

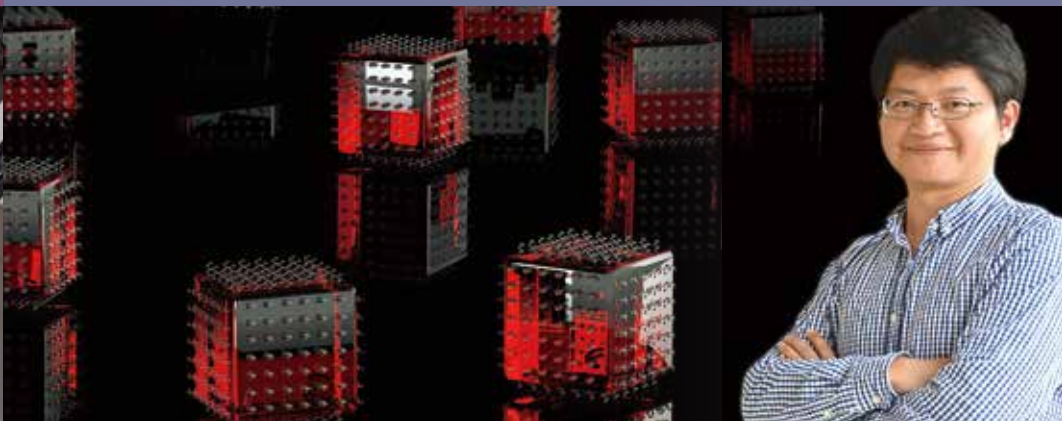
清華

NATIONAL
TSING HUA
UNIVERSITY



NEWSLETTER

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AN ONLINE GRADUATION CEREMONY

In light of the ongoing pandemic, this year's graduation ceremony was held online—a first for National Tsing Hua University. The event was made all the more memorable with two additional firsts for NTHU: the commencement speaker was the youngest ever in NTHU history, and it included the first batch of students in the new experimental education program in Taiwan.

This year NTHU awarded bachelor's, master's, and doctoral degrees to a total of 4,975 students, and participation was on-line only. Donning a doctoral gown, President Hocheng Hong gave his graduation address in the International Conference Hall at the

Learning Resource Center, which was empty but for the school flags and banners.

Ideals in action

The theme of President Hocheng's address was "action," and he encouraged this year's graduates to hold fast to their dreams and to put them into practice with unswerving perseverance.

Commenting on the NTHU school motto, "Self-discipline and social commitment," Hocheng explained that it serves as a reminder to turn knowledge into action, to never give up, and to always live up to your highest ideals.



The primacy of altruism

This year's commencement speech was given by public interest prodigy Shen Hsin-ling (沈芯菱). Shen earned her bachelor's degree from the College of Humanities and Social Sciences nine years ago, and at the age of 31, she is the youngest commencement speaker in the history of NTHU. Since beginning her public service work at the age of 11, Shen has established various social welfare organizations which have contributed more than NT\$9 million to various worthy causes.



- a. In his address, President Hocheng Hong exhorted this year's graduates to hold fast to their dreams and to put them into practice with unswerving perseverance.
- b. Student representative Lin Fangru (林芳如) of the Interdisciplinary Program of Humanities and Social Sciences delivering her address.

In addition, she has given a total of 1,037 speeches at rural schools, during the course of which she has traveled some 400,000 kilometers.

In her speech Shen spoke about the importance of altruism, and said that when she began her studies at NTHU one of her professors said, "Congratulations on being admitted to NTHU; one thing you need to consider carefully is how your studies here will be of benefit to society at large." She suggests that we dedicate more time and resources to public service as we get older, beginning with 20 percent of our time and resources at the age of 20, and increasing this year by year, so that it reaches 60 percent at the age of 60.

Shen advised this year's graduates to place "self-discipline and social commitment" at the center of their lives, and to pass it on to the next generation of graduates.

At the vanguard of experimental education

In 2018 NTHU launched the first experimental education program in Taiwan, which allows students to design their own curriculum so as to meet their interdisciplinary interests. A total of seven sophomores joined the program's first batch; the four who have already completed the graduation



c. This year's commencement speech was given by NTHU alumna Shen Shen-ling (沈芯菱); at the age of 31, she is the youngest commencement speaker in the history of NTHU.



d. Lin Fangru (right), a 2021 graduate of the Experimental Education Program, hosting an international forum on innovative education.

requirements are Lin Fangru (林芳如), Chen Tsojen (陳佐任), Wu Huanran (吳煥然), and Yang Funing (楊馥寧); the remaining three are scheduled to graduate at the end of the next semester.

Lin began home-schooling during high school, and was admitted to NTHU via the Special Admissions Program. Her studies focus on home-schooling, society and culture, and social entrepreneurship. In the past four years she has participated in several forums on innovative education, interviewed teachers and parents from around the world, and served on the Ministry of Education's Experimental Education Council. She also writes the newspaper column "Flipped Education," in which she explores a variety of issues facing students in experimental education programs.

Lin's mentor is Chen Yiguang (陳怡光), who said that lots of students and parents participate in the experimental program out of dissatisfaction with the current state of education, yet doing things differently is rarely easy. Lin dedicated seven of her academic credits to designing an experimental education project, conducted at an elementary school in Sichuan over the course of 17 days. She also wrote the teaching plan, raised funds, and recruited assistants. She said that experimental education is much more challenging than the conventional approach consisting of sitting in class, listening to lectures, handing in homework, and taking exams. In recognition of her accomplishments she was awarded NTHU's "Chasing Your Dream" Scholarship.

Lin said that NTHU is a pioneer in experimental education, and that the Program is constantly evolving. During the course of the Program she learned how to communicate with people from different regions and different generations, and also learned how to solve problems by patiently making whatever adjustments that are required. For Lin, these abilities are essential for a successful career.

Chen Tsojen is very clear about the mode of learning that suits him best, and it's not the typical one, which is why he chose the

experimental education program. Chen's course of study integrates mechatronics with a variety of areas, including robotics, racing, and aeronautics. His self-designed three-year curriculum includes courses in power mechanical engineering, electrical engineering, and computer science, as well as several practicums.

Chen is a member of the Robotics Team of the Department of Power Mechanical Engineering and is the Asia and Oceania representative of the Infiniti race car engineering education project, in which

capacity he went to the UK for a yearlong training course, along with representatives from Europe, the United States, Canada, Mexico, China, and the Middle East. At the end of the program he was awarded the project's highest rating. His graduation thesis was on rocket science.

Also admitted to NTHU via the Special Admissions Program, Wu Huanran specializes in ballroom dance. He began to study dance at the age of 6, and has served as a consultant for numerous dance companies. He plans to start a business in ballroom dance,



2021 graduates of the Department of Quantitative Finance.

and is doing coursework in management, physical education, psychology, and performing arts. He has studied ballroom dance with a number of prominent dancers in Taiwan and abroad, and his graduation thesis was on ballroom dance choreography.

Wang Chin-shou (王俊秀), the associate dean of the College of Humanities and Social Sciences, advises Wu and two of the other students in the Experimental Education Program. Wang periodically has all three attend a meeting with him to share their experience and to advise them on how to make the most of their time at NTHU by getting acquainted with various fields.

"Evaluations in experimental education are like an open book exam, with no standard answers," said Wang, who conducts oral



e. Wu Huanran(吳煥然) (right), a 2021 graduate of the experimental education program, teaching a class in ballroom dance at the Johan School in Chubei.
f. Chen Tsojen(陳佐任), a 2021 graduate of the experimental education program, preparing a rocket launch at the Hsiangshan Wetlands in Hsinchu.

exams with his experimental education students at the end of each semester, and emphasizes that learning is what counts the most.

Yang Funing specializes in management and marketing, and has taken numerous courses on the foreign online platform Coursera. Her graduation thesis was on organizational reform. Although she had to make major revisions to complete her thesis, she was impressed with all the support she got from the school along the way.

Vice president for academic affairs Chiao Chuan-chin (焦傳金) said that the experimental education program has now completed its third year. It was originally started because many students admitted to NTHU via the Special

Admissions Program were having difficulty finding a suitable course of study amongst the existing departments and programs, but now the Experimental Education Program is open to all students. Experimental education students currently only account for 0.5 percent of the student body, but it's the best choice for those who are self-directed and require lots of flexibility in their studies.



SELF-HEALING QUANTUM EMITTER WITH UNPRECEDENTED BRIGHTNESS

Although perovskite quantum dots (PQDs) are rising stars among quantum emitters, their inherent instability has limited their development. Now, Prof. Hao-Wu Lin (林皓武) of the Department of Materials Science and Engineering, Prof. Chih-Sung Chuu (褚志崧) of the Department of Physics, and Prof. Richard D. Schaller of the Department of Chemistry at Northwestern University have jointly developed PQDs with high stability and self-healing ability by applying a simple and cost-effective procedure: spray synthesis. Their PQDs display unprecedented single-photon brightness; indeed, they have broken the world-record for the brightest room-temperature quantum emitter material—a major breakthrough for quantum information processing.

Lin says that, in contrast to other quantum emitters, PQDs can realize single-photon emission at room temperature with excellent optical properties, including high quantum yield and high single-photon purity, making them ideal for future quantum computing and quantum communications. In recent years, PQDs have attracted considerable attention from international researchers, who have been hoping to extend the stability of the materials to beyond only a few minutes under excitation.

The traditional method of preparing PQDs involves directly mixing two different solutions in a flask. Instead, Lin's research team employed a spray-synthesis method to greatly increase the contact area of the reactants and to grow a uniform protective organic layer on the surface of each PQD. The resulting PQDs retained their

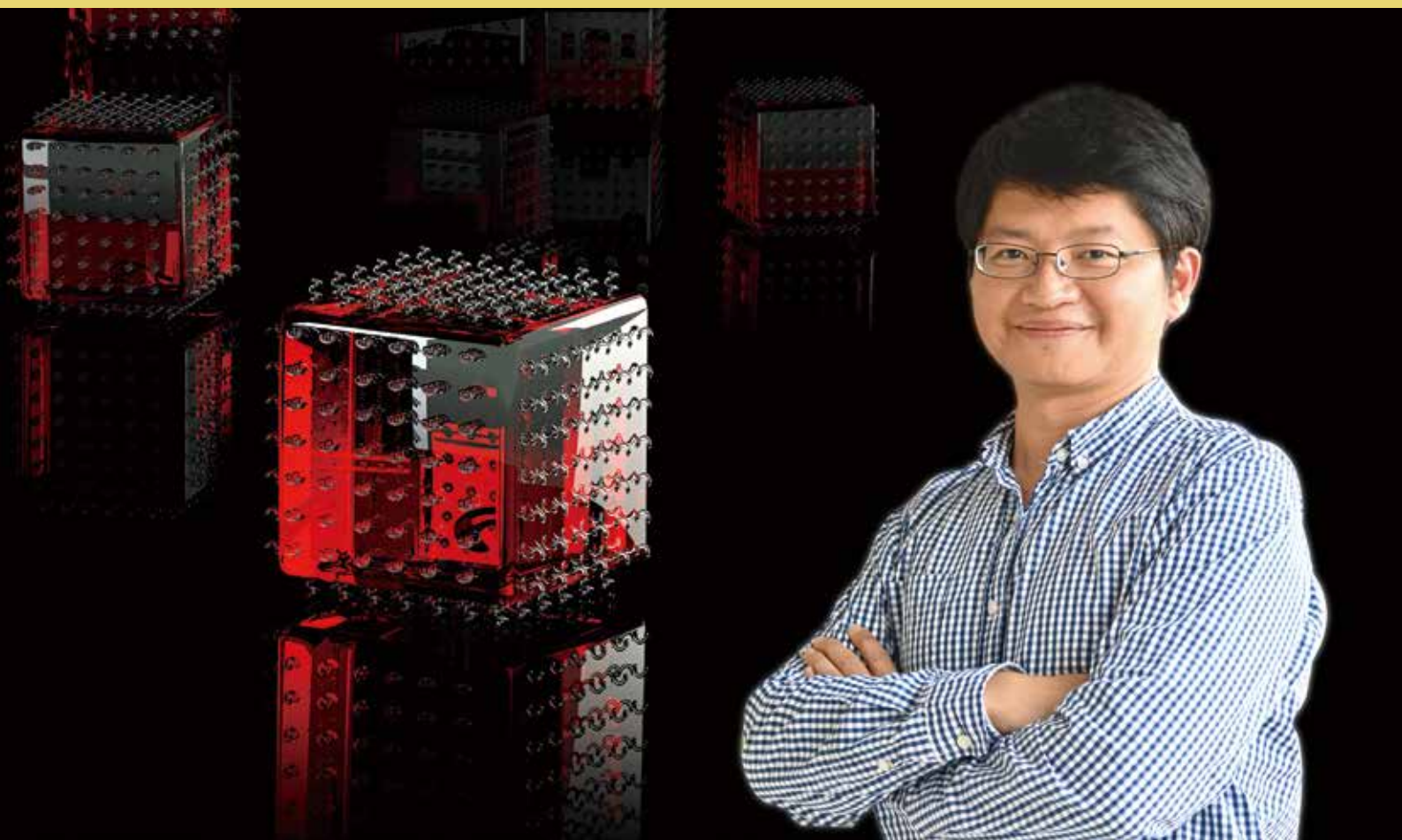
brightness even after 24 hours of continuous excitation under intense light—a dramatic improvement in stability.

A surprising finding is that these spray-synthesized PQDs have a unique self-healing ability. Although the PQDs experienced damage and decay when excited under light of extremely high intensity, they retrieved their original brightness after a break of several minutes. The team's research appears in the prestigious international journal *ACS Nano*, gracing the cover of the most recent issue.

Lin compares the preparation of these quantum dots with making dumplings. Some have tried using different ingredients, others have tried using thicker wrappers, and still others have tried doubling the wrappers, but his team simply focused on perfecting the method of wrapping the dumplings.

- a. Prof. Lin Hao-Wu of the Department of Materials Science and Engineering has played a key role in developing the world's brightest quantum light source at room temperature.
- b. Prof. Lin Hao-Wu of the Department of Materials Science and Engineering has developed a spray-synthesis method for preparing perovskite quantum dots by uniformly coating them with a protective organic layer.
- c. Doctoral student Hsu Bo-Wei is the first author of the journal paper





The first author of the journal article is Bo-Wei Hsu (許博惟), a doctoral student at NTHU. Recalling the moment he discovered the self-healing of PQDs, Hsu said, "Following a period of strong excitation, the PQDs gradually dimmed, but after a short while they recovered

their original brightness—and I could hardly believe my eyes!" Hsu performed the experiments repeatedly, eventually convincing himself that the PQDs did indeed possess this self-healing ability.

Lin notes that their spray-synthesized perovskite quantum emitter requires only about

1% of the excitation intensity needed by other quantum emitters, and provides a single-photon brightness exceeding 9 million photons per second—a new world record. In addition, the single-photon purity was

quite high, reaching 98%. With such excellent performance—high single-photon brightness, high single-photon purity, and high stability—their perovskite quantum emitter is a promising material for future application in quantum computing and quantum communications.



NTHU ASTRONOMER HUNTING FOR GHOST PARTICLES

Astronomers used to speculate that when a fixed star is swallowed by a black hole, it produces high-energy neutrinos that are a thousand times stronger than the particles produced by the most powerful particle collider now in use. However, neutrinos are difficult to detect, so much so that they are frequently dubbed as "ghost particles." Thus it was with no small measure of excitement that astronomers recently reported having observed neutrinos emitted from a fixed star torn apart by a black hole 700 million light-years away from the earth, constituting a major advance in our understanding of the origin of the universe. Amongst the research team was Prof. Albert Kong (江國興)

of NTHU's Institute of Astronomy. Kong's research was conducted in cooperation with the German Electron Synchrotron research center (DESY), and carried out under the auspices of the Shooting Star Project of the Ministry of Science and Technology.

Neutrinos are elementary particles, but they rarely interact with other types of matter, making them difficult to detect, and this was only the second time that astronomers have detected neutrinos from outside the Milky Way. This major astronomical discovery was featured in last month's edition of the *Nature Astronomy*.

Prof. Kong said that in April of last year, astronomers observed a fixed star being swallowed by a huge black hole in the center of the constellation Delphinus. The black hole had a mass 30 million times greater than that of the sun,

and when this unfortunate star approached it, it was first stretched out like a noodle by the tidal force produced by the gravitational pull, and then it was torn apart. About half of the star's fragments were sucked into the black hole, generating a high temperature and emitting a stream of particles, producing a dazzling light which illuminated the entire galaxy.

Astronomers speculate that when particles are spewed out at close to the speed of light, they sometimes collide with other particles and light to produce high-energy neutrinos, but this has never been confirmed. In October of last year, six months after the fixed star was torn apart, a high-energy neutrino was observed by the IceCube Neutrino Observatory established in Antarctica by the US National Science Foundation. While following its trajectory, it was discovered that it came from the exact position where the black hole in the constellation Delphinus swallowed the fixed star six months ago.

An international team composed of researchers from Taiwan, the Netherlands, the United States, the United Kingdom, and Sweden, and led by Dr. Robert Stein of DESY, is analyzing gamma rays, X-rays,



Working with an international team of astronomers, Prof. Albert Kong (江國興) of NTHU's Institute of Astronomy has observed neutrinos emitted from a fixed star torn apart by a black hole.



a. Kong in the observatory making an observation.

b. Simulation of the particle stream produced when a fixed star was swallowed by a huge black hole in the constellation Delphinus in 2019.

ultraviolet light, visible light, and radio waves in an attempt to confirm that these high-energy neutrinos were produced when the black hole engulfed the fixed star.

Kong's role in the project is the analysis of the X-ray data. He said that the X-rays generated by the fixed star as it was being swallowed by the black hole decayed at an unprecedented rate, preventing the research team from witnessing the powerful jet of particles, and that this was most likely due to one of two causes: the disk-like structures orbiting the star cooled at a very high speed, or the X-rays were quickly absorbed by the gradually increasing peripheral gases.

Kong said that although neutrinos have a ghost-like unpredictability, whenever one arrives from the depths of the universe it brings with it important information about its host star. For, as long as it is paired with observable electromagnetic or gravitational waves, it advances

our understanding of the physical mechanisms which generate high-energy neutrinos.

The destruction of a fixed star by tidal forces as it approaches a black hole is known as a tidal disruption event (TDE). The TDE which occurred in April 2019 in the 2MASX J20570298 + 1412165 galaxy in the Delphinus constellation was observed by a 1.3-meter automatic telescope at the Zwicky Transient Facility (ZTF) of the Palomar Observatory of the California Institute of Technology. NTHU participated in the establishment of the ZTF.

Kong has been an avid star watcher since boyhood, and while growing up in Hong Kong he constantly implored his parents to take him out to a park with a good view of the sky to observe the moon and to look for comets and meteor showers. While still

in junior high school he got his first pair of binoculars and joined the school's astronomy club. After earning a bachelor degree in mathematics, he obtained a Ph.D. in astrophysics from Oxford University in the United Kingdom. He conducted his post-doctoral research at the Harvard-Smithsonian Center for Astrophysics and the Kavli Institute for Astrophysics and Space Research at the Massachusetts Institute of Technology (MIT).

Like many astronomers, Kong really enjoys observing celestial bodies, and one of his favorite ways to unwind after a long day of crunching data on the computer is to go outside for some stargazing. Kong is also a member of the Kamioka Gravitational Wave Detector (KAGRA) project working to unravel the mystery of gravitation waves.

JOINT TSINGHUA-LIVERPOOL RESEARCH TEAM DEVELOPS RECHARGEABLE CALCIUM-AIR BATTERY

Due to their high energy density, environmental friendliness, and low cost, metal-air batteries are one of the most promising power sources of the future. A joint Tsinghua-Liverpool research team has recently developed a new type of metal-air electrochemical cell—a rechargeable calcium-air battery—which represents a major stride forward in battery technology.

Their research has been published in the latest issue of *Chemical Science*. The first author is Lu Yiting (盧奕廷), a joint PhD student at Tsinghua and Liverpool, whose advisors are Prof. Hu Chi-chang (胡啟章) of the Department of Chemical Engineering at NTHU and Prof. Laurence Hardwick of the Department of Chemistry at

the University of Liverpool. Also participating in the project was Liverpool postdoctoral researcher Alex Neale.

A major breakthrough in battery storage

Prof. Hu said that the rechargeable lithium-ion batteries currently in widespread use have a limited storage capacity and are liable to explode at high-voltages. Thus lots of researchers are working on developing a better type of battery for use in electric vehicles and for storing the electricity produced by wind turbines and solar panels. Their focus is on metal-air batteries using such materials as zinc, lithium, sodium, potassium, and

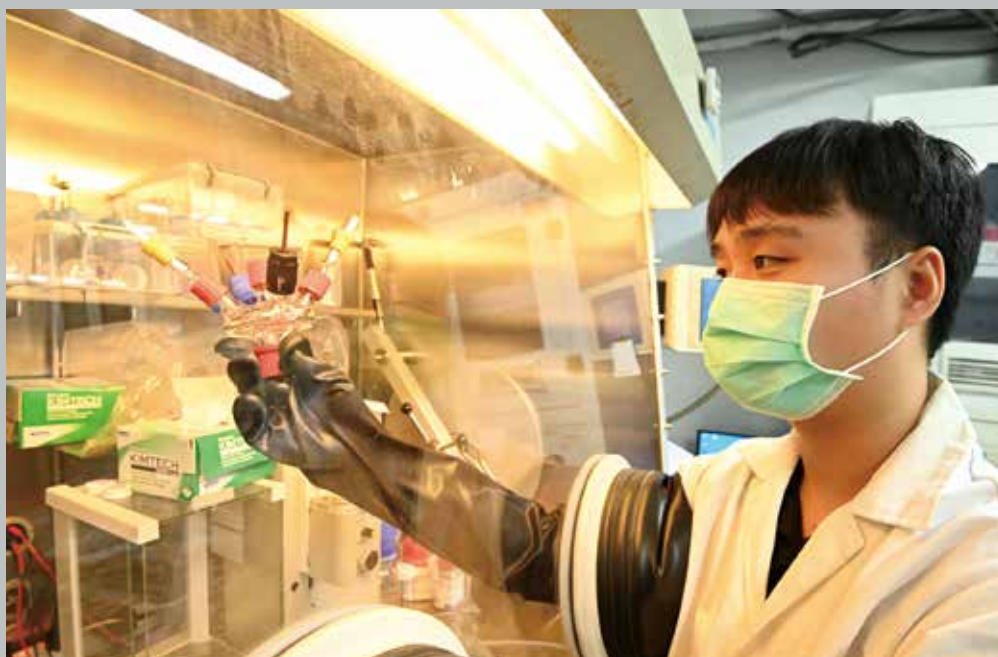
even calcium, magnesium, and aluminum. The advantages of the calcium-air battery are its small size and high storage capacity—five times that of traditional lithium-ion batteries. However, the feasibility of the calcium-air battery has long been hampered by one major drawback—it can't be recharged.

Lu Yiting explained that a metal-air battery is a type of electrochemical cell that uses a relatively active solid state metal as the negative electrode, and a porous carbon material in contact with the air as the positive electrode. When the metal of the negative electrode is oxidized, the oxygen in the positive electrode is reduced, generating an electric current.

- a. Lu Yiting (盧奕廷) (fourth from left) with the Liverpool research team led by Prof. Laurence Hardwick (fifth from right), including postdoctoral researcher Alex Neale (third from right).
- b. Lu in his lab holding the apparatus he designed for measuring electrochemical reactions.



After completing his first year of doctoral studies at NTHU, Lu enrolled at the Stephenson Institute for Renewable Energy at the University of Liverpool in September 2018. Under the guidance of Prof. Laurence Hardwick, he began doing research on the electrolyte used in the calcium-air battery.



Lu in the lab at NTHU.

The first time he went into the laboratory he performed 100 charge and discharge cycles, but the results were completely different from those obtained in the past. Lu found that when a single electrode is repeatedly charged and discharged, in the first two or three cycles it can't accept a charge, but after a few dozen cycles it gradually begins to partially charge and discharge.

Since no one had ever successfully used a calcium-ion electrolyte to charge and discharge a battery, Lu wondered if something went wrong with the experiment, or if he had discovered something new. He immediately informed his advisors, and over the course of the following year the research team conducted a series of experiments

aimed at uncovering the mechanism behind this exciting new phenomenon. In seeking a new path on the positive electrode, calcium-ions form a distinctive calcium oxide interface on the surface of the electrode, within which are confined the reduction product of the oxygen, known as superoxide.

This allows the battery to be repeatedly oxidized and reduced, so that it can be continuously charged and discharged.

Alex Neale said that by using electrochemical and spectroscopic experiments, they began to understand this surprising storage mechanism which makes it possible to recharge a calcium-air battery.

Hardwick said that the next phase of the team's research focused on designing a battery system which could use this newly discovered charging mechanism. He added that it was the cooperative research model they utilized that made their discovery possible, and that there are plans for even closer cooperation in the future.

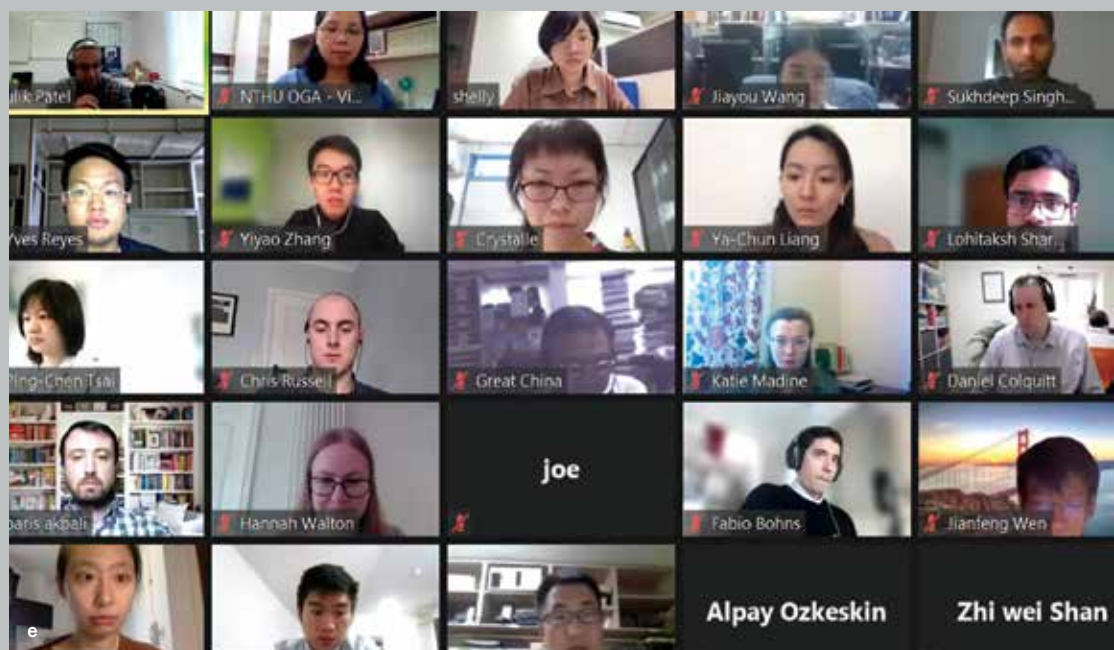


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Prof. Hu believes that the discovery of this new storage mechanism may generate similar research on other types of metal-air batteries. He said that he is particularly grateful to Taiwan's Ministry of Science and Technology and the UK's Engineering and Physical Sciences Research Council (EPSRC) for their support, and that he is looking forward to seeing the practical application and mass production of calcium-air batteries in the near future.

There's no stopping perseverance

Lu was the first student at Banqiao High School to score a perfect 75 in the university entrance exam.



He then entered the Department of Chemical Engineering at NTHU and graduated at the top of his class, whereupon he entered the Tsinghua-Liverpool joint-degree doctoral program, and will graduate in July, at the age of 25.

Hu said that what impressed him most about Lu has been

his enthusiasm for research, his perseverance in carrying it out, and his willingness to do basic research, rather than only working on applications. Lu's original plan was to conduct research at Liverpool University for two years, but due to the pandemic he had to return to Taiwan half a year early. In order to continue the unfinished experiment, he spent several months personally looking for a manufacturer to custom make a set of lab equipment similar to what he was using at Liverpool.



- e. Participants in the Tsinghua-Liverpool joint degree program holding an online conference in May.
- f. Lu presenting his research results at a Tsinghua-Liverpool joint conference.
- g. Group photo at the 2018 Tsinghua-Liverpool joint conference held at NTHU.

Once his lab was up and running, Lu and his associates at Liverpool embarked on what seemed like a non-stop relay race, due to the time difference between Taiwan and the UK. Working round the clock, they managed to complete their research in three months.

Lu thanked both NTHU and Liverpool for providing an abundance of guidance and support. He said that the Department of Chemical Engineering at NTHU emphasizes engineering and practical results, while the Department of Chemistry at Liverpool prioritizes theoretical chemistry and the spirit of inquiry. For Lu, one of the main benefits of doing a dual degree was that it gave him a more comprehensive understanding of his field.

gone in the opposite direction, indicating the excellent research environment at NTHU.

Participating NTHU doctoral students spend the first year studying at NTHU, the second and third years at Liverpool, and then

return to Taiwan to complete their dissertation. In addition to a full scholarship covering all tuition fees in Taiwan and the UK, the program also provides a stipend of at least NT\$21,000.



The first ten years of the joint degree program

The Tsinghua-Liverpool joint degree program is now in its tenth year. Vice president for global affairs Yen Ta-jen (嚴大任) said that the program has so far admitted 39 doctoral students, 13 of whom have already graduated. Their research fields include mechanical engineering, chemical engineering, computer science, physics, and economics. Interestingly, the number of doctoral students at Liverpool who have come to Tsinghua is three times the number who have

NTHU CELEBRATES 110 YEARS OF FLYING COLORS

NTHU recently celebrated its 110th anniversary and the 65th anniversary of its reestablishment in Taiwan. The celebration included the launching of "Tsinghua—A New Facebook" to highlight the achievements of notable alumni over the years. Amongst the attendees were ROC vice president William Lai (賴清德) and Hsinchu County magistrate Yang Wen-ke (楊文科).

During the convocation, President Hocheng Hong spoke on "interdisciplinary innovation," the theme of this year's anniversary celebration. He said that the school's first phase, "NTHU 1.0," began with the establishment of Tsinghua College in Beijing, and focused on training talented students to serve as bridges

between China and the West. During the second phase, "NTHU 2.0," which began in the 1960s, the two Tsinghuas—one in Beijing and one in Taiwan—developed separately, first emphasizing science and engineering, and later adding departments in other fields. During the current phase, "NTHU

3.0," the emphasis has shifted to innovation, diversification, and interdisciplinary studies, so as to turn out even more graduates capable of making major contributions to Taiwan and the world.

Vice President Lai said that he has heard that quite a few practicing physicians have come to Tsinghua



a. Raising a toast to NTHU: ROC vice president William Lai (賴清德) (center), NTHU president Hocheng Hong (5th from right), Alumni Association president Tsai Jinbu (蔡進步) (4th from right), former NTHU president Chen Lih-juann (陳力俊) (5th from left), former NTHU president Chen Wen-tsuen (陳文村) (4th from left), and this year's winners of the Outstanding Alumni Award.

b. President Hocheng Hong (center) with the first six alumni featured on the Tsinghua—A New Facebook website.



c. During his speech at the luncheon, ROC vice president William Lai said that in recent years NTHU has become a paragon of cross-disciplinary education and research.

d. President Hocheng Hong spoke on "interdisciplinary innovation," the theme of this year's anniversary celebration.

to study the latest advances in medical technology, since modern medical care requires not only medical skills, but also familiarity with such fields as artificial intelligence.

NTHU is preparing to establish a post-baccalaureate program in medicine, the relevance of which Lai himself clearly recognizes, by virtue of his background in medicine. Indeed, the anniversary luncheon was livened up by the numerous alumni in attendance who expressed their support for the new program by repeatedly chanting in unison "college of medicine."

During his speech at the luncheon, Lai said that in recent years NTHU has become a paragon of cross-disciplinary education and research, adding, "I heard somebody at the Ministry of

Education talking about NTHU and said that its Chinese majors also study law, its electrical engineering majors also study arts, and its biotechnology majors also study business, and that a quarter of its students have two or more specializations." Afterwards, Lai joined the assembled teachers, students, and alumni in cutting the cake and singing "Happy Birthday."

Hsinchu County magistrate Yang Wen-ke was accompanied by a delegation of county officials, all of whom are NTHU alumni. He said that it wouldn't be much of an exaggeration to say that the Hsinchu Science Park was single-handedly established by Shu Shien-siu (徐賢修), the president of NTHU at that time. In reflecting on the prominent role NTHU alumni have come to play in society, he

described it as a manifestation of the school motto, "Self-discipline and social commitment," adding that this is also his own motto.

A lineup of outstanding alumni

NTHU has long had a strong reputation in science and engineering, but amongst its graduates over the years are quite a few prominent doctors, financiers, legislators, and film directors, to name a few. One of the activities organized as part of this year's celebration is called Tsinghua—A New Facebook, in which a group of alumni whose combined years since graduation add up to exactly 110 was assembled and feted at the luncheon. Those in the group included Dr. Yeh Ta-sen (葉大森), the deputy director of the Chang Gung Memorial Hospital in Taoyuan; N.C. Huang (黃男州), CEO

of the E. SUN Commercial Bank; WhosCall founder Jackie Cheng (鄭勝丰); politician Sabrina Lim (林亮君); director Liao Jian-hua (廖建華); and Qingan Elementary School principal Li Jinting (李勁霆).

Kenneth Liu (劉士達) of the College of Arts led a team of students in designing Images Leaping across Time and Space, a work of technological art featuring photos of the early years of Tsinghua in Beijing and its re-establishment in Hsinchu.

By using this piece of interactive art, President Hocheng and a number of distinguished alumni traveled back in time to have their photos taken alongside such prominent Tsinghua personages as Mei Yi-chi (梅貽琦) and Hu Shih (胡適).

On the Tsinghua—A New Facebook website alumni from various fields have extended their best wishes and shared their most unforgettable memories from their time at NTHU. Amongst the contributors are Jackie Cheng, who encouraged everybody to keep up the good work in the area of diversification; Liao Jian-hua, who looks forward to seeing the results of cross-disciplinary education; Li Jinting, who reiterated his commitment to applying the Tsinghua spirit to primary education; N.C. Huang, who applauded the school's interdisciplinary endeavors; and Yeh Ta-sen, who humorously wrote that during his four years in the Department of Power Mechanical Engineering he was no match to his roommate, who was always at the top of the class, so he settled

for a career in medicine. After earning his bachelor's degree from the Department of Power Mechanical Engineering in 1980, Yeh decided to follow his younger brother's example, and switched to medicine. Yeh now serves as the deputy director of the Chang Gung Memorial Hospital in Taoyuan and the chairman of the Taiwan Surgical Association. Yeh said that his training in science and engineering honed his analytical and decision-making ability, and that this has greatly improved his medical practice.

After earning his bachelor's degree from the Department of Power Mechanical Engineering in 1987, N.C. Huang switched to finance, and has been awarded the Asia's Best CEO award several times. Huang said that his training in science and engineering taught him how to effectively analyze and solve problems.



e. NTHU president Hocheng Hong (center) and Alumni Association president Tsai Jinbu (蔡進步)(third from left) with this year's winners of the Outstanding Alumni Award (from left): Y.L. Wang (王英郎), Chris Lin (林鴻明), Wang Chao-liang (王朝樑), Jerry Lu (呂志鵬), and Ken Chen (陳超乾).

f. Hocheng Hong and outstanding NTHU alumni transported back in time by Images Leaping across Time and Space, to have their photos taken alongside such prominent Tsinghua personages as Mei Yi-chi (梅貽琦) and Hu Shih (胡適).



who graduated 31 years ago for dredging and renovating Chenggong Lake, including the construction of a path following the shoreline.

Soon after graduating from the Institute of Technology Management, Jackie Cheng founded Gogolook, and later developed WhosCall, a mobile phone application with anti-fraud and caller identification features. He enjoys sharing his entrepreneurial experience with students.

While still a student at the Institute of Law for Science and Technology, Sabrina Lim participated in various social movements, and is currently a Taipei City Councillor, in which capacity she has been particularly involved with education, youth issues, childcare policies, and long-term care.

Li Jinting graduated from the Institute of Education and Learning Technology and currently serves as the principal of the Qingan Elementary School in Miaoli. He is the youngest

principal in Taiwan, and is actively promoting rural and aboriginal education.

Best wishes from afar

One of the highlights of the celebration was the playing of congratulatory videos made by 21 of NTHU's sister schools overseas, including the University of Tokyo, the National University of Singapore, Shanghai Jiaotong University, Hong Kong University of Science and Technology, RWTH Aachen University in Germany, the University of Paris-Saclay, the University of Zurich, and the National Autonomous University of Mexico. Four additional sister schools sent congratulatory letters, including the Technion-Israel Institute of Technology.

Another highlight of the celebration was the donation of NT\$11 million by alumni

ANNIVERSARY CELEBRATED WITH A CONCERT BY THE DEPARTMENT OF MUSIC

As part of the celebration of the 110th anniversary of the founding of NTHU, and the 65th anniversary of its reestablishment in Taiwan, the NTHU Orchestra and Chorus, consisting of 150 teachers and students from the Department of Music, performed at the National Kaohsiung Center for the Arts (Weiwuying) on May 1—their first performance at a national arts venue since the merger of NTHU and National Hsinchu University of Education (NHCUE). The concert featured a solo performance of Mozart's "Coronation Mass" by Chen Tingyi (陳亭屹), a junior in the Department of Music.

The performance included Shostakovich's Festive Overture and Dvořák's Symphony No. 9 (New World Symphony). The



Chorus was conducted by Department of Music lecturer Yang Yichen (楊宜真), and the Orchestra was conducted by Toni Huang, formerly the assistant conductor of the Taipei Symphony Orchestra and currently the conductor of the Quanta Philharmonic Orchestra.

Despite his slender build, Chen Tingyi has a powerful bass voice.

Amongst the awards he has won this year are the Rising Star Award of the Association of Vocal Artists of the ROC (he was the youngest of the six winners), the first prize in the Taipei South Sea Rotary Club's Vocal Solo Scholarship Competition, and the fourth prize in the Western Opera Scholarship Competition of the Association of Vocal Artists of the ROC.



- a. The NTHU Orchestra and Chorus rehearsing on the eve of the concert.
- b. Members of the NTHU Orchestra rehearsing for the NHTH Anniversary concert.
- c. The concert featured a solo performance of Mozart's "Coronation Mass" by Chen Tingyi (陳亭屹), a junior in the Department of Music.
- d. Members of the NTHU Orchestra rehearsing for the NHTH Anniversary concert.



A tireless vocalist, Chen has previously performed at the National Concert Hall in Taipei and the National Taichung Theater. He said that this was his first performance at the National Kaohsiung Center for the Arts, and the first time he has sung a mass with a full-sized orchestra.

On the evening before the concert, Toni Huang (黃東漢) led the orchestra of budding musicians in an intensive rehearsal at the Department of Music.

Huang said that the merger between NTHU and NHCUE has invigorated the Department of Music by bringing in quite a few students with double majors. In fact, Huang himself graduated from National Taiwan University with a double major in politics and law, before beginning to study conducting at the University of Michigan. He said that music is very much an interdisciplinary field, encompassing logic, acoustics, physics, and mathematics, and that his after-class discussions

with his students covers a wide range of topics related to music.

One of the things Huang enjoys most about teaching is his students' thirst for knowledge, their curiosity, and their eagerness to challenge established ways of doing things, in connection to which he said, "Last semester, while conducting a student rehearsal of Dvořák's Symphony No. 8, it seemed as if I was hearing it for the first time, even though I've heard it countless times before!"

Wei Chunghsuan (魏崇軒) plays the tuba in the NTHU Orchestra, and has a dual major in music and technology management. He said that interdisciplinary studies have enhanced his field of vision and analytical ability, and have also strengthened his skill in music interpretation, adding that the orchestra's performance at one of the nation's premier concert

e. The Orchestra was conducted by Toni Huang (黃東漢), currently the conductor of the Quanta Philharmonic Orchestra.

f. Wei Chunghsuan (魏崇軒) plays the tuba in the NTHU Orchestra, and has a dual major in music and technology management.

g. The program of the concert, held on May 1 at the National Kaohsiung Center for the Arts.

halls is sure to give a major boost to NTHU's reputation as a leading institution in the arts and humanities.

The concert was organized by the Chair of the Department of Music, Chang Fang-yu (張芳宇) who said that ever since the merger between NTHU and NHCUE in 2017, the quality of her students has been improving, such that the orchestra has undergone significant growth. She also extended a word of thanks to Alumni Association president Tsai Jinbu (蔡進步), Southern Alumni Association president Wu Lin-maw (吳林茂), and all the members of the Alumni Association, for their help in making the event a big success.

PERNG FAI-NAN AWARDED HONORARY DOCTORATE IN ECONOMICS

On April 29 NTHU awarded an honorary doctorate in economics to Perng Fai-nan (彭淮南), the former governor of the Central Bank, in recognition of his outstanding contributions to Taiwan's economy. At the award ceremony Perng said that he is doubly pleased to receive this honor, due to NTHU's world-class reputation, and since Hsinchu is his hometown.

Perng said that the main force that has driven him forward over the years has been his strong sense of mission and the encouragement he has received from the people of Taiwan. He said that he began working at the Central Bank in 1971 and retired 2018, and recalled the impression his strong

sense of mission had on his colleagues. He was especially keen on writing analysis reports, which in the days before computers was very time consuming; thus he often worked late into the night.

"Having a sense of mission has always spurred me to get to the root of the matter," explained Perng, adding "Although I'm now retired, I still follow economic issues very closely, and present my views to government policy makers. My lifelong aspiration is to benefit the people."

Noting that during his tenure as governor of the Central Bank there were three changes in ruling party, four different

presidents, and 15 different premiers, Perng said, "fortunately, thanks to the trust of the Legislative Yuan and other senior officials, the Central Bank has been able to maintain a high degree of independence within the government structure."

During Perng's nearly 44 years at the Central Bank he had many opportunities to change jobs, but chose to stay put. Including his earlier positions at the Bank of Taiwan, the Central Trust of China, and China Trust, he has worked in the banking industry for over 51 years, about which he said, "My



- a. President Hocheng presenting the Honorary Degree.
b. At the conferral ceremony (left to right): CTM dean Lin Chenchun (林哲群), NTHU president Hocheng Hong, former Central Bank governor Perng Fai-nan (彭淮南), and TSE dean Huang Chao-his (黃朝熙).

first job was as a banker, and the last job was also as a banker. This is something I take pride in."

The limited impact of interest rates on the housing market

In his acceptance speech, Perng took the opportunity to explain the relationship between interest rates and housing prices. He emphasized that for monetary policy to be effective, it must be properly coordinated with fiscal policy. In 2009 the government drastically lowered the bequest tax rate, which, coupled with declining returns on foreign investment due to the global financial crisis, led a large number of Taiwanese to repatriate their overseas funds for purchasing local real estate. In order to maintain financial stability, in October 2009 the Central Bank launched a moral persuasion campaign calling for voluntary restraint, began conducting special financial inspections, and began urging financial institutions to strengthen their controls against real estate credit risks. Furthermore, beginning in June 2010 the Central Bank successively imposed restrictions on mortgages for a second home in specific areas, a maximum amount for home loans throughout Taiwan, and a maximum loan-to-value ratio for the purchase of



Mr. and Mrs. Perng at the conferral ceremony.

land. These targeted preventative measures were applauded by the international credit rating company Moody's.

But why did the Central Bank adopt this targeted approach for dealing with skyrocketing housing prices, rather than simply raising interest rates? Perng explained that it's a matter of prescribing the right medicine. The real estate market is only one part of the overall economy, but raising interest rates would have had an impact across the board, resulting in some unwanted side effects. Moreover, only 26 percent of homes in Taiwan are purchased with a mortgage, so the impact of interest rates on the housing market is limited.

Citing the views of the International Monetary Fund (IMF), Perng pointed out that raising interest rates is not a good way to deal with rising housing prices. Providing a recent example, he said that the Swedish Riksbank raised interest rates in July 2010 in order to curb rising housing prices;

however, this led to increased deflationary pressure, and in December 2011 the Riksbank made a U-turn and began lowering interest rates, which actually dropped to zero in October 2014. He also noted that research conducted by the IMF found that low interest rates don't necessarily cause housing prices to rise. Citing two examples, he pointed out that between 2002 and 2006, interest rates in the UK and Australia were higher than those in the US, but their housing prices rose more than in the US. During the same period, Japan maintained low interest rates, but its housing prices decreased.

The upshot, emphasized Perng, is that the real interest rate in Taiwan has not been excessively low in recent years. In fact, for most of the period beginning in 2009, the real interest rate in Taiwan was higher than that of most other industrialized nations. Furthermore, research by Nomura Securities of Japan found that Taiwan's interest rates are not excessively low.

Perng was also a major proponent of increasing the capital gains tax on short-term real estate sales; once it was implemented, speculators withdrew, the transaction volume significantly dropped, and the housing market cooled down.

The second honorary doctorate in economics from NTHU

Perng is the 39th person to receive an honorary doctorate from NTHU since 1996, and the second to receive such an honor in economics; the first honorary doctorate in economics was awarded to Yu Kuo-hwa, who had also served as the governor of the Central Bank.

Perng was jointly nominated for the honorary doctorate by the College of Technology Management (CTM) and the NTHU Taipei School of

Economics and Political Science (TSE). The recommendation was read by TSE dean Huang Chao-hsi, who praised Perng for his outstanding leadership during his 20 years as governor of the Central Bank.

CTM dean Lin Che-chun (林哲群) said that Perng was the governor of the Central Bank for two decades, during which time he successfully led Taiwan through the global financial crisis and the European debt crisis, and helped to keep the inflation rate below two percent. He also noted that Perng received the A rating from the magazine *Global Finance* 14 times, setting a record.

Paying respect at the Dr. Mei Memorial Garden

After the ceremony, Perng paid a visit to the Mei Garden to pay his respects at the mausoleum of Mei

Yi-chi, who reestablished NTHU in Taiwan and served as its first president. When Mei died in 1962, his remains were brought from Taipei back to NTHU for interment, and Perng, then a student at the Hsinchu Commercial and Vocational High School, was amongst the mourners lining the road leading to Mei's final resting place. He said that now that he is an official member of the Tsinghua community, he ought to personally pay his respects to its founder.

All of the members of the honorary doctorate committee were in full agreement as to Perng's outstanding qualities, including his conscientious attitude, humble demeanor, and low-key manner. Perng personally wrote his 22-page acceptance speech, revised and proofread it multiple times, and even added diagrams and notes, further attesting to his impeccable diligence in carrying out every task, down to the last detail.



Joining Perng were his wife and two sons.

NTHU SHINES FORTH IN THE WORLD OF VIRTUAL REALITY AND DIGITAL ART

Fifteen students of the College of Arts participated in this year's Laval Virtual, the premier virtual reality and digital arts festival in Europe, and NTHU was the only university in Asia invited to participate. The virtual event was held online on April 15th and 16th, and amongst the amazing scientific and technological works of art featured at the Tsinghua Pavilion were digital creatures emerging out of a power outlet and window grilles in the form of barcodes.

First held in Laval, France, in 1999, and held annually ever since, Laval Virtual was the first virtual and augmented reality exhibition in Europe, and has quickly become well known for introducing the latest innovations in virtual reality. Four years ago the event was expanded by the addition of the Recto VRso international digital arts festival, which features artists from all over the world showcasing their works created using virtual and augmented reality.

Due to the covid-19 pandemic, both events were held online last year and this year, and again attracted a host of top artists and talented students of art and technology. This year NTHU participated for the first time, and



a. Huang Jihong (黃紀虹), demonstrating her entry Digital Creatures.
b. Participants setting up their entries.

set up its own virtual pavilion, alongside those set up by students from top universities in such countries as France, Canada, and Austria.

The advisors of the NTHU team were Profs. Pan Cheng-yu (潘正育) and Chen Chu-yin (陳珠櫻) of the College of Arts, who specializes in digital creativity, and previously taught at the University of Paris VIII.

Chen said that the pandemic may have restricted people's movement, but it hasn't stifled the creativity of artists, especially in the world of virtual art, where imagination and creativity continue to flourish, and that she has been quite impressed by the creativity her students have put into their entries for the Festival.

Amongst these is Huang Jihong (黃紀虹), a sophomore in the College of Arts' interdisciplinary program, whose entry Digital Creatures consists of a series of imaginative creatures emerging from a power outlet when you move your tablet or mobile phone close to the socket.

"Technology brings imagination to life," exclaimed Huang, as she moved her tablet near the socket, whereupon a virtual creature that looks like a robot appeared on the screen, while another one paced back and forth by the socket, and yet another one lit up like a street lamp.

Huang said that the lanky, slightly hunchbacked creature is called the "Lamp Bearer," because he carries a street lamp which illuminates the world; the "Light-seeker"

represents fans, groupies, and hangers-on; the "Pioneer" is in the form of a fish to represent people on the move; and the "Go-getter" carries his own battery, so he's not tied to the socket.

As for the faceless creature with a white, round head, holding a tablet, Huang explains, "This creature represents all the visitors at the event, and how they have become a member of my virtual world."

The entry Behind the Grille was created by Lin Ziyang (林子妍), a sophomore in the College of Arts interdisciplinary program. This piece arose out of her keen interest in window grilles and home furnishings, and what they reflect about the occupants. Thus she transformed the grilles into QR codes which display a detailed view of the daily life of the residents. Lin explained that when you use your mobile phone to scan the QR code, you get various clues as to who lives there, such as the sound of a piano, an array of succulent plants, an altar, TV news, or a typical quarrel.



In addition to the online exhibition, all of the NTHU entries were on display for the last half of April at the Chushi Artist Space on the Nanda Campus of NTHU, in an exhibition titled Re-enchanting Daily Life: The 2021 Tech Art Campus Exhibition. The exhibition was curated by a prominent French curator Jean-Luc Soret, who worked online from his home in Paris.

The general coordinator of the exhibition was Lin Junhuang (林俊煌), also a sophomore in the College of Arts' interdisciplinary

program. Through extensive discussions with all the participating students, and in consultation with Soret, he designed a lighting scheme using spotlights to highlight each work, thereby making the most of the limited space in the venue.

c. Chen Chu-yin (陳珠櫻) (front center) with participating students.

d. Lin Ziyang (林子妍) demonstrating her entry Behind the Grille.

e. The entries were put on display at an event titled Re-enchanting Daily Life: The 2021 Tech Art Campus Exhibition



NTHU TEAM STEALS THE SHOW AT THE ASC STUDENT SUPERCOMPUTER CHALLENGE

A team from NTHU's Department of Computer Science has recently won the Championship in the online group of the 2020-2021 ASC Student Supercomputer Challenge, outperforming more than 300 teams representing prestigious universities around the world. This was the fourth time in recent years that a major computing competition has been won by a team from NTHU's Department of Computer Science.

The three most important worldwide supercomputer competitions for university teams are those held by the ASC of China, the SCC of the United States, and the ISC of Germany. The ASC competition was suspended last year due to the pandemic, but resumed this year, albeit partially online. A total of 28 teams advanced to the finals. The on-site competition was held in Shenzhen; 21 teams from China participated, and seven overseas teams participated online.

NTHU is a force to be reckoned with in the circle of supercomputer competitions. At the ASC competition, NTHU team won the Championship in 2019, the



Team members (left to right) Huang, Chang, and Wang preparing for the competition.

Highest LINPACK Award in 2018, and the First Class Award and the Innovation Award in 2017. At the SCC competition in the United States, NTHU team won the Championship in 2010 and 2011, and won the Highest LINPACK Award in 2007, 2008, and 2014.

The team's advisor was Prof. Jerry Chou (周志遠) of the Department of Computer Science, who for many years has been training students to participate in similar competitions. He said that supercomputer competitions hone students' ability to use software and hardware in solving various real-world problems. In addition

to basic skills, participants must also have a strong knowledge of various related fields and know how to apply it in different situations—a strength which his teams have consistently demonstrated over the years.

This year's team consisted of juniors Wang Tzuwen (王子文), Huang Wenyuan (黃文遠), and Chang Chenghsun (張承勛), and sophomores Mou Chanyu (牟展佑) and Chiang Liyuan (蔣立元). Team captain Wang Tzuwen said that his team began preparing for the competition in the summer of 2019, with training provided by senior classmates Hsiao

Yicheng (蕭亦程) and Lin Ente (林恩德). During this year's winter vacation they began preparing for the preliminaries, training for more than ten hours a day.

Wang said that this year's ASC finals were held on May 8. During the five-day marathon-style competition, the first two days were for installation, the next two days are for competition, and the final day was for reporting the results. In comparison to previous years, competing online was more challenging, because the virtual machines on the cloud platform weren't made available until the competition began. In addition to deciding on the optimal division of labor, the team had to quickly install and become familiar with the software so that they could start their calculations.

In this year's finals there were four topics, three of which were announced in advance. The topics were: using artificial intelligence

to understand natural language, searching for pulsars, quantum computer simulation, and weather simulation. There was also an independently scored topic requiring cooperation between teams: devising an effective calculation method for use in predicting the evolution of the coronavirus.

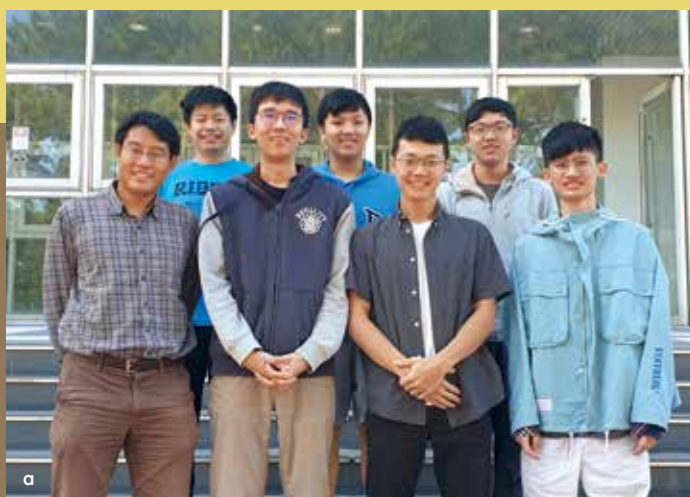
Wang and Huang tackled the topic on artificial intelligence by using the BERT language model to enable the computer to do a cloze test. They finished within an hour, and their work was scored at 85% for accuracy.

Mou and Chang handled the topic on pulsar searching. A pulsar consists of the remnants of a fixed star of huge stellar mass. Amongst all celestial bodies, pulsars have the highest density, the strongest magnetic field, and the fastest rotation.



The finalists were tasked with using open source software to search for pulsars. The Tsinghua team successfully completed the task in two hours by searching about 160GB of data from an astronomical telescope.

"A pulsar is rather like a lighthouse in outer space; the regular signals it emits can be used in time calibration and astronomical research," explained



- a. The award-winning team. Front row, beginning on left: Jerry Chou (周志遠) (advisor), Wang Ziwen (王子文) (team captain), Chang Chenghsun (張承勛), and Hsiao Yicheng (蕭亦程) (coach); back row, beginning on left: Mou Chanyu (牟展佑), Chiang Liyuan (蔣立元), and Huang Wen Yuan (黃文遠).
- b. The NTHU team which has recently won the Championship in the online group of the 2020-2021 ASC Student Supercomputer Challenge (left to right): Jiang, Huang, Wang, Zhang, and Mou.



Mou. As it turns out, Mou took a course in astronomy during his sophomore year, and thus had the background necessary for understanding the topic and devising an efficient formula.

Chiang was tasked with the topic on quantum computer simulation. He said that two days before the competition he learned that the parameters were different from the ones they were expecting, and the amount of memory required to run the program was far more than anticipated, so he had to rewrite the program on the spot, which he found both challenging and exciting.

Chou gave a special word of thanks to NTHU and the Department of Computer Science for the support provided to student teams over the years; he also thanked the National Center for High-performance Computing (NCHC) for its technical guidance, and Quanta Cloud Technology and NVIDIA computer systems for providing funding and equipment.

c. Designed by Hsiao, the team's logo features NTHU's mascot, the panda.

d. Huang helped tackle the topic on artificial intelligence by teaching the computer to do a cloze test.

e. Wang helped tackle the topic on artificial intelligence by teaching the computer to do a cloze test.

f. Huang helped tackle the topic on artificial intelligence by teaching the computer to do a cloze test.

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Fall Semester Application: February 1~ April 15

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101, Section 2, Kuang-Fu Road, Hsinchu 300044, Taiwan R.O.C.

TEL : 03-5715131 · E-mail : web@cc.nthu.edu.tw · <http://www.nthu.edu.tw/>

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