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# NTU

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### NTU Strengthens Ties with Viet Nam National U

Taiwan-US Efforts to Unravel  
Kuroshio

Students Win Youth Housing  
Competition

OIA Recruits Students at NAFSA

### Special Report

## AI and Job Market







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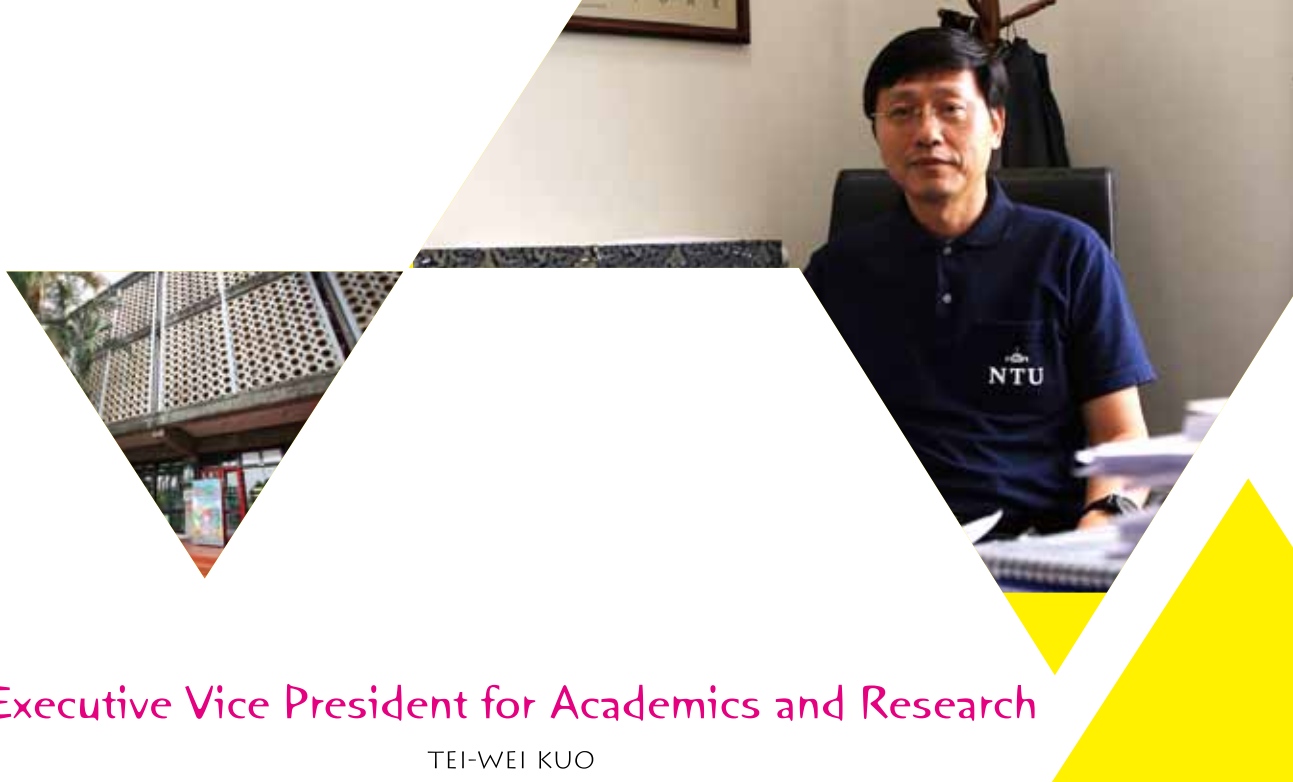
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## *NTU at a Glance*

President Yang Offers Thanks to Colleagues and Students in Farewell Address

**Error:** In Issue 60 of NTU Highlights, the photo on the right side of Page 14 should have appeared on Page 5 under the title "President Yang Leads Major Delegation to Peking University."





## Executive Vice President for Academics and Research

TEI-WEI KUO

Executive Vice President for Academics and Research Tei-Wei Kuo says, "The logic of taking care of business is to first decide which business ought to be done and then determine how to do it." This coming semester, NTU will continue to promote interdisciplinary learning and strengthen students' core abilities while emphasizing talent development for internationalization and pursuing academic cooperation and exchanges with partner universities.

Among the university's major business matters in the area of academics will be the promotion of "second specializations." This is intended to encourage students to step out of their departments so as to expand their professional knowledge in interdisciplinary fields. As they pursue specialized skills, students must not overlook the importance of cultivating core abilities. To address these needs, the Office of Academic Affairs offers training in composition and in basic computer and Internet skills.

Moreover, as language skills are the basic requirement for internationalization, students who have set their sights on the world beyond Taiwan must dedicate themselves to developing their Mandarin and foreign language skills. These days, we spend our lives connected to our computers and smartphones. This has created greater opportunities that in turn require correspondingly broader skill sets. NTU encourages students to develop their computer skills, and provides a range of courses pertaining to computers and information technology. Subjects covered in these courses include programming languages, front-end and back-end web design, and languages for data analytics.

As for research, NTU aims to provide an outstanding and well-established research environment for students and faculty members, as well as to encourage interdisciplinary cooperation, boost synergy between academia and industry, and support the nation's industrial development. Currently, we are also planning and promoting interdisciplinary and cross-generational research cooperation in hopes of igniting new sparks of innovation. Meanwhile, the university also offers scholarships for students who meet the requirements for exemptions from qualifying examinations for Master's and PhD programs. These scholarships encourage students who intend to pursue careers in academia, and help optimize the campus's research environment.

Still, Executive Vice President Kuo remains deeply concerned about such potential worries as brain drain and difficulties in hiring young faculty members to face the field of higher education in Taiwan. Citing NTU as an example, Kuo points out that more than half of the university's faculty members have already reached the age of 50, and the problem of low salaries has severely impacted the university's ability to hire and retain quality faculty members. Moreover, because university faculty members are often over 35 years old when they are hired, there are fears that the government's annuity reforms will deliver yet another major blow to higher education and leave those employed in this field facing increasingly grim prospects. Taiwan should confront this problem head on; otherwise, we will find ourselves in a position in which we have research funds but no qualified people to put them to use, which will profoundly impact our capacity to cultivate talented professionals in Taiwan as well as support the nation's future industrial development.



# COMMENCEMENT SPEAKER HIGHLIGHTS FUTURE IMPACT OF ARTIFICIAL INTELLIGENCE ON JOB MARKET

*Dr. Kai-Fu Lee, founder and CEO of Sinovation Ventures and president of Sinovation Ventures Artificial Intelligence Institute, returned to his alma mater to deliver a keynote speech during the 2017 NTU Commencement Ceremony on June 4. In his address, Dr. Lee highlighted the key role artificial intelligence is expected to play in the future, and called on the graduating students to take advantage of artificial intelligence in making innovations and creating a better world.*

**T**he NTU alumnus began his speech by first congratulating the Class of 2017 for graduating from Taiwan's most elite university. He said that his return to NTU evoked memories of his student days of discovering the two true loves of his life: his wife and artificial intelligence. The former NTU student joked that he would nonetheless limit the scope of his address to artificial intelligence.



Dr. Lee predicted that artificial intelligence would replace 50% of existing jobs, likening the potentially immense influence of artificial intelligence to the profound impact of the Internet on human society. Artificial intelligence would be a two-edged sword that brings prosperity to some and anxiety and distress to others.

According to Dr. Lee, artificial intelligence will redefine the pyramid-like structure of the workforce, elevating "innovators" to the top level and placing experts of all fields on the level below. He said these roles would not be eliminated in the coming age of artificial intelligence.

Despite the anticipated transformations in the job market, the age of artificial intelligence would also be a time in which artists and cultural workers emerge and flourish. In addition, the profound changes to be brought by the development of artificial intelligence would create new research topics in such fields as psychology, philosophy, sociology, history, and anthropology. Dr. Lee further noted that students pursuing science degrees who also cultivate their appreciation of culture and the humanities would boost their value to employers because artificial intelligence would be incapable of replacing the human element.

According to Dr. Lee, 80-90% of the jobs to be available in the new workforce pyramid would be



# Special Report



provided by service industries, where personal interaction, engagement, and emotional connections are of core importance. While artificial intelligence will bring revolutionary changes to human society, it will not satisfy people's need for direct interpersonal connections. This means there remains great potential for the development of service industries in the age of artificial intelligence.

Dr. Lee cited one of British science-fiction writer Arthur C. Clarke's famous three laws, "Any sufficiently advanced technology is indistinguishable from magic." The speaker called on the graduates of all majors to view artificial intelligence as powerful magic. He said the point was to make good use of artificial intelligence as a powerful tool in one's own field while setting learning goals and striving to become valuable professionals who cannot themselves be replaced by artificial intelligence.

Faced with the emergence of artificial intelligence, Dr. Lee pointed out, one is responsible for making wise career choices and reconnecting Taiwan to the world. He urged the graduates to use the powerful magic of artificial intelligence to broaden their horizons, pursue international connections, and fulfill their social responsibilities.

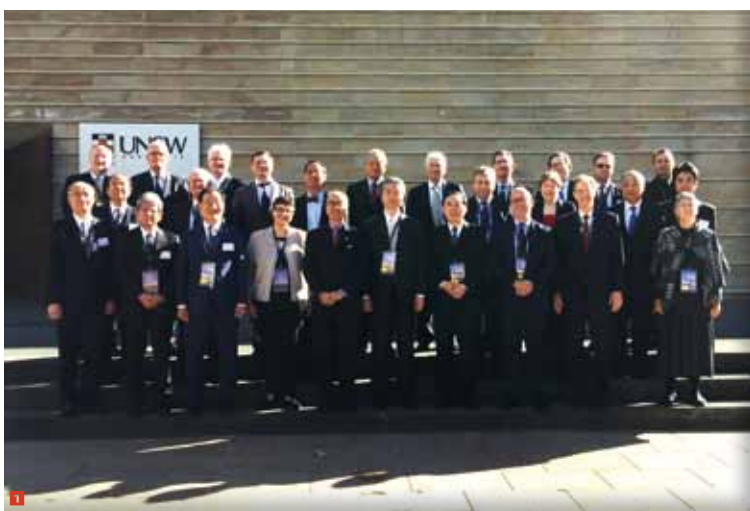
Near the end of his speech, Dr. Lee talked about how his experience of fighting cancer had changed his life priorities, philosophy, and values as well as inspired him to reexamine artificial intelligence from a newly-gained perspective. He stressed that while artificial intelligence would outperform human beings in more and more fields, the quality that makes humans different from artificial intelligence is our ability to love and be loved. With this ability, he said, people should learn to live meaningful lives of both the mind and the heart.

Dr. Lee concluded by urging the members of the Class of 2017 to set goals for the careers they wish to pursue in the future workforce pyramid, reflect on how to lead the coming era using artificial intelligence, and follow their dreams while keeping an ear to their inner voices.





# DELEGATION ATTENDS APRU PRESIDENTS' MEETING IN SYDNEY



**1** The university presidents and speakers attending the 21st APRU Annual Presidents' Meeting pose for a group photo.

**2** NTU President Pan-Chyr Yang and USYD President Michael Spence sign a research cooperation agreement.

A delegation of NTU officials attended the 21st Annual Presidents' Meeting and Presidential Retreat of the Association of Pacific Rim Universities (APRU) at the University of New South Wales (UNSW) in Sydney in June. While in Australia, the officials also formally established a strategic partnership with the University of Sydney (USYD).

NTU is a founding member of APRU and actively participates in APRU meetings, conferences, and workshops. NTU will be the host of the 22nd APRU Annual Presidents' Meeting in 2018, the year of our 90th anniversary. In 2016, Prof. Pan-Chyr Yang, the then president of NTU, became the first NTU president to be elected to the APRU Steering Committee.

Around 80 presidents and other officials from 20 universities attended this year's meeting. Prof. Yang attended the meeting at the invitation and request of NTU Interim President Ching-Ray Chang. During his four years as president, Yang maintained close contact with APRU presidents and committee members.

As a member of the Steering Committee, Prof. Yang recommended several Taiwanese universities as candidates for APRU membership. Prof. Yang also extended an invitation to the presidents and international affairs directors of the 43 APRU member universities to visit NTU in 2018 for the 22nd Annual Presidents' Meeting and the celebration of NTU's 90th anniversary.

Meanwhile, USYD President Michael Spence invited the presidents, international affairs directors, and other officials of NTU, Yonsei University, and the University of California at Davis to his residence to share their universities' goals for research and teaching development and discuss



strategies and disciplines for cooperation. Among the three invited universities, NTU was the only one to have previously initiated cooperation programs with USYD.

During the visit, Prof. Yang and President Spence exchanged the agreement officially making USYD NTU's sixth strategic partner. NTU's other strategic partners are the University of Illinois at Urbana-Champaign, University of Tokyo, Kyoto University, Peking University, and University of Hamburg.

In addition, NTU Vice President for International Affairs Luisa Shu-Ying Chang and Director for Global Engagement Andrew Tsung met with USYD Pro-Vice Chancellor (Global Engagement) Katherine Below to discuss research cooperation. They selected seven research projects, which will rely on funding previously allocated by then-President Yang for collaboration between the faculty members of both universities.

In recent years, NTU has made substantial progress in promoting teaching and research collaboration with universities in Australia. In March of 2014, USYD President Spence led a delegation to visit then-President Yang and the College of Liberal Arts, initiating the first cooperation between USYD and NTU. Subsequently, the Australian Government has launched its New Colombo Plan, which encourages Australian students to pursue further studies at prestigious universities in Asia. Moreover, NTU, USYD, and Harvard University jointly announced partnership strategies during the annual conference of the Association of International Educators.





## AGREEMENT INITIATES TIES BETWEEN ELITE UNIVERSITY SYSTEMS IN TAIWAN AND VIETNAM

**N**TU Interim President Ching-Ray Chang, who serves as head of the National Taiwan University System (NTUS), led a delegation of representatives from the three NTUS member universities to pay an official visit to the headquarters of Viet Nam National University, Ho Chi Minh City (VNUHCM) on July 7.

During the visit, which was organized in order to facilitate international academic collaboration and exchanges with Vietnam, President Chang discussed future directions for collaboration and signed a memorandum of understanding for academic cooperation with VNUHCM President Huynh Thanh Dat. Director General Liang Kuang-Chung of the Taipei Economic and Cultural Office in Ho Chi Minh City helped facilitate the delegation's trip to Vietnam and attended the signing ceremony as well.

With the signing of the memorandum, NTUS and VNUHCM formally agreed to pursue meaningful collaboration across multiple academic disciplines as well as to initiate student and faculty exchange programs. Furthermore, the agreement calls for the launching of joint research projects in areas of shared interest and the establishment of scholarships that will help Vietnamese students study in Taiwan and Taiwanese students study in Vietnam.

The signing of the memorandum marked a major move forward for substantive academic cooperation and exchanges between institutions of higher education in Taiwan and Vietnam, and heralded the beginning of Taiwan's effort to promote collaboration with institutions of higher education in the Southeast Asian region as a whole.

Both NTUS and VNUHCM are university systems comprised of multiple affiliated universities and colleges. VNUHCM was founded in 1995 through the merging of nine prestigious universities in Ho Chi Minh City. The campuses of the VNUHCM member universities cover a combined area of nearly 645 hectares.

For its part, NTUS, which went originally by the name NTU Triangle Alliance, is composed of NTU, National Taiwan Normal University, and National Taiwan University of Science and Technology, three closely located elite universities in Taipei City.

The combined student enrollment of the VNUHCM system is of a comparable scale to that of NTUS. However, a major difference between the two university systems is that the VNUHCM system is governed directly by Vietnam's prime minister, who is responsible for drawing up the system's budgets as well. Moreover, the hierarchical position of the president of the VNUHCM system within the Vietnamese government is on the same level as that of Vietnam's minister of education.





- ▲ The team from the Stanley Wang D-School@NTU won 1st prize for a design based on wood pallets.
- ◀ The students of the winning D-School@NTU team

**T**eams from NTU won the top two prizes in a housing design competition organized by the Urban and Rural Development Department (URDD) of the New Taipei City Government this spring. When the URDD announced and awarded the top five prizes for its Youth Housing Competition on May 27, it was students from the Stanley Wang D-School@NTU and the Graduate Institute of Building and Planning who mounted the stage to claim the competition's first prize and second prize, respectively.

The URDD Youth Housing Competition challenges teams from colleges and universities around the nation to innovate designs for living spaces limited to an area of no greater than 9 pings (29.8 m<sup>2</sup>). Organized to encourage Taiwan's young housing designers to realize their dreams, the competition requires the participating team members to be between the ages of 18 and 45. The competition drew 148 design projects from 44 departments at 29 colleges and universities.

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The team from the Stanley Wang D-School@NTU won the 1st prize for a design based on wood pallets, while the team from the Graduate Institute of Building and Planning won the 2nd prize for a modular system design.

The design submitted by the team from the Stanley Wang D-School@NTU reflected the team's belief that everyone should be given the opportunity to create their own living space. Adopting a user-centered design, the team made furniture making as simple as assembling ready-made wooden pallets. This easy-assembly mechanism enables users to develop a more intimate understanding of the space they inhabit, and imagine the type of living environment they truly need.

Highlighting the motivation behind the team's design, team leader Yu-Chun Liu said, "We hope the space we design feels like a home for everyone to stay and conduct their lives. We will make our idea a reality. After all, when we build our places, we are building our own lifestyles and defining our lives."



In late June, NTU Executive Vice President for Academics and Research Tei-Wei Kuo boarded a plane bound for Austin, Texas in the United States in order to enjoy the honor of receiving the 2017 IEEE TCCPS Distinguished Leadership Award in person. In conferring this prestigious honor on Executive Vice President Kuo, the Technical Committee on Cyber-Physical Systems (TCCPS) of the Institute of Electrical and Electronics Engineers (IEEE) recognized his exceptional leadership in and contributions to the study of cyber-physical systems.

Executive Vice President Kuo has received numerous honors in recognition of his influential research contributions over the course of his esteemed career. In 2015, Kuo was elected as a Fellow of the Association for Computing Machinery (ACM), becoming only the second information engineering scholar in Taiwan to have been elected an ACM Fellow. In addition, he currently serves as the vice chair of the ACM Special Interest Group on Applied Computing (SIGAPP).

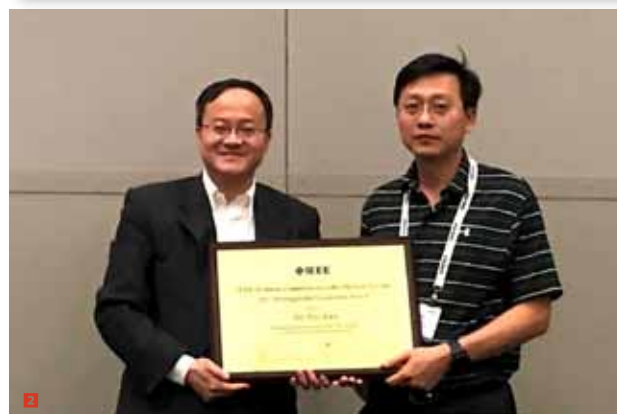
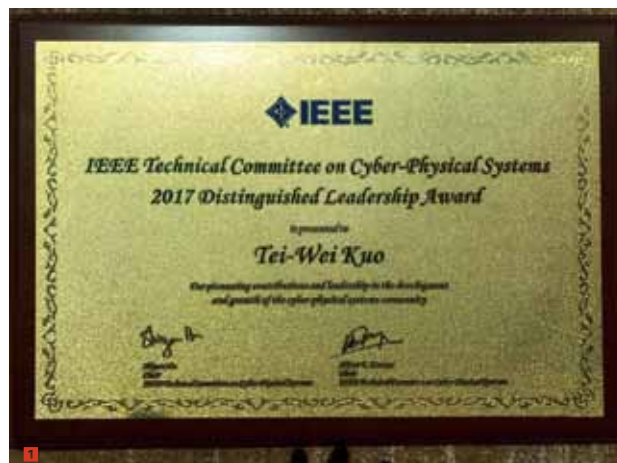
Last year, Kuo brought his abundant experience in applied and theoretical research (most notably in the design of flash memory and the development of embedded systems) with him when he took over the leadership of the Stanley Wang D-School@NTU. As the head of the school, he aims to facilitate interdisciplinary collaboration among NTU faculty members and students with the goal of building NTU's international reputation as a stronghold for the development of cyberspace systems.

Among the various societies, councils, and committees that make up the IEEE, the TCCPS is responsible for facilitating interdisciplinary research and education related to the field of cyber-physical systems. The committee also focuses on the creation of a social and industrial environment that will integrate artificial intelligence and physical systems by enabling interaction between cyberspace (e.g., automatic control based on sensors and computers) and physical space (e.g., environments and machines).

Cyber-physical systems are a critical technology for the realization of Industry 4.0, and their design and operation require the coordination of a variety of technologies. Researchers working across a wide range of fields, among them big data analysis, statistical information, computer automatic control, real-time sensing, fault tolerance management, and user feedback, have been called on to achieve the integration of cyber and physical spaces.

In addition, scientists hoping to create a comprehensive range of innovations intended to bring about a revolution for humankind are developing new modes of living and

## Executive Vice President Recognized with Leadership Award for Cyber-Physical Systems



1 The award bearing Executive Vice President Kuo's name

2 NTU Executive Vice President for Academics and Research Tei-Wei Kuo (right) poses for a photo after receiving the 2017 IEEE TCCPS Distinguished Leadership Award.

mechanisms for a future society by applying cyber-physical systems technologies in such areas as smart homes, smart transportation, free flight, smart energy, industrial automation, trade marketing, environmental control, and online-to-offline (O2O) systems for retail businesses.

The decision of the TCCPS to award Executive Vice President Kuo its Distinguished Leadership Award stands as recognition of NTU's prominent position in the field of cyber-space systems.



▲ Students participating in this year's Mosaic Taiwan program show off their creations following a calligraphy activity.

# MOSAIC TAIWAN SEEKS VIEWS OF NORTHERN AMERICAN STUDENTS ON TAIWAN

**N**TU conducted in the Ministry of Foreign Affairs' Mosaic Taiwan Fellowship Program for the first time this year. Launched in 2014, the program brings elite young North Americans to Taiwan for two weeks of workshops, lectures, visits to historic sites, and fascinating cultural activities.

The MOFA designed the program with the goals of introducing North American youth to local Taiwanese society and providing the ministry with opportunities to better understand how young people in the United States and Canada tend to view Taiwan in an effort to heighten awareness of Taiwan among the young elite in North America.

Held from May 28 to June 10, this year's Mosaic Taiwan welcomed student delegates selected from prestigious universities spanning North America, including Yale University, Johns Hopkins University, and Georgetown University.

Addressing the program's opening ceremony, Minister of Foreign Affairs David Tawei Lee stressed that the program offered an outstanding opportunity for the participants to immerse themselves in a new culture so that they could carefully observe and reflect upon the differences they perceive compared to their own cultures. NTU Vice President for International Affairs Luisa Shu-Ying Chang also stated that NTU's involvement in the program helps fulfill its mission to contribute to the nation and Taiwanese society.

Among the NTU professors who presented lectures as part of the program were Prof. Joyce Tsai, who led the delegates on a tour of the National Palace Museum, and Prof. Shun-Chern Tsaur, who led an excursion to the newly-opened Taipei Energy Hill. Prof. Chia-Fen Tsai, one of the most active flutists in Taiwan, gave an inspiring lesson called "Music from Taiwan's Lush Tea Garden." The Mosaic Taiwan delegates also visited the Stanley Wang D-School@NTU.

Mosaic Taiwan added the Youth Forum to its program this year. Participant Tylor Blackmon, who holds a Master's degree in Politics and Economics from Yale University and currently works for the Minnesota Democratic Farmer Labor Party, called the Youth Forum the highlight of the program.

With the Chair of the NTU Department of Political Science Philip Szue-Chin Hsu serving as forum moderator, the visiting delegates interacted with participating NTU students and exchanged their views and opinions regarding such topics as the reaction in Taiwan to the election of US President Donald Trump, cross-strait relations, and Taiwan's economy.

Besides the lectures and forum, the Mosaic delegates also engaged in a number of cultural activities, such as learning Chinese calligraphy and martial arts from expert NTU students and visiting the Dragon Boat Festival races and the Taipei 101 skyscraper.

Near the end of the program, the delegates met with Taiwan's Vice President Chien-Jen Chen with whom they discussed a variety of issues, including cross-strait relations and the nation's current political status.





# PRESIDENT YANG ATTENDS LEADERS COUNCIL ON VISIT TO PARTNER UNIVERSITIES IN GERMANY

▲ Officials of NTU and the University of Tübingen pose for a photo in the reception room of the German university's rector.

NTU President Pan-Chyr Yang accepted invitations extended by NTU's key partner universities in Germany, the University of Tübingen and the University of Hamburg, to visit the European nation in order to discuss innovation, interdisciplinary collaboration, and international networking strategies during June 4-8. President Yang was accompanied on his trip by Vice President for International Affairs Luisa Shu-Ying Chang and Director of Global Alliances Section Linda Chang.

During the sojourn in Germany, President Yang's party first traveled to the University of Tübingen. University of Tübingen President Bernd Engler has visited the NTU campus three times since NTU and the elite German institution established a university partnership in 2006. President Engler's repeated visits have facilitated student and faculty exchanges as well as cooperation in such fields as social sciences, law, Mandarin Chinese teaching, sociology, politics, and European Union studies.

As this was the first time an NTU president had led a delegation to visit the University of Tübingen, President Engler placed great importance on this event and accompanied President Yang throughout his visit.

Taking the collaboration that has already been initiated between NTU and Tübingen

in the humanities and social sciences as a foundation, the presidents and officials of the two universities discussed potential approaches for interdisciplinary cooperation across a broad range of fields, including translational cancer research, prehistoric history and archaeology, biochemistry and pharmacy, geographical environment, neuroscience, molecular biology and botany, quantum mechanics and nanotechnology, and clinical imaging.

Following the delegation's visit to the University of Tübingen, President Yang proceeded to the University of Hamburg for the 2017 Hamburg Transnational University Leaders Council, an event organized in order to provoke dialogue among university leaders from around the world on the key challenges facing higher education systems. Among the 46 participating university leaders from 25 countries, President Yang was the sole representative from Taiwan and one of the four Asian university presidents invited to attend the Council.

President Yang was first invited to attend the inaugural University Leaders Council in 2015. This year, he participated in the international conference as a panel member, sharing his opinions and experiences with university presidents from countries around the world under the topic "Measuring Quality, Effectiveness and Relevance in a Differentiated System." During the Council, President Yang introduced Taiwan's higher education system and shared NTU's educational ideals and research specialties, which served to increase the visibility of Taiwan and NTU in the global higher education community.

# OIA BOOSTS NTU'S VISIBILITY AND RECRUITS ETHNIC-CHINESE STUDENTS IN LOS ANGELES



*In its ongoing effort to promote campus internationalization and pursue contacts with universities around the globe, the Office of International Affairs (OIA) strives to boost NTU's visibility among the international higher education community by standing out as an active participant in the annual conferences of the NAFSA: Association of International Educators.*

This year was no exception, as Deputy Vice President for International Affairs Bennett Fu led the OIA's Manager for Global Alliances Tzu-Yu Huang and Manager for International Students Yu-Jen Chen on their mission to promote NTU to the world at the 69th NAFSA: Association of International Educators 2017 Annual Conference and Expo, which was held in Los Angeles, California from May 30 to June 2.



- ▲ Deputy Vice President for International Affairs Bennett Fu introduces NTU's strategy for developing relations in Southeast Asia while moderating a forum.
- ▲ Deputy Vice President Bennett Fu and his OIA colleagues meet with the vice chancellor of the University of California, Berkeley during the 2017 NAFSA Annual Conference.

As the largest international organization working to promote international education and exchange, NAFSA boasts a vast membership of more than 10,000 education professionals from every corner of the globe. Under the theme "Expanding Community, Strengthening Connections," the 2017 Annual Conference and Expo aimed to bring the participating educators together to consider and discuss approaches for strengthening contacts and exchanges as well as forming international education alliances with special features and of different scales.

As internationalization requires coordinated effort on parallel fronts, Deputy Vice President Fu's mission to the annual conference was a multifaceted one. In addition to his goals of strengthening global alliances, promoting summer programs, and pursuing the establishment of faculty exchange programs and dual/joint degree programs, Fu also sought out new approaches to raise the quality of NTU's student exchange programs. His mission also included bolstering the university's existing strategic partnerships with elite universities as well as meeting with potential partners.

Due to its status as the world's premier annual meeting for international education professionals, the event is attended by influential educators from more than 100 countries, making it an ideal venue for global educators to network with their peers. During this year's conference, the OIA team held meetings with the representatives of nearly 60 universities around the world. Among the universities the NTU representatives met with were such prestigious institutions as the University of British Columbia, University of Rochester, University of California at Berkeley, University of Pennsylvania, Waseda University, Kyoto University, University of Bordeaux, University of Zurich, and Lund University.



# International Corner



NTU President Pan-Chyr Yang delivers a speech during the APRU's 20th Annual Presidents' Conference.

Deputy Vice President Fu discusses cooperation plans with his counterparts from the Université de Bordeaux.

Besides meeting with their global counterparts, the members of Deputy Vice President Fu's team also presented papers during the conference. Over the last four years, the OIA has made great effort to ensure it submits quality papers for presentation at the conference, and each year its papers have been accepted. It submitted two papers this year. Even though people from Europe, the Americas, Asia, and Africa participated in the conference, NTU was the only university to have presented two papers as well as moderated two forums.

The OIA team delivered its first paper, called "Eliminating Barriers for Multilateral Borderless Education" in collaboration with two of its partner universities, the University of Bordeaux and University of Tsukuba. For its second paper presentation, "Venturing into Southeast Asia Programs and Partnerships," the OIA cooperated with Waseda University and the University of South Carolina.

Both presentations were met with positive reactions and drew numerous queries from participating representatives who hoped to learn more about NTU's experience and strategies for success regarding the development of its international education programs. The OIA's participation in the two forums helped raise NTU's international visibility and reputation, and provided practical approaches and goals for universities seeking cooperation in East and Southeast Asian countries.

Taking advantage of the occasion of the NAFAA conference, the Taipei Economic and Cultural Office in Los Angeles and the Foundation for International Cooperation In Higher Education of Taiwan teamed up to organize the 4th Taiwan Education Fair in US, which aims to encourage overseas ethnic-Chinese students to pursue an education in Taiwan.

NTU and 15 other institutions of higher education in Taiwan participated in the education fair, which was visited by nearly 500 people, including overseas ethnic-Chinese students, international students, and their family members. NTU provides an outstanding education and offers nearly 800 courses taught in English. During the fair, the NTU booth received an endless stream of curious students. The OIA team received valuable assistance from the members of the NTU Alumni Association of Southern California, who helped recruit students by sharing their experiences as students at NTU.

While in Los Angeles, Deputy Vice President Fu gave an exclusive interview to the local Chinese-language newspaper *World Journal*. In the interview, Fu called on students to recognize the advantages of higher education in Taiwan, and encouraged them to become a part of Taiwanese society and experience ethnic-Chinese culture. He added that students who study at NTU enjoy numerous opportunities for studying in other countries while at NTU due to the university's extensive international connections.



# Dongsha Coral Reefs Reveal Influence of Human Nitrogen Emissions

▼ Patch Reef and Dongsha Atoll 2 (Photo by Keryea Soong)

▲ By detecting the presence of light nitrogen isotopes in coral from Taiwan's Dongsha atoll, Prof. Abby Hao-Jia Ren's research team provided the first direct evidence that anthropogenic nitrogen can travel to the open ocean.

Prof. Abby Hao-Jia Ren of the Department of Geosciences led an international team seeking to obtain the first direct evidence for the influence of anthropogenic nitrogen (N) sources on the open ocean. The team's findings were published in a study titled, "21st-Century Rise in Anthropogenic Nitrogen Deposition on a Remote Coral Reef" in the journal *Science* in May.



NTU Executive Vice President Ching-Ray Chang joined Deputy Minister of Science and Technology Yu-Chin Hsu in co-hosting a press conference on May 19 to mark the article's publication.

The study shows that nitrogen emitted through the use of fossil fuels can spread to the open ocean and be used immediately by ocean organisms.

Marine phytoplankton, like all organisms, require nitrogen to live and grow. Although the majority of the air we breathe is  $N_2$ , the nitrogen in the atmosphere is unavailable for use by most phytoplankton. In order for these organisms to be able to use nitrogen,  $N_2$  gas must first be converted to a more chemically available form such as ammonium, nitrate, or organic nitrogen. The inert nature of  $N_2$  means that biologically available nitrogen is often in short supply in the ocean, limiting phytoplankton growth.

During the last hundred years, human activities have raised the speed of nitrogen fixation primarily through the use of nitrogen-rich fertilizers and combustion of fossil fuels, which have more than doubled the amount of fixed nitrogen that is pumped into the biosphere every year. Modeling studies suggest that the oceans far away from the major continents are not immune from the impact of humankind's nitrogen fertilization experiment; however, little evidence exists to support this.

Anthropogenic sources of nitrogen are often isotopically lighter than the nitrogen circulating through natural processes in ecosystems. Using  $^{15}/^{14}N$  stable isotope analysis, Prof. Ren and her team tracked the appearance of this isotopically light nitrogen in seasonally resolved coral from Dongsha atoll, a semi-closed circular coral reef atoll located 300 km away from the nearest continents in the northern South China Sea.

The authors found that the light-nitrogen signal increased just before the year 2000, coincident with massive increases in fossil fuel combustion in Asia, but decades later than predicted by modeling work. The amplitude of change suggests that, by 2010, anthropogenic atmospheric N deposition represented about one fifth of the annual N input to the surface ocean in this region, which appears to be at the lower end of other estimates.

This discovery highlights the urgent need to monitor the ocean environment with significant spatial coverage and through time to better understand the human footprint on the open ocean. This study points to the tremendous potential value of a network of coral-bound N isotope records





# Research Achievements

## Joint Taiwan-US Field Studies Reveal Reverse Current under Kuroshio



Researchers led by Prof. Sen Jan of the Institute of Oceanography have been working in coordination with counterparts in the United States in recent years to gain insight into the dynamics of the most important ocean current in the western North Pacific Ocean, the Kuroshio.

In 2012, while Prof. Jan headed the field study, the Observations of the Kuroshio Transport and Variability (OKTV), scientists at the United States Office of Naval Research conducted their own study, the Origins of the Kuroshio and Mindanao Current (OKMC). Additionally, another team from the Woods Hole Oceanographic Institution collaborated on the studies and associated data analysis.

The joint findings of the two companion field programs were published in the American Geophysical Union's *Journal of Geophysical Research: Oceans* in March in an article titled, "Downstream Evolution of the Kuroshio's Time-Varying Transport and Velocity Structure."

The article's importance was reflected in its selection as a "Journal Highlight," which included the editor's comment: "The results reveal that the current's evolution is influenced by factors such as downstream thickening, bathymetric ridges, and eddies from the ocean interior. Given contemporary discussions about the role of Western boundary currents in global observing systems, this is a great example of how boundary observations tie together basin-wide circulation."

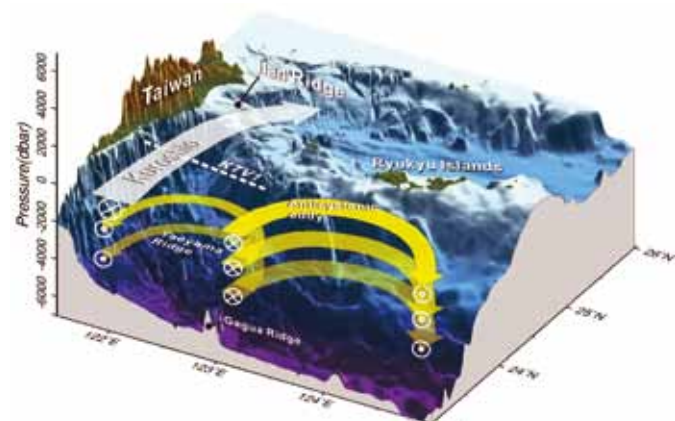
As the chief scientist of the OKTV, Prof. Jan worked with Prof. Yiing-Jang Yang, Prof. Ming-Huei Chang, and technicians of the Institute of Oceanography and the crew of NTU's research vessel Ocean Researcher I. The team successfully conducted a series of comprehensive ship surveys and anchored instruments observations using pressure-sensor equipped inverted echo sounders and upward-looking acoustic Doppler current profilers in 2012 and 2015.

Based on the unprecedented in-situ data acquired by the OKTV and OKMC, the researchers revealed that the time-averaged net absolute flow volume transport (i.e., integrated from the surface to the bottom) is  $13.7 \times 10^6 \text{ m}^3 \text{ s}^{-1}$  ( $\pm 3.6 \times 10^6 \text{ m}^3 \text{ s}^{-1}$ ) east of Taiwan, where

◀ Onboard NTU's research vessel Ocean Researcher I, technicians and researchers of the Institute of Oceanography deploy an acoustic Doppler current profiler into the Kuroshio Current off the east coast of Taiwan.

the northward velocity of the Kuroshio—bounded by the  $0 \text{ m s}^{-1}$  isotach—reaches to the seafloor (3,000 m). The observations indicate a deep countercurrent beneath the poleward-flowing Kuroshio ( $-12.5 \pm 1.2 \times 10^6 \text{ m}^3 \text{ s}^{-1}$ ).

Importantly, the studies found that the abrupt topography east of Taiwan and the effect of ocean eddies on the deep-flow volume transport modulate the deep countercurrent (deeper than 1,000 m) variations. As the shoreward (western) edge of an anticyclonic ocean eddy arrives at the offshore (eastern) side of the Kuroshio at the Yaeyama Ridge, deep flow impinges on the downstream topography (i.e. the Ryukyu Island Arc and I-Lan Ridge), and a deep recirculation (called countercurrent) is induced on the inshore side of the moored instrument array. This is the first time that the countercurrent beneath the Kuroshio east of Taiwan has been directly observed with a plausible explanation of its dynamics.



▲ Schematic of a process that could lead to variability in the countercurrent beneath the Kuroshio east of Taiwan.

# AGRICULTURAL EXHIBITION EMPOWERS CONSUMERS IN WAKE OF FOOD SCANDALS

Those who enter the NTU campus by way of its side entrance on Xinsheng South Road are immediately welcomed by the looming presence of a broad, low-slung building on the right side that appears to hover an entire story above the ground.

Affectionately called Dong Dong Guan (literally, Hole Hole Hall) by the members of the NTU community due to the geometrically-aligned lattice of circular holes perforating the exterior walls of its upper floors, NTU Agricultural Exhibition Hall was designed by renowned architect Chao-Kang Chang. Merging Chinese and Western architectural concepts and functions, the building not only occupies an important spot in the campus's architectural history, but has also been designated as a historic building by the Taipei City Government.

NTU Agricultural Exhibition Hall is one of the ten museums making up the NTU Museums Group. The hall regularly holds special exhibitions with the goal of informing the public about important and fascinating aspects of the history of agriculture in Taiwan, including government policy, historical development, technology, and consumer market development.



The museum's current exhibition, called "Food, Production, and Consumption," was jointly organized by the Department of Bio-Industry Communication and Development and the Department of Library

and Information Science. Located on the second floor of the Hall, the exhibition is designed to educate the public about the nation's recent food safety problems as well as the production

of agricultural products and the food consumption chain in Taiwan.

The recurring message of the exhibition is that, besides the need for experts and legislators to bring about improvements in the food system and at the production and processing end, the public needs to have access to food safety information as well as to cultivate informed consumer attitudes as essential elements of a well-developed food consumption chain.

The exhibition first introduces visitors to the agricultural features and production processes of common crops in Taiwan, including rice, sweet potato, and corn. Then it guides the visitors to reflect on the food crises that have occurred during the course of Taiwanese history, as well as the recent series of food scandals that have rattled consumer confidence.

The exhibition aims to empower consumers by reminding them that the most effective way to improve food production models is through the modification of consumer behavior. Moreover, it provides visitors with the tools to make this change by presenting such proactive consumer concepts as produce traceability systems, local purchasing, and diversified consumption.

Meanwhile, on the first floor of the Hall, another exhibition featuring a wooden tea house designed by students for the NTU Experimental Forest is also underway. The students integrated environmentally-friendly concepts into the tea house design and construction.





## Student Instructors Teach Calculus in Two-Hour Live Broadcast

**T**he NTU Center for Teaching and Learning Development teamed up with the education platform N2 Consulting Online (NIICO) in broadcasting a live online instructional program for students who feel frustrated by calculus on June 13. Called "A Night of Calculus: Student Instructors Solve Problems LIVE!," the two-hour program featured five student instructors who presented a variety of calculus problems, and methodically and entertainingly guided the student viewers in arriving at the correct solutions.

The enthusiastic response of the viewers greatly exceeded the organizers' expectations, and the video of the broadcast continues to draw new viewers to this day. While the instructors' clear explanations of difficult calculus problems have led to the video's popularity, the wit and humor with which they approach the problems have proven to be one of the program's outstanding features.

The five instructors from the Department of Mathematics and the Department of Chemical Engineering were selected for their outstanding academic records as well as their love of calculus. In addition, graduate student Shang-Ching Lin of the Graduate Institute of Biomedical Electronics and Bioinformatics, who serves as a teaching

assistant at NIICO, joined the student instructors on camera as the emcee for the program.

Following repeated rehearsals aimed at giving the instructors experience in front of the camera and working out any glitches in their presentations, the speed and locution of their explanations reached a level comparable to some of the nation's most respected cram school instructors. However, the most remarkable performance was delivered by Hao-Jen Pan, whose movie-star face has earned him the nickname NTU's Little Hu Xia due to his resemblance to the Chinese singing star Hu Xia. Though it was the first time he had appeared on live video, Pan managed to give a polished performance marked by not only precise explanations but also humorous reminders to the student viewers about important points to keep in mind while taking examinations. One viewer was so impressed with the instructors' calculus skills that, after watching the program live, he went straight to the location of the broadcast to discuss calculus problems with the instructors in person.

During the two-hour live broadcast, the student instructors adhered to a tight schedule as they took turns on camera answering not only questions students submitted online prior to recording, but also questions posted in the program's chat room during the broadcast. Adding to the challenge, the instructors worked in front of multiple cameras and were required to move between filming positions while calmly discussing difficult calculus problems.

The success of the program was due as well to the production supervision provided by Prof. James Chien-Mo Li of the Department of Electrical Engineering, who had gained experience teaching online courses while at Stanford University.

# Teaching and Learning



▼NTU startup teams showcased their products during an anniversary exhibition.



◀The Taidah Entrepreneurship Center's third anniversary celebration featured a forum.

## Entrepreneurship Center Showcases Student Startups on Third Anniversary

The Taidah Entrepreneurship Center celebrated its third anniversary on June 7. During the celebration event, eleven NTU startup teams showcased their products and several outstanding alumni returned to campus in order to talk about their experiences of building successful start-up companies.

The TEC's mission is to translate students' creativity and technological research capacity into influential startup companies and create opportunities to transform the nation's industrial environment.

Among the alumni invited to speak during the anniversary event were Legislator Karen Yu, who founded the company Okogreen and has since become a legislator; Co-founder and CEO of Greenvines Harris Cheng; and Co-founder and CEO of Pinkoi Peter Yen. NTU Garage alumni Anny Chang and Simon Ko, who have gained inclusion in Forbes magazine's "30 Under 30 Asia" over the last two years, also shared their experiences of starting up new businesses.

TEC Director and Professor of the Department of International Business Ji-Ren Lee stated, "We aim to achieve the following three goals. First, advocate and promote entrepreneurship at NTU. Second, integrate entrepreneurship resources from both on and off the NTU campus. And, finally, do our best to help startup teams acquire support and resources, and thus establish a sound startup community."

Since its establishment in 2014, the TEC has launched the campus incubator NTU Garage and helped develop more than a hundred startup teams. NTU Garage not only provides student startups with

working spaces, but also connects them to industries and alumni entrepreneurs. According to Director of NTU Garage Yute Liu, TEC has secured the input of more than 150 instructors from various industries and alumni, who are willing to provide one-on-one consultation, networking assistance, and even investment opportunities.

Citing Facebook Founder Mark Zuckerberg's commencement address at Harvard University, "Ideas don't come out fully formed. They only become clear as you work on them. You just have to get started," Director Lee encouraged young entrepreneurs to pursue breakthroughs continuously, sustain their initial passion for what they are doing, and not hesitate to launch their startup projects.

Legislator Yu discussed her experience of developing Okogreen and promoting startup programs in the public sector. Greenvines' Cheng noted that startups should select co-founders on the basis of expertise, connections, and values. He also discussed how to develop high employee engagement through competition- and vision-based recruitment when a startup is growing.

Pinkoi's Yen noted that the company has committed itself to expanding its international markets after obtaining an investment of US\$ 9 million from Sequoia Capital. He described the uncertainty of facing the international market and shared how he conceived of starting up a new business. Currently, Pinkoi is the largest e-commerce platform selling design products in Asia.



## President Yang Offers Thanks to Colleagues and Students in Farewell Address



On June 21, NTU President Pan-Chyr Yang completed his service as NTU President and handed over the university's official seal to Interim President Ching-Ray Chang, who also serves as Executive Vice President for Administrative Affairs.

At the handover ceremony, President Yang thanked all of his NTU colleagues for their four years of dedication in developing a wonderful campus culture, improving the university's quality of teaching, research, interdisciplinary cooperation, and international exchanges, as well as constructing more space for teaching and research.

During the ceremony, several top NTU officials shared stories about President Yang. Executive Vice President for Financial Affairs Shu-Hsing Li applauded President Yang for speaking with students on equal terms, providing a bright vision for NTU, and enhancing the university's international visibility.

Vice President for Student Affairs Tsung-Fu Chen noted the importance President Yang placed on quick action whenever students' welfare was concerned. In particular, Chen mentioned two things about President Yang that impressed him the most. First, he said that while Yang always stresses the importance of time, he had even texted Chen about work matters as late as midnight. Second, he said Yang believes that education provides opportunities for students from disadvantaged backgrounds to achieve upward mobility.

Also from a humble background himself, Yang can identify with the difficulties facing disadvantaged students. During his term, President Yang increased from 100 to 400 the number of students eligible for Hope Scholarships, which waive four years of tuition for disadvantaged students. In addition, he extended the Food Assistance Program to help disadvantaged students cover four years of meals at NTU.

Following the congratulatory statements of the many honored guests, President Yang opened his farewell address by saying "Thank you" heartily three times to everyone present, expressing his gratitude to all the members of the NTU community who had worked with him over the previous four years.



## DUO RECITAL DELIVERS ECHOES OF TRADITIONAL TEA HARVEST CHANTS

The organizers of the course "Music Design and Innovative Application" offered at the Stanley Wang D-School@NTU teamed up with the Dixon Foundation for Arts and Culture to put on the concert, "Sio-Po-Kua: Music from Taiwan's Lush Tea Gardens," on May 28.

Held at KHS Hall in Luzhou, the duo recital featured Taiwanese flutist Chia-Fen Tsai, a graduate of the Yale School of Music, and virtuoso Cuban classical guitarist Rene Izquierdo.

Unique to Taiwan, sio-po-kua are traditional mountain songs that were chanted among the tea farmers of Pinglin, a mountainous area in southeastern New Taipei City famous for its pouchong tea, while they picked tea leaves during the harvest season. Although the melodies of sio-po-kua are composed of simple three-note scales, they are still rich in expression.

The songs presented in Tsai and Izquierdo's performance were the work of composer Chun-Da Huang, who reinterpreted the traditional songs compiled by ethnomusicologist Chin-Cheng Lin in his book, *Pinglin's Sio-Po-Kua*. Huang's fresh reinterpretations merge a bygone soundscape of Taiwan with Western musical instruments, enabling a fading echo from the past to reach the ears of contemporary listeners.

