

NTU



HIGHLIGHTS

Special Report:

Smart Building

- Innovative Visiting Student Program
- NTU's Intelligent Medicine Initiative
- COVID-19 Drug Research

More Sports, Please

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The NTU Buffaloes usually train 4 times a week on top of daily early morning sessions 2 months prior to any tournament. In addition to the skills, the players are encouraged to develop teamwork, discipline, and self-management skills.

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Kuai-Yuan Chan: Future University Breaks Tradition

As long as new trends in education start rolling, that is what NTU will look like in the future.

What is the “future university” going to look like? No one has a definite answer for sure. With the changing times, plenty of variables and innovations have opened new possibilities for education in the future. College education in Taiwan is based on old systems adopted from abroad, so in many cases it deals with content that is evolving rapidly in research and industry, creating a gap between offerings of college education and the needs of the workplace.

To develop the Future University Program, NTU has hosted a hundred workshops to collect feedback from students, the teaching staff, and alumni. Treated like references for a research project, the feedback was carefully analyzed to shape the outline of the program. For the moment, a more specific implementation plan is being drawn up based on all of the discussions. The preliminary ideas and directions include that the future college education will be open the way for students to master different fields of expertise. After being accepted by a specific department, students will be able to choose to be awarded the diploma by the department, the college or even the university. Throughout their time at the university, students will be free to take courses from different fields. Instead of stating their majors, the diplomas will feature their field of expertise to help them transition smoothly into the workforce.

Second, students will be granted sabbatical leaves just like the teaching staff. Taking a gap year usually means the students are labeled as bad students. However, Future University courses will offer students ample opportunities to explore the world on their own. They can take a week, a month, or a year off to pursue what matters to them away from campus while still earning credits.

Last but not least, NTU alumni will be given 20 to 30 credits for free, or a coupon to redeem for the fee. Not only will this give the alumni a golden opportunity to learn new things at their alma mater, they will be able to exchange different perspectives and fresh ideas with the current students. Please stay tuned as more details become available when the plan is released.

As messy as the experience is, the COVID-19 pandemic has showed us that nothing is impossible. It is actually an important stress test and driving force in innovating education. By breaking existing systems and frameworks, Future University grants students, the teaching staff and alumni unimaginable new opportunities, flexibility and space.



92nd ANNIVERSARY CEREMONY 臺大92校慶

President Kuan emphasizes the importance of USR in his speech.



NTU Celebrates Its 92nd Anniversary

NTU's 92nd anniversary ceremony was held on November 15. Festivities opened the day before with colorful booths and activities all along the Royal Palm Boulevard. While some students enjoyed food stalls offering an irresistible array of exotic, international cuisines, others explored handicraft booths showcasing delicate decorations and accessories. Enthusiastic students seized the chance to entertain their visitors with spectacular performances. Taking time off from their studies, the students indulged in food, drink, dance, and merriment, relishing the splendor of the occasion. Opening day festivities were concluded a rousing rendition of the classic song "Happy Birthday" to the school sung by every students and staff member present.

On the next day, the 92nd Anniversary Celebration was held at the NTU Sports Center. President Kuan Chung-ming presided over the proceedings, which were attended by distinguished alumni and guests from home and abroad. In addition to celebrating the school's illustrious history, the ceremony also recognized

Honorary Doctorates, Distinguished Alumni of the year, and Outstanding Student Scholarship and Fu Bell Scholarship recipients.

In his opening address, President Kuan affirmed NTU's commitment to University Social Responsibility (USR) and presented, with pride, the school's first "Social Responsibility and Sustainability Report." This report, issued in June 2020, reflects NTU's goal of becoming a leading institution of higher education institution that promotes sustainability. It showcases NTU's social contributions and successes in research, education, social service, and governance. President Kuan also stressed NTU's determination to be a low-carbon campus and mitigate global warming by reducing its greenhouse gas emissions 50 percent by 2028, the year of its centennial celebration, and be a carbon-neutral institution by 2048. In his remarks, President Kuan also expressed the desire to recruit more disadvantaged students from rural areas so that all students, regardless of their background, might have a chance to study at NTU. President Kuan concluded that education is not only a ticket to a better life, but it also gives students the opportunity to make contributions to and empower their hometown and community.

This year, the two honorary doctorate recipients were Bruce Cheng, Founder of Taiwan Delta, and Jensen Huang, CEO of NVIDIA. Cheng founded Taiwan Delta in 1971 and his company emerged as a global provider of power and thermal management solutions. The company's vision is to develop innovative, clean, and energy-efficient solutions to address the impact of global climate change. In his speech, Cheng stated that Delta and NTU share a history of collaboration that goes back a long way, and both parties have gained valuable experiences from each other. For example, Delta's collaboration with the Department of Mechanical Engineering to develop solar vehicles and electric vehicles (EV) has helped the company make significant progress in the field of renewable energy and EV. Currently, Delta and NTU are working together on a variety of projects, including smart manufacturing, deep learning algorithm, and the design of industrial automation motors, EV power systems, and testing platform.

Jensen Huang, one of NTU's youngest honorary doctorates, was unable to attend the ceremony in person due to the pandemic. However, a pre-recorded video of Huang delivering his speech in his doctoral robe was presented. Huang expressed his gratitude to the university and stated that this honor was also a recognition of his company's efforts. Twenty-six years ago, NVIDIA transformed computer graphics by developing a GPU that outperformed its predecessors. The breakthrough design has revolutionized parallel computing, paving the way for AI deep learning and high-performance computing. Morris Chang, the founder of Taiwan Semiconductor Manufacturing Company,



This year's eight Distinguished Alumni were recognized, including Man-houng Lin, Former President of Academia Historica.



President Kuan (right) presents the Honorary Doctorate Award to Bruce Cheng, Founder of Delta Taiwan (left).



NTU Orchestra performing at the ceremony.

congratulated Huang via video and expressed his high expectations for Huang's future success.

The school then awarded this year's eight Distinguished Alumni: Man-houng Lin, Former President of Academia Historica; Winston Ho, Member of Academia Sinica; Biing-Hwang Juang, Member of Academia Sinica; Wu-fu Chen, renowned as "the famous business germinator in Silicon Valley"; Jui-hsiang Lin, Taiwan's Father of Insulin; Taiyin Yang, Executive Vice President of Pharmaceutical Development and Manufacturing at Gilead Sciences; Yi-jun Luo, CDC Deputy Director; and Jack Sun, TSMC Former CTO and Vice President of R&D.

After the awards ceremony, the NTU orchestra and chorus gave a spellbinding performance showcasing the school's core tenets of "critical thinking, building connection, and creating impact," as well its commitment to diversity and inclusion. The ceremony culminated with the official launch of NTU's image video and new logo, an embodiment of NTU's determination to lean into the future while learning from the past.

A Smart Building as the Best Learning Resource for Earthquake Prevention: Donation and Opening Ceremony of the New Extension of the NCREE Building

In partnership with the National Center for Research on Earthquake Engineering (NCREE) and the Ruentex Group, NTU's Department of Civil Engineering adopted both seismic retrofit and earthquake-resistant technologies for the extension of an existing building, as an example of smart disaster prevention construction integrating earthquake early warning and smart IoT technologies. The opening ceremony and donation of this "smart earthquake-resistant building" was held on November 9, 2020. NTU President Chung-Ming Kuan presided over the ceremony, at which the building was donated to the Department of Civil Engineering by Samuel Yin, Chairman of the Ruentex Group.

Responsible for developing Taiwan's earthquake engineering technologies, training specialists, and meeting international standards, NCREE is dedicated to developing technologies for earthquake disaster prevention and mitigation in keeping with the local environment and social needs. The concept of sustainable building was the watchword of this project. Rather than tear down the existing building and construct a new one, a 7-story steel structure was added atop the existing 6-story RC structure, creating a 13-story composite building. Moreover, the building site was expanded to make room for a steel service core.

This project was challenging in design and construction. Structures from different eras were combined, so different construction materials had to be converted and connected, namely, reinforced concrete and steel. Moreover, since the new steel service core made the building's floors asymmetrical, the problem that an earthquake



Photo prior to the extension shows that the project had to tackle the challenge of combining structures from different eras by connecting very different materials.



The extension of the NCREE building is an important benchmark for all smart earthquake-resistant buildings in Taiwan.

could have torsional effect on the building had to be solved.

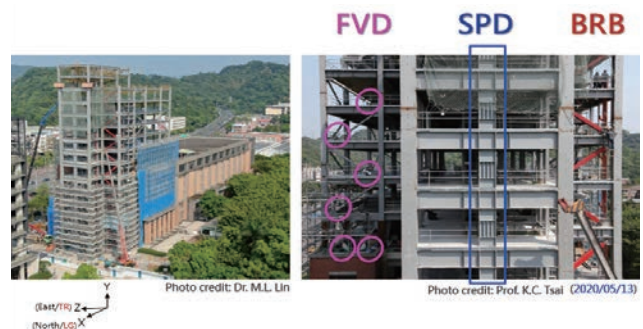
To satisfy the current requirements for seismic design, a seismic retrofit of the existing building was a main goal of the project. After careful seismic evaluation and design, the original building was reinforced using proven earthquake-resistant retrofit measures, such as thickening the walls and adding RC shear walls and FRP-strengthened RC beams at strategic points on the floors. While the upper floors were constructed on a steel frame to reduce weight, steel reinforced concrete (SRC) was adopted for the 7th floor as the transfer plate between the original building and the extension, allowing the extension to be built upwards.

Two damping components developed by NCREE were installed at multiple locations in the building, namely, the Buckling-restrained Brace (BRB) and Steel Panel Damper (SPD). Besides eliminating the potential threat of structural torsion caused by the steel service core, the two damping components improved the seismic resistance of the whole building. In keeping with the building's appearance and earthquake resistant design, the Fluid Viscous Damper (FVD) was installed at the corners of the 7th to 11th floors. The FVD dissipates seismic energy to avoid serious damage to the main structure during a major earthquake.

Furthermore, the earthquake early warning (EEW) and structural health monitoring (SHM) developed by the NCREE were incorporated into the extension, allowing for 24-hour self-monitoring of structural safety and triggering of early warning and disaster prevention mechanisms. The building's responses to earthquakes are recorded and structural health reports are automatically produced in the wake of earthquakes, shortening the time needed for evaluation and accelerating the recovery. In addition, the NCREE's patented "5D smart laboratory maintenance management platform" was combined with 3D digital modeling, time information, and various sensors installed in the laboratory to construct a complete virtual 5D visual maintenance management platform. Incorporating both virtual and physical elements, this platform constantly monitors the security of



The donation and opening ceremony of the extension of the NCREE building is cohosted by NTU President Chung-Ming Kuan, President Kuang-Chong Wu of the NAR Labs and Samuel Yin, Chairman of the Ruentex Group (from left to right).



Many devices have been incorporated into the building structure, such as dampers.

laboratory operations and records detailed laboratory maintenance information to ensure a secure "smart laboratory."

Overall, this building an important index of Taiwan's "smart earthquake-resistant building" by improving resistance with structural retrofit measures prior to an earthquake, automatically triggering warning and emergency response mechanisms prior to the arrival of seismic waves (such as automatically stopping the elevator, implementing the evacuation plan, cutting electric power to prevent fires, and so on) while monitoring the building's response during an earthquake, as well as promptly assessing its structural health after an earthquake. By grasping the key information throughout such events, the building provides smart earthquake disaster mitigation strategies to the general public who live under the threat of earthquakes.

The 71st NTU Sports Day

A venerable tradition for NTU, the 71st Sports Day was held on November 21 this year. A series of exciting competitions was held on the sports field of the main campus, including track and field, fun races, relay races, tug of wars, and extreme physical challenges. While the participants were going all out on the field, many professors, students, and staff cheered them on, displaying the energy and vitality of NTU to the world.

During his speech at the opening ceremony, President. Dr. Chung-Ming Kuan stated that many major sports events had been canceled or postponed in the first half of 2020 as a result of the COVID-19 pandemic, including the Tokyo Olympics. This was a huge loss for the athletes who had dedicated themselves to a strict daily training routine. With Taiwan's success in tackling the pandemic, it is now possible to put many events back on the agenda. With the pandemic still wreaking havoc in most parts of the world, it is almost unimaginable that so many participants and spectators could gather at the NTU sports field for the annual Sports Day.

NTU students have always been second to none in their passion for sports. Alumnus Louey.J of the Department of Foreign Languages and Literatures was commissioned to create the theme song this year. The hip hop song expresses the especially strong desire to win that is hard-wired in student athletes, coupled with their indomitable will and persistence and the incredible energy and excitement on the sports field, raising everyone's spirits.

With a total of 5,300 people signing up, this year's Sports Day had the most participants in the 71-year history of the event. "NTU Family Day" was incorporated into the program, with a dedicated area set up by the school teams and students from the Graduate Program in Sport Facility Management and Health Promotion. Open to all family members, the dedicated area gave them the opportunity to try different sports as well as enjoy the children's playground. Moreover,



All clubs and school teams set up corners for people to try out different sports.



A professor passed the torch to a student representative to signify passing on the good tradition.



The 71st NTU Sports Day was attended by enthusiastic students from every department.

more fun races made it to the program this year, allowing everyone to experience the joy and health boost from doing physical activities together. The two-day event was almost like a team-building activity that gave everyone plenty of opportunities to bond with their peers, creating irreplaceable happy memories on campus.

Besides celebrating the sportsman spirit of all NTUers, it is the university's fondest hope that everyone can stay healthy by continuing to stay active and fit for life.



Full version of the theme song.

NTU's Innovative COVID-19 Special Visiting Student Program

Given the unprecedented impact of COVID-19, NTU launched its first "COVID-19 Special Visiting Student Program" during the 2020 fall semester, to help NTU students whose overseas study has been affected by the pandemic. Under this program, such students are invited to be visiting students at NTU and access their right to education.

To date, over 200 students have enrolled in the program. They had been planning to study at over 80 institutions of higher education in over ten countries, including the U.S., Canada, the UK, Germany, The Netherlands, Switzerland, Belgium, Japan, and Australia. Some had been planning to study at elite global universities, such as the Massachusetts Institution of Technology, Harvard University, Yale University, the University of Chicago, and University College London. Moreover, this program has been actively supported by NTU's partner universities, including the University of Maryland, Temple University, New Jersey State University, and Michigan State University, which have generously assisted NTU students in continuing studies at their schools.

To help the visiting students adapt to campus life here and leverage the school's abundant educational resources and facilities, the Office of

International Affairs (OIA) assigned volunteers and offered campus tours and information sessions for the newcomers. Also, on September 24, Hsiao-wei Yuan, Vice President of the OIA, hosted a luncheon at Conference Room 1, inviting Shih-tong Ding, Vice President for Academic Affairs, April Shen, Vice President for Student Affairs, and over 100 of students. During that event, the visiting students shared their experiences as students at NTU and discussed how the pandemic had affected their study plans. The students expressed their appreciation for the program, admiration of NTU's academic excellence, and wish to participate in more campus activities at NTU.

Since the COVID-19 pandemic is still seriously impacting many countries, NTU plans to extend the visiting student program for at least one more semester. This means that students who are already in the program can re-apply to continue their studies at NTU. Moreover, any student who is interested in enrolling in courses at NTU may apply to Office of Academic Affairs and transfer to NTU to complete their studies.

The Special Visiting Student Program is intended to not only protect Taiwan's overseas students' right to education but also foster cultural diversity and awareness on campus, thereby enriching campus life. News reports on this NTU program have appeared in the international press, including the *South China Morning Post* and *THE (Times Higher Education)*.



The NTU COVID-19 Special Visiting Student Program Information Session.



The NTU COVID-19 Special Visiting Student Program Campus Tour.

Study Abroad, Study the World!

The 2021/2022 NTU Study Abroad Fair was held on November 8. Event organizers adopted precautionary measures for COVID-19 to safeguard the health of the participants and staff. At the opening ceremony, NTU President Chung-ming Kuan encouraged the students to be bold and not let the pandemic derail them from realizing their plans and dreams.

Over 1,200 NTU students travel to NTU's partner universities around the globe every academic year, making NTU the academic institution in Taiwan with the largest number of students studying abroad. Students can apply for semester exchange programs, exchange student programs, dual degree programs, and overseas summer programs to get international experience during their studies.

Every year, Office of International Affairs (OIA) hosts the Study Abroad Fair as part of the university's anniversary celebration. The event showcases NTU's broad network of partner universities worldwide, which offer students opportunities to plan and embark on rich international learning journeys. Due to the unprecedented impact of the pandemic this year, most of NTU's partner universities were unable to dispatch a

representative to Taiwan to attend the Fair. However, Taiwan-based admissions representatives from Temple University, University of Tsukuba, Waseda University, and Technical University of Darmstadt were able to grace the event and introduce their exchange programs.

Although just a few admission representatives from partner universities attended the Fair due to the pandemic, NTU's strategic partner universities, such as Kyoto University, The University of Tokyo, University of Hamburg, The University of California, The University of British Columbia, National University of Singapore, Keio University, and Yonsei University, all set up booths to offer information about their programs. Their booths attracted countless students eager to learn more about these universities and their study opportunities. NTU's Office of International Affairs also hosted a series of seminars at the Fair to introduce its student exchange programs, visiting programs, dual-degree programs, and overseas summer programs, as well as to describe the various learning environments outside of Taiwan.

Studying abroad is a game-changer that deeply affects the lives of many students. This year, NTU especially invited return students who had participated in exchange or overseas summer programs to inspire the new participants with their insights into learning and travelling abroad. This



sharing of first-hand experiences let students who are interested in international study know what to expect overseas. The seminar also sought to encourage students to plan ahead to avoid facing any delay of their graduation after they complete their study abroad. In the future, the school will consider recognizing the return students who graduate on time by amending its scholarship and recruitment system.

To encourage students to step outside their comfort zone and explore the outside world, NTU established the Voyage of Aspirations Scholarship and the Outgoing Exchange Student Financial Assistance Grant. These grants offer excellent students, low-income students, indigenous students, immigrant students, students from less-educated families, and disadvantaged and culturally deprived students the chance to study overseas. Many students showed interested in these grants and sought more information at the booth.

Many other institutions, such as the British Council, Fulbright Taiwan - Foundation for Scholarly Exchange, Holland Education Association in Taiwan, Australian Office, and DAAD, also participated in the Fair to offer guidance and counseling to students who wished to participate in short-term programs or take language tests.

The “Best Booth Campaign” and the “Lucky Draw Event” also were highlights of the event. Fair participants voted for their favorite booths based on exhibition design and service. This year, the institutions with the highest votes for the “Best Booth Campaign” were Technical University of Munich, Kyoto University, and The University of California. The first prize of “Lucky Draw Event” went to Wang, a graduate student in Statistics at NTU, who took home an Apple Watch S6. Other prizes included free language tests, a 10,000 NTD-value voucher for overseas summer programs issued by NTU’s Office of International Affairs, as well as other discounts on application fees and program fees.

Although 2020 has been a year full of unimaginable challenges and obstacles, institutions of higher education have leveraged the capabilities of the internet and innovative technology to break down barriers and continue promoting international academic exchanges in a more diverse and inclusive manner. The mission of the 2021/2022 NTU



President Kuan giving his opening remarks at the NTU Study Abroad Fair.



President Kuan and OIA Vice President Yuan visiting the booths.



The booth of The University of California.

Study Abroad Fair was to encourage students to keep striving forward and embracing change. By offering students a rich palette of study abroad programs, the university sincerely hopes they will seize this precious opportunity to have a unique experience studying at an elite university overseas and gain the knowledge and skills to realize their aspirations and thrive in a world of constant change.

NTU’s Office of International Affairs welcomes students who are interested in studying abroad and study abroad students who would like to share their experiences to attend the 2022/2023 NTU Study Abroad Fair next November.



For more information, please visit:
<https://oia.ntu.edu.tw/>

NTU Discovers Potential Antiviral Agents for COVID-19

In early 2020, the severe acute respiratory syndrome-coronavirus type 2 (SARS-CoV-2) became the world's most serious health threat in less than 6 months, spreading worldwide and taking the lives of thousands of people. To date, over 1.5 million have perished due to the virus globally. The disease not only damages the respiratory system but also affects multiple other organs, including the central and peripheral nervous system. While there is high medical demand for SARS-CoV-2 control, so far no drug or vaccine has been proven effective for treating the disease. Among the tested drugs, FDA has granted the use of remdesivir and monoclonal antibodies on critically ill hospitalized patients. However, these drugs can only mildly benefit recovery and may lead to potential serious side effects.

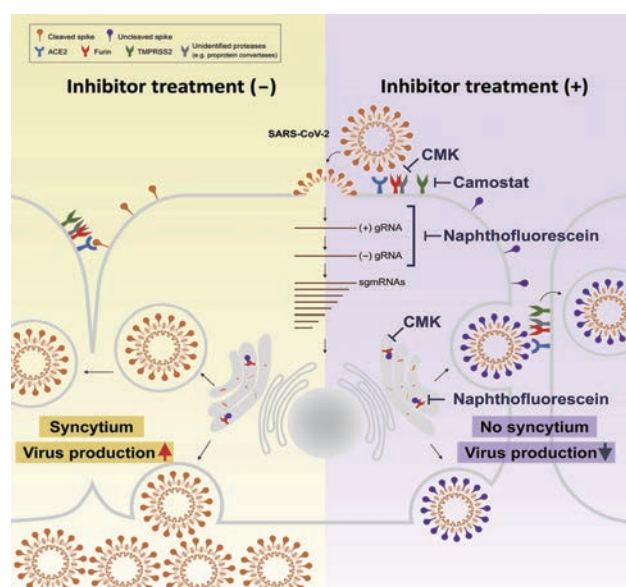
To help patients with coronavirus, a NTU team of researchers led by Professor Shiou-hwei Yeh of the Department and Graduate Institute of Medical Microbiology, College of Medicine, and Professor Sui-yuan Chang of the Department of Clinical Laboratory Sciences and Medical Biotechnology, started to investigate potential antiviral agents for SARS-CoV-2 infection and pathogenesis.

The study of the SARS-CoV-2 genomic sequences revealed that the viral Spike protein contains conserved putative motifs for several cellular proteases. It was discovered that the S1/S2 boundary features a unique polybasic stretch of an RRAR motif, one that was identified in SARS-CoV-2 but not in other lineages of β -CoVs. Since the motif matches the consensus sequence of the substrate for furin, the team further validated the cleavage site to learn more about its syncytium formation.

The treatment was performed using two furin inhibitors, decanoyl-RVKR-chloromethylketone (CMK) and naphthofluorescein. Studies showed that CMK can block virus entry, effectively

suppressing cleavage of spikes, and the syncytium Naphthofluorescein serves to suppress viral RNA transcription.

The team's study confirmed the role of the furin cleavage site in the fusion activity of the Spike protein, a step that contributes to virus production and syncytium formation, and also discovered two specific inhibitors that may serve as promising antiviral agents for COVID treatment. These insights laid the groundwork for further development of antiviral agents against COVID-19. The team's findings were published in the October issue of *Cell Reports*.



Furin inhibitors can block virus entry, suppress cleavage of spikes, and prevent virus production and syncytium formation.



A photo of the research team.



Scan the QR code to read the journal article.

NTU Expedites COVID-19 Drug Repurposing Research with AI

The COVID-19 pandemic has unleashed one of the worst global crises in a century, wreaking unimaginable suffering and loss of life. To facilitate efforts to combat this global crisis, the genomics team of National Taiwan University, National Yang-Ming University, and Taiwan AI Labs initiated a project that leverages the power of AI to accelerate drug repurposing for COVID-19.

Early in February, Professor Hsueh-fen Juan, NTU Graduate Institute of Biomedical Electronics, and Bioinformatics, and Professor Chien-yu Chen, NTU Department of Biomechanics Engineering, decided to examine existing drugs for possible repurposing for COVID-19. Within two weeks, the team had built a database on TAIGenomics. The team's mission was to utilize biotech and perform molecular docking analyses to predict the binding affinity of approved drugs with seven proteins. Their effort resulted in the development of a comprehensive drug database for SARS-CoV2 titled DockCoV2.

DockCoV2 is aimed to predict the binding affinity of 2,285 FDA-approved and 1,478 NHI drugs with seven proteins, including, Spike, 3CLpro, PLpro, RdRp, N protein, ACE2, and TMPRSS2. Additionally, it generates appropriate validation information supported with referenced

literature. This database thus provides significant insights to medical teams and greatly aids the formulation of future experimental designs, since it not only provides experimental data but also delivers biological assays, pathway information, and gene set enrichment analyses obtained from other databases. To date, DockCoV2 has already accumulated more than 20,000 results, and its success was reported in the October issue of *Nucleic Acids Research*, a prestigious biochemical journal which spotlights cutting-edge research.

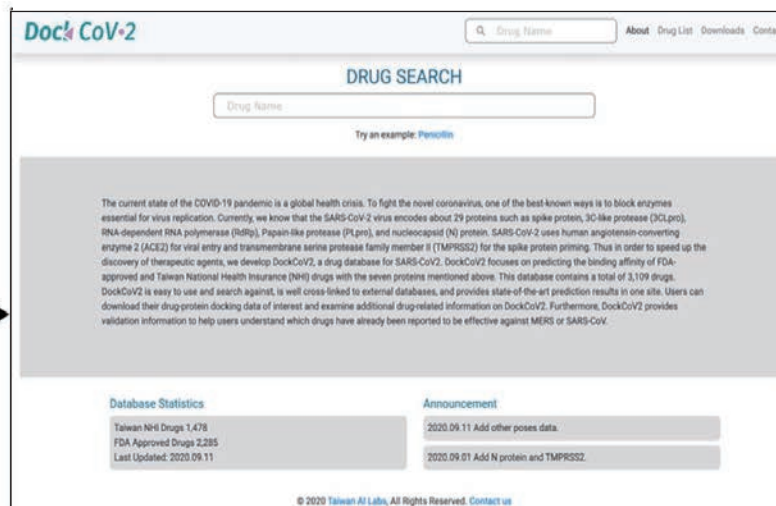
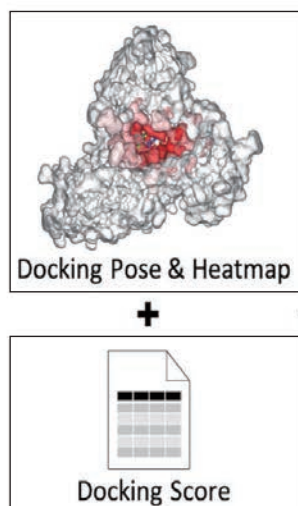
Drug development is a time-consuming and costly process that involves complex tasks, such as target identification, validation, and compound screening. The effort often takes 10 to 12 years; however, with the aid of advanced computers, DockCoV2 can offer experts relatively rapid solutions for infectious diseases.

According to Juan, DockCoV2 is not only easy to use but also the most comprehensive and advanced database for calculating drug-target docking results. The docked structures can be utilized to obtain more accurate binding poses and correct ranking of the binding affinity. With the help of DockCoV2, researchers can access the latest drug-target docking results and offer hope of rapidly tackling the pandemic.

started to investigate potential antiviral agents for SARS-CoV-2 infection and pathogenesis.



For more information, please visit:
<https://oia.ntu.edu.tw/>



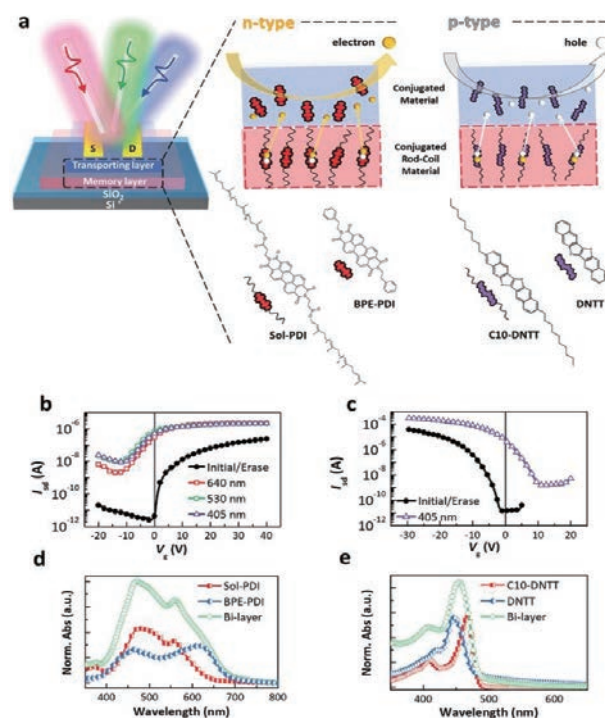
The research team built DockCoV2, a database used to predict the binding affinity of drugs and proteins, greatly benefiting future experimental designs.

Taiwan and Japan Develop High-Performance Nonvolatile Organic Photonic Transistor Memory Devices Using Conjugated Rod-Coil Materials

Prof. Wen-Chang Chen of the Department of Chemical Engineering has maintained a fruitful long-term collaboration with Prof. Toshifumi Satoh of the Faculty of Engineering, Hokkaido University. Recently, the pair successfully developed high-performance nonvolatile organic photonic transistor memory devices using conjugated rod-coil materials. Their result has been published in *Advanced Materials*, a renowned journal in materials science.

Existing memory device technology takes advantage of miniaturization technology and three-dimensional stacking methods to meet the increasing demand for its performance and storage density. However, the complex manufacturing processes give rise to problems, such as technical difficulties in development and high manufacturing costs. In recent years, next-generation organic memory devices composed of organic semiconductors have generated considerable academic interest because they are flexible as well as cheaper and easier to be mass produced. However, several issues, such as operating voltage, response speed and long-term stability, still have to be resolved.

Prof. Wen-Chang Chen has devoted himself to the development of memory devices and materials for many years. He first proposed the concept of photonic inorganic/organic composite floating gate in 2017, which led to the development of a memory device using light as the switch. The device is capable of adjusting to different wavelengths with multiple-bit storage characteristics (*Advanced Materials*, 2017, vol.29, page 1701645).



The research team recently succeeded in developing high-performance nonvolatile organic photonic transistor memory devices using conjugated rod-coil materials, which is vital for the development of the material design and response mechanism of next-generation organic light driven components

Prof. Wen-Chang Chen and Prof. Toshifumi Satoh have worked together for many years on the development and application of nanomaterials. They discovered a new approach using conjugated rod-coil materials as a floating gate in the fabrication of nonvolatile photonic transistor memory devices, consisting of n-type Sol-PDI and p-type C10-DNTT. Sol-PDI and C10-DNTT are used as dual functions of charge-trapping (conjugated rod) and tunneling (insulating coil), while n-type BPE-PDI and p-type DNTT are employed as the corresponding transporting layers.

By using the same conjugated rod in the memory layer and transporting channel with a self-assembled structure, both n-type and p-type memory devices exhibit a fast response, a high current contrast of 105 times, and an extremely low programming driving force of 0.1 V. The fabricated photon-driven memory devices exhibit a quick response to different wavelengths of light and a broadband light response that highlight their potential for light-recorder and synaptic device applications.



Scan the QR code to read the journal article.

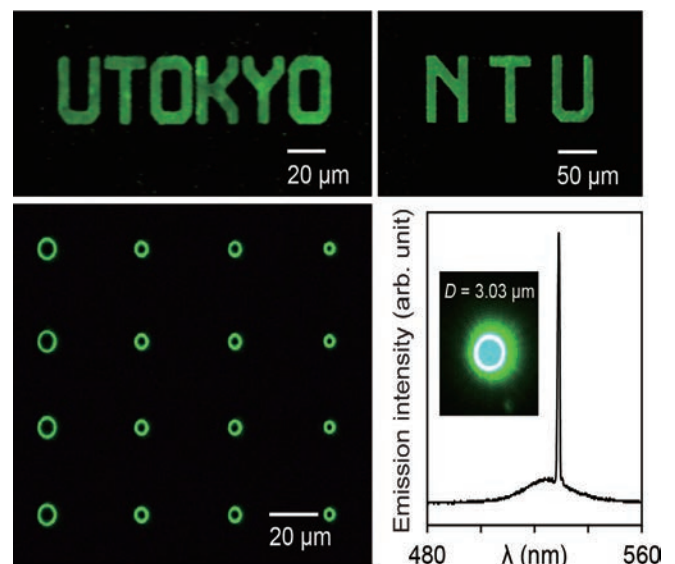
NTU's Multinational Research Team Publishes Paper on High-Efficiency Perovskite Laser Technology

Director of NTU's International Graduate Program of Molecular Science and Technology as well as Distinguished Professor at the Department of Materials Science and Engineering, Prof. Chun-Wei Chen recently led a research team in making a significant breakthrough in high-efficiency perovskite laser technology, in collaboration with Prof. Delaunay's lab at the Department of Mechanical Engineering, the University of Tokyo. Perovskites marked a vital discovery in the material science field in recent years, especially regarding their applications in solar cells. In just a few years after their discovery in 2009, perovskites reached a level of energy conversion efficiency equivalent to that of commercial silicon solar cells. The biggest advantage of perovskite solar cells is that they can be produced by large-area coating and printing using a solution process. Requiring a greatly reduced cost for process technology and materials, they are thought to have great potential as the next-generation solar materials, compared to traditional silicon solar cells that need to be made at high temperatures.

In addition, perovskites have excellent luminescence characteristics and quantum efficiency, which result in great potential for high-efficiency light-emitting diodes and laser applications. However, the biggest bottleneck at present is that perovskites are not stable enough to be combined with lithography process technology, which is a mature process in the semiconductor industry for producing the resonant cavity required by high-performance lasers. The multinational research team has

met this challenge by combining the commonly-used semiconductor lithography process technology with their proposed "self-healing" concept. In the lithography process, the self-assembly and recrystallization characteristics of the materials are employed for developing "Self-Healing Lithographic Patterning" technology and producing high-efficiency single-mode lasers on a large area, which hold considerable promise for industrial applications. The result has recently been published in *Advanced Functional Materials*, a renowned journal in the field of materials science.

NTU and the University of Tokyo have nurtured a close relationship over the past few years through bilateral visits and seminars. Funded by the Ministry of Education, Assistant Professor Ya-Lun Ho of Prof. Delaunay's lab was invited to spend three months at NTU at the end of 2019. His discussions and experiments with Ph.D. students in the program gave rise to this new technology. More than just a technical breakthrough, this is a paradigm case of the excellent academic collaborations between Taiwan and Japan.



Names of the universities taking part in the project, UTokyo and NTU, are spelled out with perovskites using advanced lithography technology.



Scan the QR code to read the journal article.

NTU Launches the Intelligent Medicine Program

Launched in the 2020 school year, NTU's Intelligent Medicine Program is a joint effort of the College of Medicine and the College of Electrical Engineering and Computer Science to train cross-field professionals in smart healthcare. Courses are offered in programming, artificial intelligence, information security, big data, and medicine so students can integrate their expertise before applying it such fields as medical care, the biomedical industry, and so on. The program is aimed at preparing specialists who will advance towards precision medicine from smart healthcare in order to raise the standards of medical care.

With the goal of strengthening cross-field linkages, the program's applicants come from various colleges. Enrollment has reached the maximum capacity of 60 students, with 25 from the College of Medicine, 25 from the College of Electrical Engineering and Computer Science, and 10 from other colleges.

Dr. Yen-Hsuan Ni, Dean of the College of Medicine, holds that the teaching staff and students of the College of Medicine could benefit from ICT and AI, as technology continuously evolves in today's world. However, medical students formerly lacked

access to such courses. As part of the new program, Introduction to Medical Informatics allows students from the College of Medicine to learn basic programming and gain an initial understanding of electrical engineering and computer science, preparing them to apply these technologies to the medical field. The College of Medicine also offers the Introduction to Medicine to non-medical students, in which the basics from medical knowledge to clinical applications are covered. It is hoped that course will open the way for the students to work in the medical care and biomedical industries in the future.

Dr. Yao-Wen Chang, Dean of the College of Electrical Engineering and Computer Science, thinks the synergy of the two fields can take healthcare and smart medicine to the next level. The COVID-19 pandemic has showed the world the importance of integrating information technology with medicine. When combined, the two fields can enhance the well-being of humankind by upgrading virus detection, data analysis, epidemic prediction, scientific epidemic prevention, and vaccine production.

The two colleges started their collaboration last year with a seminar. A theme of this program involves information security, data, and imaging. Headed by Dr. Hsin-Hsi Chen, an expert in natural language processing, the program features courses carefully selected by professors from both colleges to help the students acquire fundamental knowledge in both fields.



NTU Finds Pride at NAIG

Originally scheduled for last May, the 2020 National Intercollegiate Athletic Games (NIAG) were postponed due to the COVID-19 pandemic, but finally held during October 31 to November 4 at National University of Kaohsiung. Thanks to the concerted efforts of every NTU athlete, coach, and staff member, the NTU team brought home 35 gold, 18 silver, and 29 bronze medals--a spectacular medal count of 82. This medal count not only broke NTU's medal haul record, but also placed NTU at No.4 in the NAIG rankings; No.1 among universities without athletic departments.

A total of 7,773 student athletes from 147 institutions of higher education competed in this year's NIAG. NTU dispatched 263 athletes and 50 coaches and staff to compete in 12 of the 18 sports categories, including track and field, swimming, table tennis, tennis, badminton, judo, taekwondo, archery, fencing, gymnastics, soft tennis, and cheerleading. NTU President Chung-ming Kuan and Executive Vice President Ching-hua Lo traveled to Kaohsiung to attend the games and root for the NTU athletes.

The NTU cheerleading team won 1 gold and 1 silver in the mixed and small squad division, and the tennis team won the championship for the women's doubles matches. NTU also gained 1 silver and 2 bronze in soft tennis; 1 gold, 1 silver, and 1 bronze in taekwondo; 1 gold and 3 bronze in both judo and fencing; 1 gold and 2 silver in archery; 1 silver and 2 bronze in table tennis; and a bronze in badminton, men's doubles. The track and field team also shined, winning 5 gold, 2 silver, and 7 bronze, ranking third in the men's

division and second in the women's division. The gymnastics club won 3 gold, 1 silver, and 6 bronze, and the swimming team ranked first in both the men's and women's divisions, boasting a total of 21 gold, 9 silver, and 4 bronze.

Athletes who participate in NTU's varsity teams are passionate about sports and devote much of their time and effort, seeking to balance their sports training and school work. These student athletes must overcome serious obstacles, psychological as well as physical, to seize the chance to shine in their competitions and celebrate their victories and medals.

The stellar performances of the NTU varsity teams at 2020 NIAG not only demonstrated NTU's awesome spirit but made the school proud.



NTU's Table Tennis Varsity Team wins 1 silver, 2 bronze.



NTU's Judo Varsity Team wins 1 gold and 3 bronze.



NTU's Gymnastics wins 3 gold, 1 silver, and 6 bronze.

NTU Buffalo: Passing Down the Tradition While Looking Ahead to the Future as the Top Rugby Team in Taiwan

National Taiwan University's school rugby team, NTU Buffalo, was founded in 1946. The team participated in the first Taiwan Province Sports Event that year, competing with delegations from different counties and cities and winning the second place. Developing rapidly after the victory, the Buffaloes soon swept across all major competitions as a regular champion at the Taiwan Province Sports Event, Rugby National Tournament, and the College Cup. Throughout the team's 75 years of history, it has garnered a great many accolades, such as "the longest-standing school team," "the toughest and hardest-working school team," "the school team that nourished numerous leaders in society" and "the forerunner of rugby in Taiwan."

Despite having this glorious history, the NTU Buffaloes have also experienced countless challenges over the years. For example, with other sports gaining a foothold in Taiwan and school entrance systems dedicated to sports merit students, members of the NTU Buffalo team who started playing rugby at university found it hard to measure up to elite athletes who started their training at junior high school. As a result, the Buffaloes experienced hard times from the 1980s to the early 2000s in performance and team size. Nevertheless, the team held its own in competitions against general-level teams at the College Cup, such as the Republic of China Military Academy, National Cheng Kung University, National Taiwan Ocean University and National Chengchi University, and remained one of their most respected and feared opponents.

With every team member feeling dedicated and working hand-in-hand, the team has made a comeback in recent years, with several outstanding performances. They won the championship in the general-level division of the College Cup in 2010, 2011, 2012, and 2018. It is noteworthy that sports merit students have been banned from competing in the general-level division of the College Cup since 2013, and the NTU Buffalo has been the only team that stands a chance against the Republic of China Military Academy, the title holder since 2013.

A rugby team's performance at the general-level division of the College Cup is often an indication of their overall competitive resources. The rugby team of the Republic of China Military Academy, for example, enjoys guaranteed time for practice as well as rewards for good performances, resulting in sufficient training and discipline. A regular participant at the finals, National Cheng Kung University has 8 teams from the College of Engineering that can recruit freshmen, with good players moving on to the school rugby team. In comparison, not only do NTU students face stricter academic requirements, there are no rugby teams at the department level. The NTU Buffalo's greatness derives from the team's spirit of perseverance and pragmatism passed down throughout its 75 years of history, as well as the



The generous donations from the alumni that formed the "NTU Rugby Association." Many past team members are now members of the elite in the society, and they would like to give back to this organization.



The NTU Buffaloes usually train 4 times a week on top of daily early morning sessions 2 months prior to any tournament. In addition to the skills, the players are encouraged to develop teamwork, discipline, and self-management skills.



Founded in 1946, NTU Buffalo is one of the top rugby teams in Taiwan, and a regular champion at the Rugby National Tournament and the College Cup.



Rugby lays great emphasis on teamwork, perseverance and self-discipline, which simply cannot be replaced by individual talent. Only new players who are willing to train with consistency and good attitude stand the chance of joining the starting lineup after a significant amount of training.

generous donations from the alumni that formed the “NTU Rugby Association.” Many past team members are now members of the elite in the society, and they would like to give back to this organization that infused them with life skills and values that contributed to making them the successes they are today. The current leaders have their hands full, but they have the unique opportunity to learn more life skills for their future. For example, not only must the captain and deputy captain lead the team, they are responsible to recruit new team members.

NTU Buffaloes usually train 4 times a week. Besides that, they must attend daily early morning sessions for two months prior to any tournament. In addition to the players’ individual talent and skills, they are encouraged to foster teamwork, discipline, and self-management skills.

Known as “a thug’s game played by gentlemen,” rugby lays great emphasis on teamwork, perseverance, and self-discipline, which simply cannot be replaced. Only new players who are willing to train with consistency and a positive attitude stand the chance of joining the starting lineup after a significant amount of training.

Even with their brilliant record and glorious history, NTU Buffaloes have faced some challenges in recruitment over several decades. However, the team continues to adjust and develop despite the hardships. Looking ahead to the future, the NTU Buffaloes aim to uphold the values of rugby, including team work, perseverance, diversity, and inclusion. It is the team’s fondest hope that more freshmen will join the lineup and accept this chance to meet new challenges and create their own legends.

NTU's Competitive Cheerleading Squad Crowned Champion at the National Intercollegiate Athletic Games

Dressed in bright blue sportswear, NTU's competitive cheerleading squad chanted their slogans in sync with spirited dance steps, wowing the audience with somersaults and throws. Crowned champion in the general mixed division at the 2020 National Intercollegiate Athletic Games, the squad won by a wide margin over the runner-up. Judging by their current performance, it's hard to believe the squad had placed last in the competition just a few years ago.

Competitive cheerleading combines gymnastics moves with difficult stunts. The formations often require two to three layers of people, with males at the bottom and females on top. As a tiny mistake could lead to a serious accident, the members have to know each other's moves better than in most team sports. The squad must have one to two months of intensive training before each competition, which means four to five days of practice a week. However, winning requires more than just perseverance and effort from the squad members.

The current captain Wei-Han Yao said that the team wouldn't have reached this level of performance without the coaches Wen-Yuan Chien and Han-Yin Wu. The coaches have united the squad members with a grand vision. A former gold medalist at the Cheerleading World Championships, Chien said it is a challenge to take over the team. Since NTU students have had little or no prior training and are preoccupied with their schoolwork, the team did not perform well at past National Intercollegiate Athletic Games. However, because the squad members showed exceptional determination and endured



Showcasing excellent teamwork, NTU's Competitive Cheerleading Squad was crowned champion at this year's National Intercollegiate Athletic Games.



Group photo of NTU's Competitive Cheerleading Squad.

incredible hardship this year, their success was possible, perhaps inevitable.

Being on a team means working with different people, who think, communicate, and interact very differently. One squad member, Yu-Hsuan Chiang, said that what's most fascinating is seeing how everybody adjusts and fine-tunes, and eventually learns to think as a team member and not just stick to their opinions. According to the squad captain, what makes competitive cheerleading such a marvelous sport is that nobody is dispensable. The absence of any member would make the performance incomplete.

Besides affirming their self-worth, every squad member developed a sense of responsibility and teamwork during their training and practice. They worked hard with their squad mates. And, since they all shared the same goal, they emerged as the winners this year! Even though NTU students are traditionally considered to be self-centered individuals who concentrate on their studies, the competitive cheerleading squad has proven that when there is a will, there is a way.



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