

NTU



The Sustainability Report



- NTU Swimmer at Tokyo Olympics
- Int'l Researchers Contribute to Biotech Development
- Students to Enhance Global Vision

Machine Learning Gains Popularity

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TEACHING & LEARNING PEOPLE

BACK COVER



Baseball is a team sport. It teaches us how to cooperate and work with others, especially with our devoted teammates.

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A Student-oriented Belief: Words from Dr. Shih-Pe Wang, Vice President for Student Affairs

Responsible for over 34,000 students, the Office of Student Affairs is one of NTU's busiest offices. It addresses many aspects of students' lives but focuses on four main concerns: leadership, employability, well-being, and culture. Its guiding principle in every endeavor is to fulfill a "student-oriented belief."

To ensure the effectiveness of student counseling, the Office of Student Affairs is determined to bring the Center for Student Well-Being, the counselors at each college, and the mentor system to the next level in order to build a comprehensive safety net for students by facilitating communications among departments/colleges, university administration, and mentors. It also established the Student Affairs Advisory Committee to solicit opinions from the faculty. Students as well as faculty are invited to join discussions on targeted topics in policy-making.

Communications, coordination, and constructive criticism are the backbone of student affairs. Every month, the Office modestly gathers and reviews precious feedback from students, seeking to make positive changes. The Office strives to make learning and feedback a two-way street to turn diversity and inclusion into reality.

During the past eighteen months, a key mission of the Office of Student Affairs has been epidemic prevention. Advance preparations and timely responses require effective collaboration among the different offices on campus. Also, to ensure student mental health under the threat of the pandemic, the Office enhances student counseling and assistance for mentors. The Office acts as both the first line of defense and the support system in waging the battle against COVID-19 on campus.

The Office welcomes students to contribute their innovative ideas to extracurricular and large-scale activities. The online commencement ceremony in June and the series of freshmen welcome events in



September featured ideas offered by students. The NTU ArtFest last April included an unprecedented collaboration with Cloud Gate Dance Theater. With students, professional performers, and support from the private enterprise, the final performance outside the NTU Library was a feast of art and culture.

Students, faculty, and administrative staff are all deemed important resources of the university. In the Office of Student Affairs, we will continue this student-oriented belief, take action to enthusiastically support the mentors, and encourage communication and innovation among our staff. Based on this belief, we are sincerely looking forward to inspiring the spirit of humanistic care as NTU approaches its centennial celebration.

NTU Launches Future Action Plans

On August 11, National Taiwan University organized the “Future NTU Action Plans” online presentation. In fact, the university has launched a series of action plans to encourage NTU students to “Explore the Future, Position Yourself.” The action plans include Exploratory Learning, Field Expertise, Trans-disciplinary Bachelor Degree Program, Designing Your NTU, Designing Your Own Course, and Academic Advising Office. These plans are intended to make NTU’s academic programs and courses more flexible by showing the students how to plan cross-disciplinary learning in accordance with their personal interests. Furthermore, the plans show students how to tailor dedicated modules to facilitate adaptive learning.

Due to COVID-19, the online presentation was held on an amusing and interactive web-conferencing platform, Gather Town; all the participants appeared as virtual characters. In his remarks to the gathering, NTU President Chung-Ming Kuan announced there would be more bottom-up discussions about the action plans, involving everyone. He expressed the hope that NTU faculty and students could come up with creative ideas to spark significant breakthroughs so that Future NTU could suit the specific needs of every learner.

One of the highlights of the action plans is to provide the students with the opportunity and support to pursue the areas in which they are most interested, whether they be projects, entrepreneurship, or exploration of life. Exploratory Learning enables the students to learn

in different settings at home or abroad, for a period lasting from one semester to two years. During this period, they may maintain their status as students and accumulate credits. They no longer have to take temporary leave just to get the opportunity and time to pursue their dreams, and moreover they will be given resources and assistance from their mentors, whether they intend to work for an NGO or start their own business.

Finally, once students have identified their interest, Field Expertise allows them to learn systematically by organizing courses into modules. During the 2022-23 academic year, 39 departments will launch a total of 167 such modules opening the door for students to challenge their strengths or engage in cross-disciplinary learning as they plan their individual topics for future learning. This unprecedented flexibility will revolutionize university education and encourage students to be more proactive in the future.



Venue of the Future NTU Action Plans online presentation.

NTU Leads in University Social Responsibility

NTU has issued its second social responsibility and sustainability report, an overview of NTU's progress towards meeting the United Nation's Sustainable Development Goals (SDGs) in governance, research, service, and teaching. In addition, this year's report includes a summary of NTU's efforts in the global fight against COVID-19 and its achievements in safeguarding the health and safety of the Taiwanese people.

NTU's ongoing efforts in social responsibility have proven effective. In the *CommonWealth University Citizen Rankings (USR)* survey conducted by *CommonWealth Magazine*, NTU took the top spot in the category of public university for two consecutive years since 2020. In the same year, NTU was also awarded Taiwan Corporate Sustainability Awards in the categories of "Outstanding Sustainability University" and "Outstanding University Sustainability Reports."

Ever since he took office, President Chung-Ming Kuan has actively collaborated with students and the Office of Financial Affairs to promote socially responsible investments. Under his leadership, NTU completed the divestment of high-pollution and high-emission industries within 2 years, making it the first university in Asia to take such firm actions.

In June 2020, NTU announced it would achieve 50% carbon neutrality by 2028 and 100% carbon neutrality by 2048 in response to the Paris Agreement. Committed to the goals set by the Science-Based Targets Initiative (SBTi), NTU will utilize carbon-negative technologies, increase energy efficiency, use carbon-free electricity and low-carbon energy, and move the production of electricity from carbon neutrality to net-zero emissions.

President Kuan believes that universities should be pioneers in making social and future change. He is impressed by the extent to which the SDGs have been integrated into NTU's curriculum, research,



President Chung-Ming Kuan holding NTU Social Responsibility and Sustainability Report.

and student groups. He hopes that USR can be incorporated into the school's routine tasks and that students will develop expertise in SDGs, promote these values around Taiwan, and make them part of daily life.

NTU strives to root its strategies and actions in sustainability and altruism. By sharing its positive practices and initiatives, NTU hopes to work alongside society and make the world a more sustainable, innovative, and progressive place.

Note: NTU commissions a third party to verify the stated achievements in social contributions and university governance described in the report every two years.



Scan the QR code to read the English report.

Opening Ceremony of the 2021 Academic Year

After the glorious, long, hot summer vacation, NTU hosted the opening ceremony of the 2021 academic year on September 15 to welcome the freshmen of class 110. The theme “First Year So Wild” was adopted for the opening ceremony, to express NTU’s fond hope that the freshmen would deliver different points-of-view and new energy to the university and society with their rich, diverse imaginations and ideas.

Due to the pandemic, the ceremony was streamed as the first online opening ceremony in NTU’s history. This different format allowed for many new innovative and interesting features, such as the Minecraft Campus created by the NTU Minecraft team for the campus tour, prizes offered to freshmen watching the ceremony online, and freshmen sharing their ambitions through images.

During the welcome speech, President Chung-Ming Kuan told the freshmen that the campus would be different this academic year due to the pandemic; they would have to face campus life as well as the challenges brought by the pandemic with a brand new attitude. President Kuan also mentioned that past freshman surveys showed that some freshmen had many uncertainties and fears regarding their life prospects and what they should study. As a result, NTU aims at becoming a “learner-centered open university” by offering Future NTU Action Plans. The action plans are intended to allow students to break through the traditional academic framework, make academic

decisions more flexibility, and proactively develop themselves according to their own design. On that note, President Kuan expressed his wish that the freshmen would seize the opportunity to develop into the person they aspire to be during their time at NTU.

Two students were invited to speak at the ceremony, including Gladys Yu Sook En of the Department of Bio-Industry Communication and Development and Fang-Yu Hu of the School of Medicine. They shared stories of their personal growth at NTU and hoped that the freshmen would draw on NTU’s abundant resources to overcome their difficulties in setting their values and one day contribute to the world. The ceremony concluded with a video produced by the Office of Student Affairs to offer the freshmen a sincere welcome, marking a great beginning of the 2021 academic year.

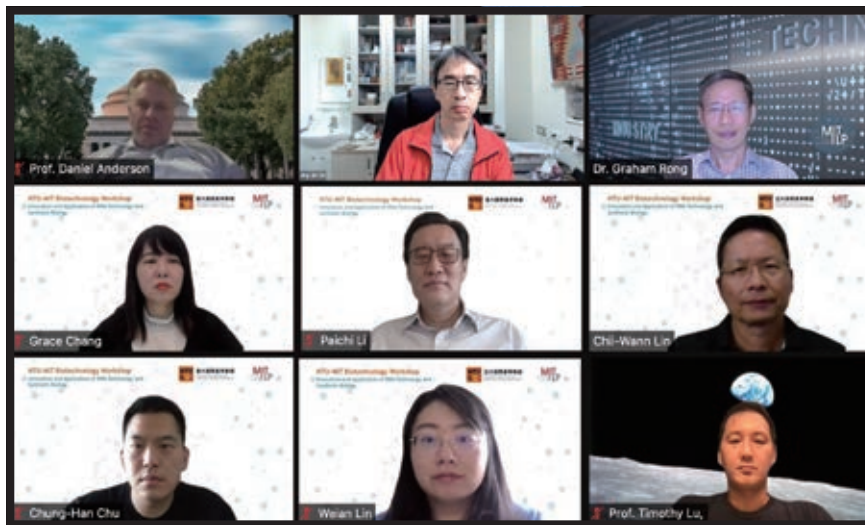


Selfie of the master of ceremony (front), President Chung-Ming Kuan, Vice President for Student Affairs Shih-Pe Wang, and Executive Vice President Ching-Hua Lo (left to right on the back).

NTU and MIT Host Workshop for a Biotech Boost

Biotechnology, which encompasses food, medicine, agriculture, industry, and energy, plays an ever-greater role in our lives. During the COVID-19 pandemic, biotech has entered the spotlight owing to the global focus on the research and development of vaccines and drugs. On August 19, NTU hosted a biotechnology workshop on cutting-edge developments in RNA technology and synthetic biology applications. Leading experts from MIT were invited to discuss their latest findings.

“The pandemic has pushed us to develop vaccines in record time and also generated many great research questions in the field of biotechnology,” asserted Distinguished Professor Pai-Chi Li, VP of NTU Office of Research and Development and Director of the NTU Industry Liaison Office, in his opening remarks. In the first half of the workshop, Professor Daniel G. Anderson of MIT’s Department of Chemical Engineering and Institute for Medical Engineering and Science explained his research on nucleic acid delivery systems and how RNA therapy and gene editing can help in the development of vaccines for infectious diseases. Associate Professor Timothy K. Lu of MIT’s Department Biological Engineering and Electrical Engineering and Computer



Workshop Group Photo.

Science program then elaborated on the potential of using synthetic biotechnology to efficiently produce affordable therapeutics and diagnostics for resisting future pandemics. He stressed the crucial role of DNA programming in new therapeutics modalities and how investing in new technologies helps prepare for the unknown.

During the second half of the workshop, Professor Chii-Wann Lin of NTU’s Department of Biomedical Engineering discussed his research findings on optical biosensors with engineering aptamers for kinetics diagnostics. Next, Assistant Professor Chung-Han Chu of NTU’s Department of Chemistry described how he had discovered nine new antibiotics by combining bioinformatics and chemistry.

“RNA research has brought hope to millions during the pandemic, and the change that synthetic biotechnology has made in our lives is enormous. The developments we heard today demonstrate the infinite possibilities of using biotechnology to advance future medicine and health,” concluded Professor Jing-Jer Lin, NTU Associate Vice President of Research and Development.

The workshop included a timely discussion on solutions for fighting the pandemic, sparking new ideas among the experts and participants, and opening doors to potential collaboration opportunities between academia and the industry.

NTU Plus Academy Global Vision Workshop

NTU Plus Academy Global Vision Workshop, hosted by the Office of International Affairs on July 13-15, 2021, was conducted in English for students with a passion for international issues. The participants included mostly high school students from Taiwan, but also students from abroad, such as Indonesia, Hong Kong, and Japan. The participants' diverse nationalities and backgrounds added an interesting layer to the experience.

The workshop theme was Pandemic and Change, and Associate Prof. Ching-Hsuan Gary Lin of NTU's D-School was invited to share insights into Entrepreneurial Action and COVID-19. Besides discussing how to make breakthroughs with innovative thinking, he guided and coached the students in developing an innovative thinking procedure of their own to facilitate Innovation & Entrepreneurial Action. Associate Prof. Lin highlighted the importance of generating ideas, solving problems, and collaboration in the procedure.

Several professors of the Department of Political Science contributed to the program by adapting their expertise in politics and economics for the context of the pandemic. An expert on climate change, Associate Prof. Tze-Luen Lin presented the challenges of global environmental changes



NTU Plus Academy Global Vision Workshop: Tackling the Pandemic by Broadening the Horizon.

and compared the environmental protection policies and energy issues of different countries. Associate Prof. Yi-Feng Tao delved into global economics by comparing statistical data. Lastly, Associate Prof. Hans Hanpu Tung analyzed how different governments around the world addressed the political challenges wrought by COVID-19.

Some NGO representatives discussed how to keep up with international affairs during the pandemic. Chiayo Kuo, President of Taiwan Digital Diplomacy Association, addressed how to make an impact on international communities through social media. Yenchen Lee, Senior Coordinator of the Taiwan Alliance in International Development, highlighted the difficulties of providing humanitarian aid abroad in the current context.

The workshop courses were conducted online with student advisors leading group discussions afterwards. The participants' final presentations combined course content and their personal experience. A panel discussion was also organized for graduate school students to offer pointers and advice for the participants. The professors generously gave comments and feedback after each presentation so the students gained a more in-depth understanding of the topics and issues.

The firm hope of the Office of International Affairs is that the student participants will be able to face the challenges of global changes with confidence by this broadening of their horizons in a multicultural setting, as well as deepening their understanding of the pandemic situation in Taiwan and around the world.

Chemical Detectives Unlock the Secrets of Famous Italian Violins

The Chimei Museum in Taiwan boasts a world-famous collection of antique Italian violins, including some made by such legendary masters as Antonio Stradivari and his neighbor Guarneri “del Gesù.” In collaboration with the Chimei Museum, NTU researchers recently uncovered their secrets that had been locked away for 300 years—special chemical recipes for altering wood properties to achieve special sounds. Led by Associate Professor Hwan-Ching Tai of the Department of Chemistry, this study has been published in the journal *Angewandte Chemie*.

Analyzing wood flakes collected during violin repairs, scientists found that Stradivari and Guarneri used chemically altered wood for the front and back plates. This technique was developed by their master, Amati, who added chemicals (like borax and copper sulfate) to prevent worms and fungi. Stradivari and Guarneri took it one step further to achieve acoustic tuning by using much more aggressive chemicals. To make the wood stiffer, Stradivari added table salt and Guarneri tried alum, $KAl(SO_4)_2$. They also aged the wood by alkaline treatments.

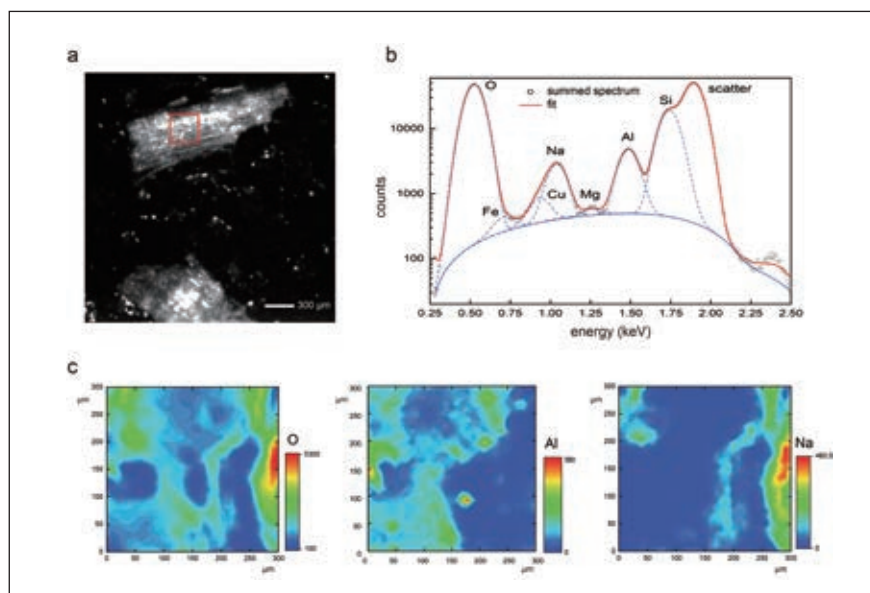
The salt stiffened the wood by altering the distribution of water molecules, similar to the principle of salt-cured meat. The alum stiffened the wood by forming chemical crosslinks between wood fibers. The alkaline treatments caused the rearrangement of wood fibers. The hydrolysis of hemicellulose fibers under basic pH conditions allowed extra space for the remaining cellulose fibers to reorganize and form thicker bundles. On a side note, the artificial aging of wood using lime has been recorded by ancient Chinese guqin makers, with the same cellulose bundling observed by Associate Prof. Tai.

These new discoveries take us one step closer to reproducing the

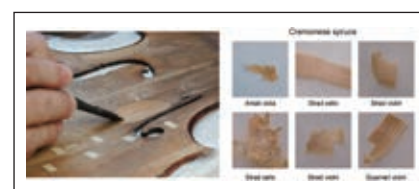
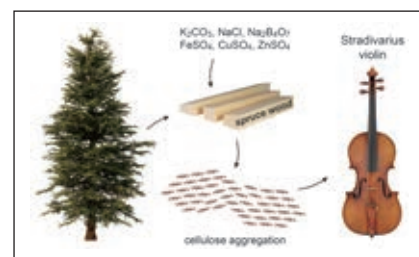
famous tonal quality of Stradivari and Guarneri violins. Associate Prof. Tai believes that different chemical recipes are associated with the distinct tonal colors of each master. Leading modern violin makers are incredibly skilled and they will probably surpass Stradivari once they master the principles of materials engineering for tonewood. Associate Prof. Tai started this line of research when he was a PhD student at Caltech during a visit to Joseph Nagyvary, the biochemistry professor at Texas A&M who pioneered Italian violin materials research. Associate Prof. Tai is also an avid collector of classical music CDs and hi-fi audio equipment, and plays on a Nagyvary-Chen violin made in 2009.



Scan the QR code to read the journal article.



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1. Aluminum in Guarneri's wood.
 2. Cellulose changes in Stradivari's wood.
 3. Spruce sampling.



$^{236}\text{U}/^{238}\text{U}$ Analysis of Femtograms of ^{236}U by MC-ICPMS

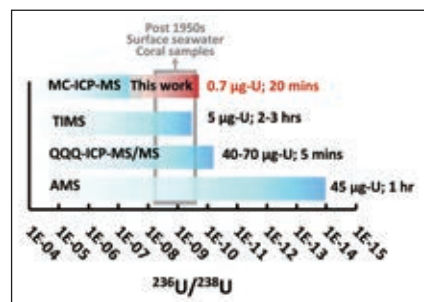
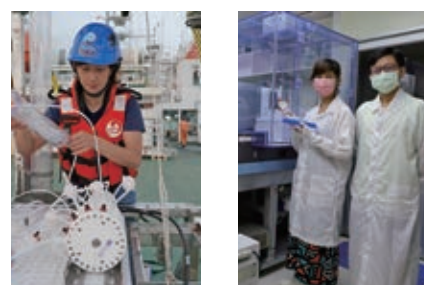
A cutting-edge study led by the assistant professor Huei-Ting (Tina) Lin of the Institute of Oceanography, in collaboration with distinguished chair professor Chuan-Chou (River) Shen of the Department of Geology, two post-doctoral researchers, Hong-Wei Chiang and Tsai-Luen Yu, and international partners, was published by the prestigious journal *Analytical Chemistry* on June 9. The study made a breakthrough in making extremely difficult measurements of the uranium isotope ratio ($^{236}\text{U}/^{238}\text{U}$), which is expected to lead to significant advances in modern oceanography and open a new path in ocean circulation research.

Uranium is evenly distributed in the world's oceans, though in trace abundance. In the 1950s-1960s, a series of nuclear weapons tests in the central Pacific generated ^{236}U , entering the ocean waters. The bomb-generated ^{236}U was transported from the Central Pacific to other regions by ocean currents and changed the $^{236}\text{U}/^{238}\text{U}$ ratios. The ten-thousand-fold amplification makes $^{236}\text{U}/^{238}\text{U}$ ratios a sensitive ocean circulation tracer. However, measuring both the ^{236}U and the ^{238}U at the same time is a daunting task.

About ten years ago, quantifying the low $^{236}\text{U}/^{238}\text{U}$ in natural samples became possible at a few

accelerator-mass-spectrometer (AMS) laboratories. However, AMS is rather insensitive and detects only one out of a thousand uranium.

To make the $^{236}\text{U}/^{238}\text{U}$ measurements more widespread and affordable than AMS, our team developed a new analytical method using a multi-collector high-resolution inductively coupled plasma mass spectrometer (MC-ICPMS) located in the NTU's Department of Geosciences. The MC-ICPMS is far more sensitive than AMS, detecting about two out of a hundred uranium. However, the accelerating power of the MC-ICPMS is only 8000 volts, instead of 3-10 million volts in AMS, and thus cannot achieve complete separation of ^{236}U from ^{238}U . As a result, the ^{238}U interference on ^{236}U is a-thousand-fold larger than the true ^{236}U signal. The research team used a reversed high voltage filter to reduce the ^{238}U interference on ^{236}U greatly. The team also quantified and corrected the hydride of ^{235}U that overlapped with the ^{236}U signal. This analytical method can be applied with the MC-ICPMS found in many Earth Sciences and Oceanographic research institutes at relatively low cost, short analytical time, and the smallest sample size. The team hopes to apply this method to the study of modern global and regional ocean circulation.



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1. Dr. Huei-Ting (Tina) Lin was handling a sample on a clean bench.
2. Dr. Huei-Ting Lin was preparing the sampler of the deep-sea lander on the R/V New Ocean Researcher-1.
3. Dr. Huei-Ting Lin (left) and Dr. Chuan-Chou Shen (right) standing in front of the multi-collector high-resolution inductively coupled plasma mass spectrometer (MC-ICPMS) stationed at NTU's Department of Geosciences.
4. Comparisons among published $^{236}\text{U}/^{238}\text{U}$ analytical methods.



Scan the QR code to read the journal article.

NTU Discovers a Hidden Smoking Imprint in the Tumor Microenvironment

Research on methylome and transcriptome co-analysis of cancer-associated fibroblasts taken from patients with non-small-cell lung cancer, published by Dr. Sheng-Fang Su, Graduate Institute of Oncology, Dr. Chao-Chi Ho, Internal Medicine at NTU Hospital, Dr. Ker-Chau Li and Dr. Hao Ho, Institute of Statistical Science at Academia Sinica, was featured on the cover of *Journal of Clinical Investigation* this past August. The research opens a new epigenome-wide perspective on how detecting cancer-associated fibroblast perturbation may shed light on the behavior of individual tumor microenvironment in clinical outcomes. Moreover, this discovery offers invaluable insight into the workings of precision medicine.

Cancer-associated fibroblasts (CAF) are a key contributor to the tumor microenvironment (TME) that engages critical participants during tumorigenesis. Studies related to genome-wide profiling of cancer patient-derived CAFs for biomarker development and CAF-targeted therapy have gained increasing attention in recent years. However, the limited molecular-level understanding of CAF heterogeneity among cancer patients has posed a challenge to researchers.

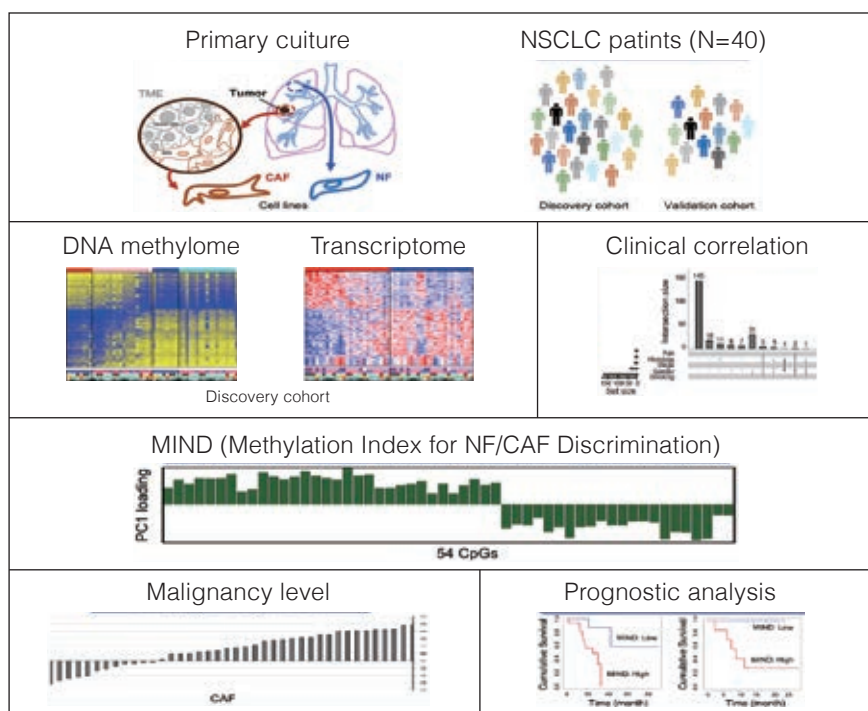
In this research, the team was able to quantify the pro-tumorigenic potency of CAFs via a DNA methylation signature and reported the smoking impact on premalignant TME. These results suggest that smoking not only incurs disarrangement in cancer but disrupts the



Cover of the *Journal of Clinical Investigation*.

physiological functions of surrounding CAFs. By exploring the behavior of CAFs, physicians may score those patients with risks of tumor relapse and better predict their prognosis.

Dr. Su received her advanced training at the renowned cancer epigenetic laboratory of the University of Southern California, under the guidance of Dr. Peter Jones, where she received her Ph.D. Specializing in cancer epigenetic research, Dr. Su established an epigenomics laboratory at NTU for genome-wide epigenetic studies. By cross-disciplinary collaboration, she continues her studies in tumor biology and liquid biopsy application to advance precision medicine.



Scan the QR code to read the journal article.

Epigenome-wide quantification of patient-derived cancer-associated fibroblast reveals a smoking-associated malignancy index of tumor microenvironment.

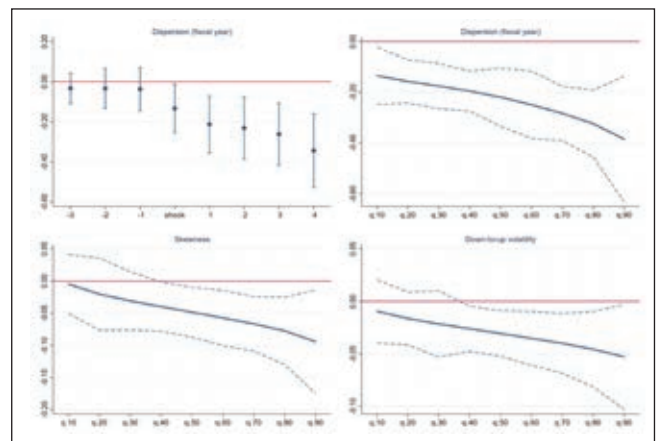
Establishing Causality in Investor Disagreement Models, Research Forthcoming in *The Journal of Finance*

Testing Disagreement Models, new research by Associate Prof. Yen-Cheng Chang, Associate Prof. Kevin Tseng, doctoral student Pei-Jie Hsiao of the NTU Department of Finance, and Chair Prof. Alexander Ljungqvist of the Stockholm School of Economics, is forthcoming in *The Journal of Finance*, marking the journal's first acceptance of a submission by NTU scholars since 1999.

Asset pricing is a core field in financial economics. One of the major challenges of asset pricing is to propose models that explain the behavior of asset prices. To this end, models that incorporate investor disagreement can be enlisted to explain empirical regularities, such as investor overtrading, asset bubbles, and stock price crashes. These are all issues of great interest to academics, practitioners, and policy makers. While models of investor disagreement are appealing on theoretical grounds, prior empirical studies do not demonstrate solid causal evidence for the role of disagreement in asset prices.

To meet this empirical challenge, the research team exploited a regulation enacted in the 1990s by the Securities and Exchange Commission (SEC) requiring all public firms to submit and disclose their financial reports online. Firms were required to participate in this system in discrete ways that effectively led to random assignments of treated and control firms. This empirical setting served as a natural experiment with which the research team compared the pre- and post-regulation differences between the treated and control firms (difference-in-differences design). The researchers found that this regulation indeed induced a reduction in investor disagreement, which in turn alleviated speculative stock price bubbles and crash risks. The team also found that these effects were more pronounced for stocks with binding short-sale constraints, consistent with models of investor disagreement. Overall, a single and

parsimonious empirical identification design was adopted for this study to test all core predictions of disagreement models, thus establishing a causal relation between investor disagreement and important asset pricing phenomena. The results of this paper also shed new light on the benefits of mandatory disclosure from an asset pricing perspective. These contributions were key in receiving recognition from the world's leading academic journal in finance, *The Journal of Finance*.



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1. Photo of Research Team Pei-Jie Hsiao, Yen-Cheng Chang, Kevin Tseng (Left to Right).

2. Investor Disagreement Dynamics and Quantile Regression Plots.



Scan the QR code to read the journal article.

NTU IPARC: Leading Force in Photonics

Racing to meet rising industry demands for varied and innovative applications of photonic techniques, NTU Innovative Photonics Advanced Research Center (IPARC) has proven its leading position in the field in recent years. Astounding research breakthroughs and technology transfers have infused excitement into ongoing and new collaboration projects on a range of topics.

In view of the increasing importance of III-V compound transistors and photonic devices, IPARC collaborates with the Graduate Institute of Photonics and Optoelectronics and WIN Semiconductors Corp. in developing HBTs, Fin-HEMTs, and PICs. The project has made significant contributions to the advancement of compound semiconductors. In research on 3D sensing, the development of VCSEL array fabrication, measurement system, and algorithms of 3D image recognition are the core efforts in a collaboration among IPARC, Graduate Institute of Networking and Multimedia, and LOTES, a leading domestic connector manufacturer. Such developments are hoped to be applicable to tests of production line yields.

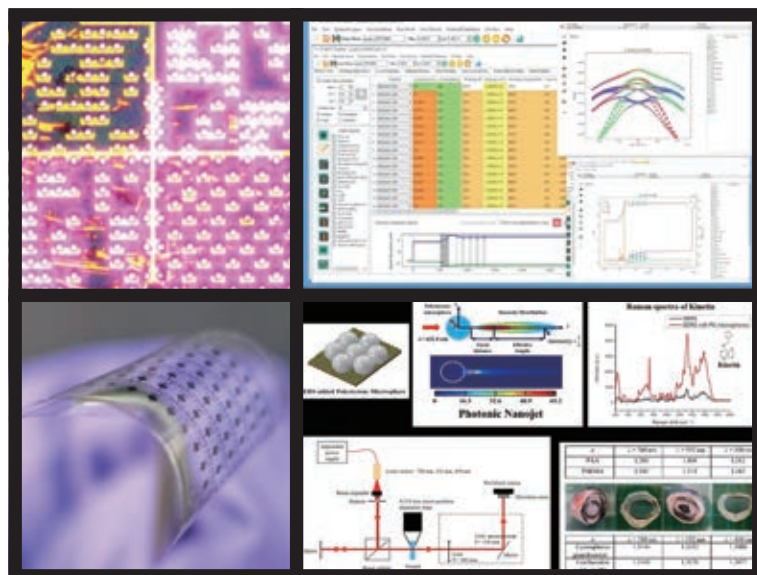
Furthermore, the photonic device simulation tool developed by IPARC professors has accumulated over 500 downloads.

Collaborations in the design of innovative photonic devices abound, as IPARC launches projects with not only renowned academic institutions worldwide but also key players, such as EPISTAR, PlayNitride, and Apple.

The growing need for flexible photonic devices in new electronic products, such as flexible electronic patches, did not escape IPARC's attention, either. Resources are being poured into the development of flexible complementary thin-film transistor technology, techniques of display and sensing elements, and flexible packaging. Industry-academia collaborations are already in full swing.

Efforts are also being made in integrating photonics into biosensing, opto-mechanical-electronic sensing, analysis of nanophotonic properties, and so forth, with groundbreaking results published in top journals, such as *IEEE*. Meanwhile, cutting-edge techniques are being adopted in the development of energy harvesting and storage elements. The dielectric barrier discharge (DBD) technique incorporated with a jet system is being used to construct an atmospheric-pressure DBD plasma system that modifies and treats the surface of low-temperature materials.

In addition to research and development, IPARC is devoted to hosting academic forums and cross-strait exchanges to stimulate advancements in photonics. As a pioneer, IPARC will continue to lead efforts in the flourishing of advanced photonic techniques in Taiwan.



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1. Vertical-cavity surface-emitting laser (VCSEL) arrays can be applied to 3D sensing, LiDAR, etc.
2. A multi-Dimensional TCAD simulation tool can assist in the design of innovative photonic devices.
3. Flexible complementary oxide thin-film transistor-based inverter with high gain can be applied to new flexible electronic products.
4. Applications of photonics in biotesting techniques: (Top) Photonic nanojets used to enhance surface-enhanced Raman scattering (SERS) substrates sensitivity of detecting kinetin, a type of plant's growth hormones. (Bottom) Refractive index measurement of shark corneas by Shack-Hartmann wavefront sensors.

Thousands Join Machine Learning

Artificial Intelligence (AI) is revolutionizing the way the world operates and as it gains momentum, one of its core technologies—machine learning—is increasingly important. Since machine learning technology is rooted in several fields, the course “Machine Learning” offered by Associate Professor Hung-yi Lee of the Department of Electrical Engineering was open to all NTU students. Last semester, 1280 students enrolled in the course, one of the few classes at NTU with over 1,000. To ensure that students would have the best learning outcome, lecture recordings and class materials were available in Chinese and English, to accommodate international as well as domestic students.

As NTU does not have a classroom that can seat 1,000 students, Associate Prof. Lee arranged for the lectures and class materials to reach students both inside and outside the classroom. Students in the course had the option to attend the lectures in person or participate online via live streaming. Additionally, the lectures were recorded and uploaded to YouTube for students to replay.

Machine Learning was a huge class and the students came from a variety of departments. Associate Prof. Lee strived to help students of different levels and abilities to keep up with the lectures and achieve a basic grasp of machine learning. The lectures covered a range of topics, from basic concepts of machine learning to deep learning, self-attention, transformer, generative models, and subject-specific machine learning theories, such as quantum machine learning, which presented by guest speakers. All the cutting-edge research was presented clearly and straightforwardly, to make the course beginner-friendly. Nonetheless, the course content remained challenging, even for majors in electrical engineering and computer science.

The course prerequisites included calculus, linear algebra, probability, programming, and Python. Students were required to complete ten of the fifteen assignments given during the semester. The assignments covered a variety of topics, including COVID-19 trend prediction, image recognition,

translation between Chinese and English language, voice recognition, speaker recognition, self-supervised learning, meta-learning, and life-long learning. Students were asked to apply the machine learning skills they learned in real-life scenarios.

All the assignments and project results were submitted online and the evaluation of machine learning models was done automatically via platforms, such as Kaggle. However, some assignments were too innovative to be assessed on existing platforms. For example, “Adversarial Attack,” an assignment that required students to add noise to images to fool machine learning-trained image recognition systems. In order to evaluate this assignment, a team of teaching assistants set up a DIY platform “Judgeboi” by which students could test their models and better understand the vulnerabilities of machine learning.

“At first, I was hesitant to offer such a huge class and teach over a thousand students. But the notion



Associate Prof. Hung-yi Lee was awarded for The 59th Ten Outstanding Young Persons by Junior Chamber International Taiwan, in recognition of his research and development achievements of science and technology field.



Students attending the lecture.

that students who attend this course may apply the machine learning knowledge they learn to areas beyond my imagination and possibly benefit the world inspired me to accept the challenge of designing this hybrid course,” said Associate Prof. Lee.

In the process, Associate Prof. Lee had to navigate a variety of novel challenges. For example, training a machine learning model can be a toilsome and lengthy task that requires patience. While the class assignments were designed to be simple and required just a few hours to complete, some students still expressed frustration. To facilitate a positive learning experience and encourage the students, Associate Prof. Lee and his teaching assistants spent hours finding solutions and devising ways to keep the students motivated.

Technology is changing not only the way people live but also the way students learn. In the “Machine Learning” class students not only learned the key concepts of the field but also had

precious experiential learning. Through trial-and-error efforts, the students got hands-on experience in simulating real-life situations without facing the risks. Reflecting on the idea of machine learning, both the students and the teachers in this course challenged themselves to stay resilient and innovative.



A T-shirt especially designed for this course.



Scan the QR Code to visit Associate Prof. Hung-yi Lee's website.

F.I.R.S.T Workshop— Your First Lesson at NTU Library

NTU Library has always striven to empower NTU faculty, students, and staff with a wide range of information and research resources. Every year, the Library hosts workshops and seminars, such as the “HELP Lectures,” to help students to access and utilize database information, and “Master Class,” which is geared toward individual directed studies. To enhance the students’ learning experience and ability to access library resources, the Library also dispatches librarians to give presentations in classrooms and offer free library lessons for students, by appointment. To date, more than ten thousand faculty, students, and staff have utilized these services.

In the past, the vast majority of presentations and services offered by the Library were conducted in Chinese. At present, because NTU welcomes an increasing number of international students and professors, the Library now offers its presentations and services in English, as well. Since 2017, the Library has hosted the “Know Your Library” tour each year. On this tour, international students and faculty are guided through the abundant resources and programs offered by the Library, in English. Additionally, some librarians also give presentations in English and assist professors from various colleges and departments.

NTU Library launched its first English program: “F.I.R.S.T. Workshop in NTU Library” in 2021 to further assist foreign library users in obtaining the

information they need. The acronym F.I.R.S.T stands for **F**oreign Students Must Learn: **I**nformation, **R**esearch and **S**earch **T**echniques; the program includes sessions on EndNote reference manager, databases, and other multi-media resources. At the workshop, subject specialists act as consultants and assist participants in resolving the challenges they encounter when accessing and using information resources.

The program was well-received, and many believe it will play a pivotal role in NTU’s internalization process. It is hoped that the program will not only open the Library’s door to a greater audience but help everyone on campus maximize their use of the rich Library collections and academic resources. This program is promoted by the Office of International Affairs, the Center for Teaching and Learning Development & Digital Learning Center, NTU Colleges and Departments, NTU’s foreign teaching faculty, and student clubs.



Scan the QR code to discover more courses.



1. Teaching students how to use reference manager EndNote in English.
2. Students using their phones to answer questions on Kahoot.





Forge Ahead— NTU Baseball

It felt like yesterday—the whistle blew. The game was over. He saw his teammates pat each other on the back; some were wiping the sweat from their brows, or were they tears? Their star players, including the pitcher and catcher, had just played their last game in the University Baseball League. They were outstanding. That homer in the top of the sixth inning sent chilled down his spine, and he shouted and cheered with the team, eager for a comeback. They nearly made it, just lost by one run to Taipei University of Marine Technology. NTU Baseball played fiercely this past season in the UBL games. Their hard work paid off. Going into the second round in second place of the divisional preliminary, they advanced to the quarter finals, buoyed by a winning streak.

“Ready to drill?” Without a second thought, he ran to join his teammates. They may come from different backgrounds, but they are all baseball diehards. Through the endless drills, team practices, and hard-fought games versus teams from other universities, they have bonded tightly. They’ve relied upon each other in every game, sharing moments of joy and remorse, vowing to play better next time. At the end of the final game last season, the team sat together to review their performance—in order to win the next game. This

1. Baseball is a team sport. It teaches us how to cooperate and work with others, especially with our devoted teammates.
2. We take pride in the spirit of never giving up lightly even in the brunt of a predicament.
3. Fearless of the freezing winter and sweltering summer, we trained. In recent years, NTU Baseball has been recognized by all to be a strong opponent in the UBL normal group.
4. Star players of NTU Baseball graduated this summer. The team has to brace itself for the upcoming games and cultivate new players at the same time.
5. A group photo of NTU Baseball.

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fierce determination to come back stronger has won the team its reputation as a formidable opponent in the UBL normal division.

Next season, the star players would not take the field with them—they are poised to test their mettle outside of NTU’s hallowed gate. It’s time for him and his teammates to carry the mantel and to maintain the glory of the 71-year-old team, the first college baseball team in Taiwan. It’s their time to entice talented new recruits to join the family and compete in the UBL. A glance around him relieves him of his qualms; the players’ faces show the same grit and spirit of players past. He smiles. Despite the many challenges ahead, he knows that with these devoted teammates, NTU Baseball will take the field again with its players standing strong and dauntless. Bat in hand, he is ready—ready to blast a home run deep into the center field stands.

Memories of the Olympics: NTU Swimmer Mei-Chien Huang at the 2020 Tokyo Olympics

NTU graduate student Mei-Chien Huang competed in the Women's 50m Freestyle at the Tokyo Olympics as the only female swimmer on the Chinese Taipei team. Competing against some of the best swimmers in the world, she finished in 25.99 seconds, placing 6th in the heat and 38th overall. Although she did not qualify, it was an amazing personal achievement for her.

A graduate of the Department of Bioenvironmental Systems Engineering (2020), Mei-Chien Huang is now a master's student in Sport Facility Management and Health Promotion and captain of the NTU Swimming Team. She finished the Women's 50m Freestyle in 25.59 seconds at the National Intercollegiate Athletic Games last May, breaking her own record and winning a ticket to the Olympics.

Looking back, Mei-Chien Huang said she truly enjoyed every moment at the Olympics though she was extremely nervous about the competition. "I told myself not to worry about the result, but I was shaking all over on the platform." For a first-time Olympian, the jitters were inevitable. However, she learnt a lot from observing the techniques and rhythms of the best swimmers in the world. She also studied the psychology of

elite athletes after the Olympics, especially how they relax and release pressure.

The Opening Ceremony has left a deep impression on Mei-Chien Huang, though she regretted being unable to take a good look at the Olympic Village due to the pandemic, especially the driverless buses. She was thrilled to meet many star athletes. Besides the thrill of having her picture taken with Novak Djokovic and Stefanos Tsitsipas, being greeted by Danish Olympics badminton champion Viktor Axelsen in Mandarin was the highlight of her stay in Tokyo.

As the coach of the NTU Swimming Team, Assistant Prof. Chien-Ju Lin, a former national champion and Olympian herself who participated in the Atlanta Olympics in 1996, praised Mei-Chien Huang for her skills and diligence. Although she mostly trained off campus, she never held back during weekly training with the university team.

Back home in Taiwan, Mei-Chien Huang is continuing with her studies and training. As the national record-holder in Women's 50m Freestyle and Women's 50m Butterfly, she aspires to break her own records in future competitions.



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1. Mei-Chien Huang at the Tokyo Olympics Opening Ceremony.
2. Mei-Chien Huang and the Tokyo Olympics logo at the venue.
3. Athlete Mei-Chien Huang warming up at the Tokyo Olympics.
4. NTU Olympics swimmers: Mei-Chien Huang (right) and her coach Chien-Ju Lin.
5. Mei-Chien Huang and the Tokyo Olympics logo at the venue.



A New Milestone: New Logo Launch for National Taiwan University Press

National Taiwan University Press is celebrating its 25th anniversary this year. Since its establishment in October 1996, the press has published primarily academic works, as well as a variety of college textbooks and high-quality general titles. The new logo was launched for this grand occasion and has appeared on every publication since August. This brand new visual is intended to add a burst of creativity and depth to the field of academic publishing in Taiwan.

A logo is a bridge that connects a publisher with the world and distinguishes the identity of the brand. The new logo of NTU Press presents an artistic interpretation of its abbreviation, NTUP, aimed to prompt readers to visualize the press's English name "National Taiwan University Press" at first sight. Serif was chosen for the English font. Tracing back to ancient Rome, serif was the font carved into stone by the Romans in antiquity. To this day, serif is regarded as a classical and

elegant font which bears incredible cultural and historical depth.

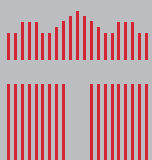
The design of the Chinese font strives for visual harmony and is aimed to unite the images to showcase the importance and rigor of academic publishing. Moreover, it conveys the innovative spirit of the publishing house. To underscore the intimate connection between the press and National Taiwan University, a shade of brick red inspired by the buildings flanking NTU campus's Royal Palm Boulevard was selected.

On the occasion of its 25th anniversary, NTU Press launched the new logo to symbolize the press's intention to transmit the fruits of significant research to the future generations, as well as open a new chapter in academic publishing at National Taiwan University. Besides appearing on publications, the new logo is also featured on a variety of merchandise sold by the press bookstore.



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1. The new NTUP logo.
2. Examples of the NTUP logo application.
3. Examples of the NTUP logo application.



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