president Lyu Ping-chiang said that some of these unidentified gas cylinders are over 30 years old, and could explode at any time. He also thanked the EPA for making such a concerted effort in dealing with this hidden menace.

A total of 61 old cylinders have already been safely processed.

a

b

A NEW ERA OF MODERN ART AT NTHU

Many top universities around the world have an on-campus art gallery, such as Princeton in the U.S., and before long NTHU will also have one. Thanks to a major donation from alumnus Hsieh Hong-liang, a world-class art museum will soon be built next to the large lawn on the south side of the campus; it will be named the Hsieh Hong-liang Museum of Modern Art, and will be the first of its kind in Taiwan.

A futuristic museum and a new landmark

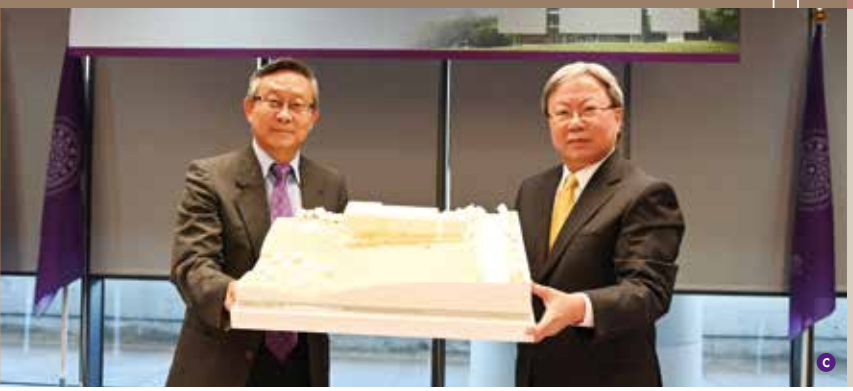
The Museum has been designed by a team of architects led by Kuo Hsu-yuan and Effie Huang to have the appearance of three boxes rising out of the greenery opposite the Tsinghua Laboratory. The building will be situated on a gentle slope and will be reminiscent of the Guggenheim Museum in New York. The Museum is expected to be completed in 2022 and is destined to become a new landmark in Hsinchu and beyond.

The earth-colored Museum will have two-stories above ground and one below, providing about one thousand ping (3,300 square meters) of floor space. Situated between the lawn and a copse, the environmentally friendly building is designed to seamlessly blend into the natural landscape. The exterior walls of the first floor will be in the form of a glass curtain, and the elevators and stairs will also use transparent materials, allowing the greenery and natural light to enter the interior space. A cafe will be situated so as to provide a clear view of the public art piece *Confrontation*, *Conversation* located in the Go Garden, and is sure to become a popular place for admiring the sunset and moonrise.

An art connoisseur and philanthropist

Hsieh Hong-liang graduated from the Department of Physics in 1973, and is now the chairman of the Scientech company. A long-time connoisseur of art, he has previously donated from

Hsieh said that he expects the new art museum will be a major boon to the cultural life of Hsinchu.



ⓐ President Hocheng Hong (left) thanking alumnus Hsieh Hong-liang for donating the funds for building the new Museum, a simulated image of which is on the lower left.
ⓑ At the donation ceremony (left to right): Alumni Association President Cai Jinbu, Hocheng, Hsieh, and Alumni Association Honorary President Xie Yongfen.
ⓒ Hocheng (left) and Hsieh holding a model of the future Museum.

his personal collection a replica of Rodin's *The Thinker (Le Penseur),* which is on display next to the Main Library.

During the donation ceremony held on campus Hsieh said that, in recognition of the Buddhist teachings on returning to the source, he was initially considering having the Museum built in Yilan, where he grew up, but was eventually persuaded by President Hocheng Hong's persistent entreaties to have it build at NTHU. His intention is to establish an art museum which combines technology and the humanities, so that the building itself will be regarded as a work of art.

Hsieh also said that the prevailing materialistic attitude in Taiwan has resulted in distorted values and a general decline in morality. So when he heard about the Chun-shan UMC Concert Hall currently being built on campus, he realized that an art museum would be an ideal complement to the new Concert Hall, and that together they would make a significant contribution to the cultural and spiritual climate in Taiwan.

President Hocheng said that NTHU is most grateful for Hsieh's generous donation, and that the NTHU community has three prominent art and antique collectors. One is Professor Yang Rur-bin, whose collection is strong in historical and cultural relics; another is Professor Li Chia-wei, who collects religious images, specimens, and fossils. The third is Hsieh, and although his collection is not as well known as that of the other two, it's also world-class. Hocheng added that soon NTHU will be the only university with a College of Arts and a major art museum, thereby placing it at the forefront of art and art education in Taiwan.

The architect Kuo Hsu-yuan said that the basement of the Museum will serve as the permanent exhibition area, the first floor will have a lecture hall and coffee shop, while the third floor will consist of three special exhibition areas that can be combined or used separately.

President Hocheng said the NTHU will be the only university in Taiwan with its own art museum.

Chen Sheng-ping (center) with his parents.

NTHU FRESHMAN SIGNS UP WITH US BASEBALL TEAM

Chen Sheng-ping, a freshman in the Department of Sports Science, recently become the first student in the history of NTHU to join an American professional baseball team. On July 2 it was announced on the official website of the Arizona Diamondbacks that Chen has been signed up as a shortstop for its minor league team. After graduating from Hsinchu's Chengde High School last month, Chen was admitted to the Athletics Competition Group of NTHU's Department of Sports Science.

NTHU president Hocheng Hong heard the news while on a trip abroad, and upon returning he immediately had a meeting with Chen, during which he congratulated Chen and assured him that NTHU is willing to support him in every way it can.

Last year NTHU's Sports Technology Center was set up by Wu Cheng-wen, distinguished chair professor of the Department of Electrical Engineering, who was a famous pitcher in his youth. Wu has recruited 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 teachers, to create a baseball training system making use of the latest advances in artificial intelligence. Hocheng said that the Sports Technology Center is planning to record the postures used by Chen while batting, throwing, catching, etc., all of which will be entered into a database and used to help him improve his performance. NTHU launched an experimental program which allows students to propose their own course of study with on- or off-campus curriculum, and academic credit can be earned for off-campus and overseas experience. Thus it will be possible for Chen to simultaneously pursue his academic and baseball careers.

Chen is an equally talented batter and fielder.

Chen wearing his Arizona Diamondbacks jersey.

Chen said that his interest in baseball began as a young boy, when he used to watch his father playing softball and help out with carrying the equipment. By the time he started school he already had a passion for baseball. His parents agreed to allow him to transfer to an elementary school with a baseball team, and his talent soon became obvious. "At first," said Chen, "I set my sights on a career in Taiwan's Chinese Professional Baseball League, so when I was offered a contract with an American team I was amazed and overjoyed!"

Chen's family has always been highly supportive of his dream to become a professional baseball player. He recalls how his father used to exhort him by saying, "If you're set on playing baseball, then give it all you've got, and don't give up."

Chen has long been in the limelight for being a versatile player due to the fact he can play all nine positions on the field, including pitcher and catcher. Last year he was selected as the most valuable player in both the NIKE Taiwan Youth League training camp and the Fubon U-18 Future Star Game. For signing up with the Arizona Diamondbacks, Chen received a bonus of US$300,000.

From left to right: NTHU baseball coach Lin Kun-han, Department of Sports Science director Chiu Wen-hsin, NTHU senior vice president Chou Hwai-pwu, Hocheng Hong, Chen Sheng-ping.

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Graduate Program : August 15 to October 15
Undergraduate Program : August 15 to October 15

Exchange Student
Fall Semester Application: February 1~ April 15
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