



# NCKU

2018 Annual Report



# Reflection



Strolling around the NCKU campus is like walking through a 250-year time portal to observe; a preserved ancient city gate from the Qing dynasty, a military hospital and camps from the Japanese colonial period, an old library from the American aid period, and recently completed teaching buildings throughout the campus. This university, closely knitted with the development of Taiwan's modern history, gently reminds us to rethink of the values we wish to embody and the role we want to play in the present, and future.

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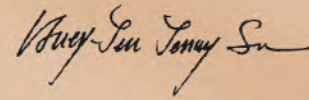
The Cradle of Future Entrepreneurs

Next Silicon Valley

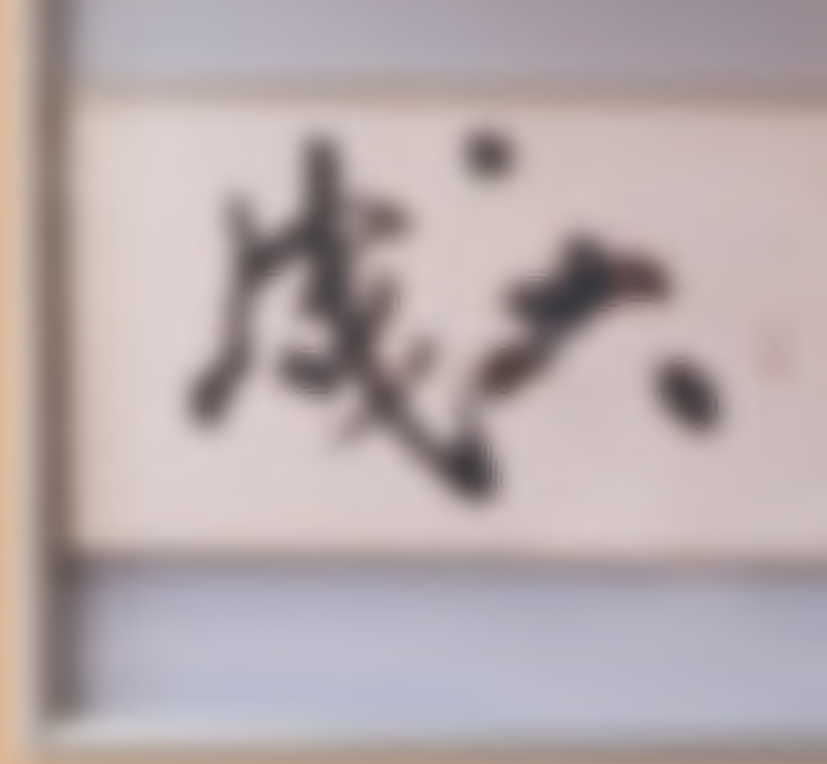
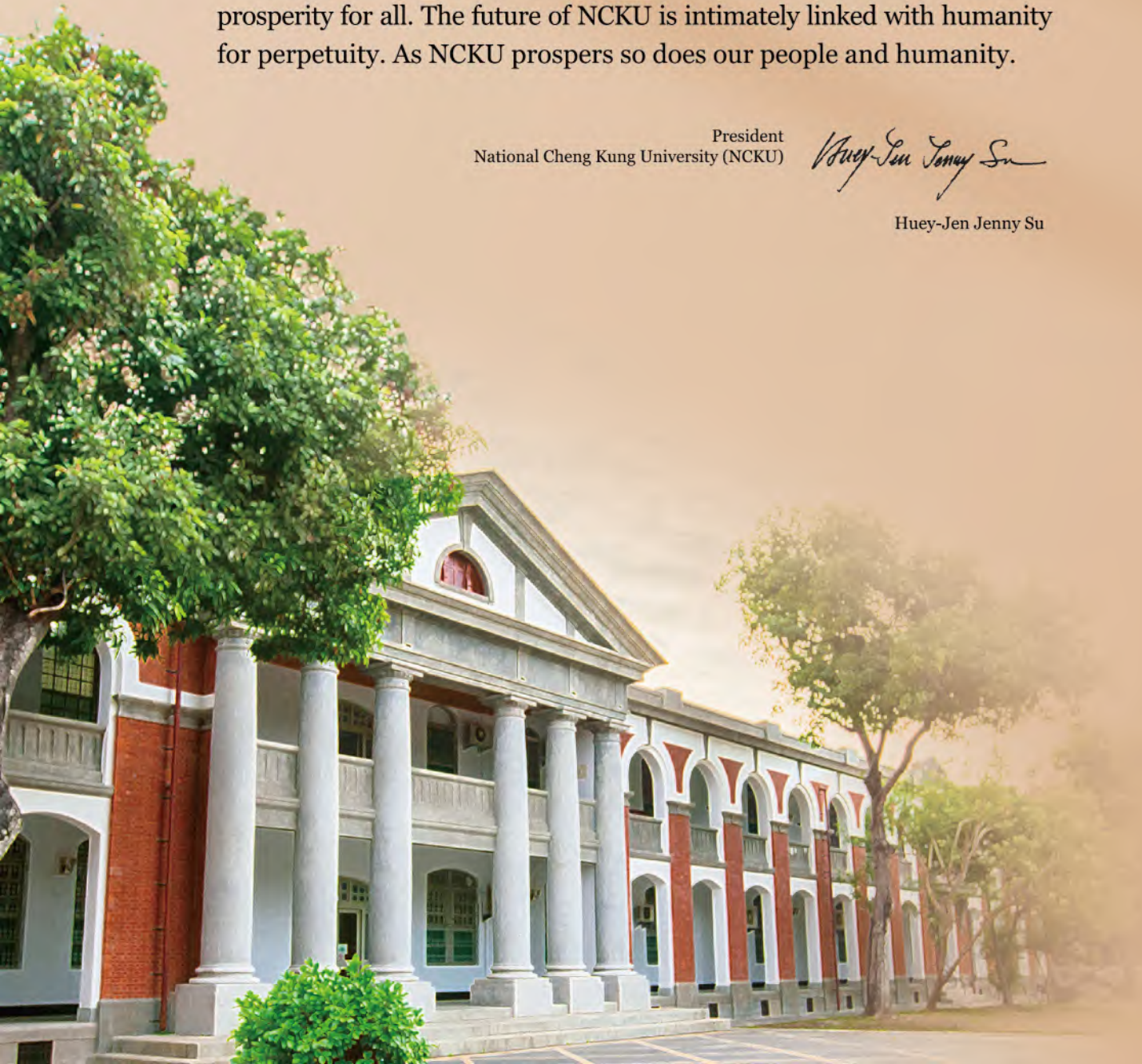
成大人能在全球社群中清楚標記自己的價值，  
成大人的知識文化與科技發明會在倫理的基礎上，  
關注弱勢的需求、應用社會的發展，  
進而連結成大人所在的城市、國家以及共同面對的未來。

**The** local NCKU community significantly contributes to the welfare of the global community. Faculty, staff, and students utilize a culture of knowledge and technological innovation by starting from an ethical foundation to support the disadvantaged for the betterment of society. This synergism connects cities to nations and promotes the idea of prosperity for all. The future of NCKU is intimately linked with humanity for perpetuity. As NCKU prospers so does our people and humanity.

President  
National Cheng Kung University (NCKU)



Huey-Jen Jenny Su



# Weaving the Future

Historically, universities have played a major role in leading social transformation through scientific research, the creation of innovative solutions, and the education of intellectuals and agents of change. The UN 2030 Agenda explicitly recognizes that certain goals and objectives can only be achieved through collaboration among institutions of higher education and research centers. Specifically, universities can help implement the UN's Sustainable Development Goals (SDGs) via governance, management, teaching and learning, research, and partnerships.

Over the past 30 years, due to the efforts and dedication of our faculty, students, and esteemed , NCKU has steadily improved its performance in terms of academic research, cultivation of talent, cultural promotion, social service, and national development. From the perspective of the stages of knowledge development, NCKU has moved from being an "ivory tower" and "technical degree service specialist" to being a "living laboratory" that can solve pertinent social problems and precisely react to the demand for attaining the SDGs.

Currently, NCKU is taking *educational innovation, research excellence and social responsibility* as its main axis to improve the well-being of human beings and build a university with "teaching, research, and social responsibility" as its vision for excellence. To attain this goal, NCKU has initiated a five-year strategy incorporating the following four approaches:

- 1. Deeper Learning through an Engaged Scholarship**  
 Cultivating talent scholars with leadership abilities who care for society and are capable of engaging in cross-disciplinary integration.
- 2. Excellence in High Impact Research**  
 Developing key technologies with industrial value, that can be applied to society's requirements and further enhance both national and social development.
- 3. Fostering an Innovative and Synergistic Industrial Collaboration Paradigm**  
 Cultivating industry alliances, pioneering innovation and startups, and simultaneously contributing to industry transformation.
- 4. Multicultural Fusion Intended to Generate Global Clusters**  
 Cultivating international talent with global competence and creating a borderless global campus.



## Global Ranking

- # 16**  
THE University Ranking in "industry income"
- # 80**  
THE Impact ranking 2019
- # 234**  
QS worldwide 2018
- # 501-600**  
THE worldwide 2018
- # 372**  
NTU Ranking

## Subject Ranking

- # 62**  
QS Engineering and tech 2018
- # 241**  
QS Life Sciences and Medicine 2018
- # 98**  
U.S. News Engineering
- # 98**  
U.S. News Computer Science

## Regional Ranking

- # 37**  
QS Asia 2018
- # 58**  
THE Asia 2018
- # 91**  
U.S. News Best Global Universities in Asia

## National Ranking

- # 1**  
Most Favorite Graduates 2018 (Cheers)
- # 3**  
Best Global Universities in Taiwan (U.S. News)
- # 3**  
Best University 2018 (Global Views Monthly)



# Academic Excellence

NCKU features a practical academic climate conducive to the steadfast pursuit of knowledge and truth. Since its inception, NCKU has undergone tremendous transformation and growth. Today it comprises 9 colleges: Engineering, Management, Liberal Arts, Sciences, Medicine, Social Science, Electrical Engineering and Computer Science, Planning and Design, and Bioscience and Biotechnology, with 43 undergraduate programs, 36 independent graduate institutes, and 9 Ph.D. programs. In 2018, NCKU launched an initiative called *College X* intended to cultivate innovative interdisciplinary learning, teaching, and research in order to quickly adapt to the changing times.

Having laid down a solid foundation in engineering followed by expanding into liberal arts and science, NCKU has developed into a university with a broad academic scope. With its effective interdisciplinary integration and outstanding academic achievement, NCKU stays in close touch with societal trends and developments. It assumes a core role in industry, social engagement, and sustainable innovation, and its achievements in these areas are well recognized globally. In the near future, NCKU aims to further expand its research impact through the following strategic approaches:

- Upgrading the research infrastructure and cultivating future talent
- Developing key technologies and strengthening featured research fields
- Focusing on social science and humanity topics in order to attain the SDGs
- Cooperating with international partner universities on vital issues



## The Knowledge Bank of NCKU

Full-time faculty **1,337**

Part-time faculty **728**

Female full-time faculty members **24.5%**

Papers involve international cooperation **30.2%**

International projects **155**

Papers are published in the world's top 10% journals **40.8%**

Papers are published in the world's top 1% journals **3.7%**

## Hsin-Lun Wu

Department of Chemistry

Professor Wu investigates a less energy consuming synthetic process for producing  $\text{NH}_3$ . Artificial  $\text{N}_2$  fixation for producing  $\text{NH}_3$  at a large scale has been achieved using the Haber-Bosch process. However, the Haber-Bosch synthetic process is very energy consuming, and requires high temperature and pressure. Therefore, Professor Wu uses a hot electron-driven dissociation of  $\text{N}_2$  on plasmonically active metal nanoparticles under visible light irradiation, which can directly convert solar energy into chemical energy. This is a promising energy-saving synthetic process for the production of  $\text{NH}_3$ .



## Ching Hung

Department of Civil Engineering

Professor Hung investigates the initiation time to landslide events and precisely locates the sites. His research defines Taiwan's mudstone failures, which has led to international recognition. In addition, he leverages experimental tools via innovative ideas and novel applications. Development and advancement of disaster prevention technologies are also a part of his many achievements. His work sheds new light on these issues at the international level that in turn leads to solutions for the geohazard challenges Taiwan faces.



# Young Gen Innovation

## Jan-Chi Yang

Department of Physics

Professor Yang established the Laser Molecular Beam Epitaxy (Laser-MBE) Lab in the Dept. of Physics in August 2017. His main goal is to strike an elegant balance between physics and materials science for the purpose of creating novel quantum materials with new functionalities, and characterizing their intriguing interplays to be easily understood.

## Cheng-Te Li

Institute of Data Science

Professor Li's research interests include data mining, machine learning, and recommender systems. In his current project, Professor Li aims to develop a general-purpose privacy-preserving framework based on massive online social datasets. He will develop and exploit novel techniques that include machine learning, social network analysis, information security, and text mining. The ultimate goal is to simultaneously protect user privacy of sensitive data and ensure data usability in various science applications.

It is the responsibility of NCKU to create an enriching, inclusive, and innovative environment that provides young scholars the opportunity to conduct impactful research. In 2018, **13** young NCKU scholars were awardees of the "Einstein Program" and "Columbo Program" conducted by the Ministry of Science and Technology (MOST). These programs encourage young scholars to dream big with regard to the influence of their research. NCKU had the 2nd largest number of recipients among universities in Taiwan.



## Kuo-Hsing Kao

Department of Electrical Engineering

This department has been studying the adoption of the charge-plasma concept and dopingless FETs with both metal-semiconductor (MS) and metal-insulator-semiconductor (MIS) contacts in parallel at the source/drain (SD). It was discovered that currents are mainly routing through the MIS contacts for a given SD metal work function when the insulator thickness is relatively thin enough. This work combines the charge plasma concept in dopingless semiconductors and MIS ohmic contacts and predicts the electrical characteristics of the proposed device. It also provides a general guideline with physical insights for designing dopingless FETs with a high-insulator at the SD MIS contacts.

## Watchareeya Kaveevivitchai

Department of Chemical Engineering

In order to harness the full capacities of renewable energy sources, e.g., solar and wind power, clean and sustainable energy storage is clearly required. Professor Kaveevivitchai's goal is to develop new rechargeable battery systems based on multivalent cation charge carriers, such as  $\text{Mg}^{2+}$ ,  $\text{Zn}^{2+}$ ,  $\text{Ca}^{2+}$ , and  $\text{Al}^{3+}$  ions. These involve more than one electron transfer and offer the promise of delivering higher specific capacity and energy density.

## Shih-Ming Lin

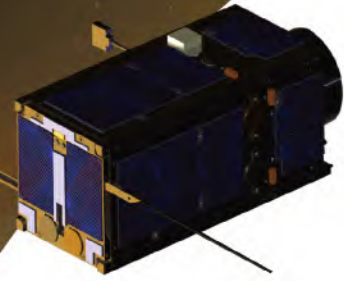
Department of Biotechnology and Bioindustry Sciences

Professor Lin has proposed a project intended to conduct a comprehensive investigation into the biochemical functions, molecular structures, and regulatory mechanisms of phytohormone transport proteins. His exploration of these transporters will be very helpful with regard to clarifying their role in plant physiology, as well as elucidating their working mechanisms. In the future, the team will be making continuous contributions to scientific and technological development in Taiwan.

## Tay-Rong Chang

Department of Physics

Professor Chang's research group successfully predicted novel topological phases in many different types of materials in various dimensions by relying on a combination of first-principles calculations and theoretical modeling methods. He plans to simulate a spectroscopy experiment intended to predict both the required experimental parameters and signal results. The success of his research will lead to a historic breakthrough not only in an understanding of fundamental physics but also in the design and development of future device applications.



## Featured research

# Astronautics

## PHOENIX satellite

The **PHOENIX satellite** is a 2U-CubeSat used for upper atmosphere science and technology demonstrations, and is built by an NCKU team led by **Prof. Jyh-Chin Juang** and **Prof. Jiun-Jih Miao**. The team is a part of the QB50 program supported by the European Union's Seventh Framework Programme for Research and Technical Development directed by the von Karman Institute (VKI). The program obtains multi-point measurements of the upper layers of the atmosphere, the mid-lower thermosphere located between altitudes of 200 km and 400 km, using a constellation of CubeSats.

## DOTCam

A team led by **Prof. Bing-Chih Chen** (Institute of Space and Plasma Sciences) and **Prof. Charles, Lin** (Department of Earth Sciences) developed the DOTCam (Dual-band Optical Transient Camera) as a part of the RISEsat project, a micro-satellite mission and a small satellite development activity in Japan. The objective is to observe Transient Luminous Events (TLEs) in the Earth's upper atmosphere. With a combination of selected wavelengths, the DOTCam can detect different types of TLEs via on-board image processing technology. RISESAT operates in the Earth Limb pointing mode during the DOTCam operation, which is limited to the eclipse side of the earth orbit.

## Featured research

# Unmanned Aerial and Autonomous Vehicles

## The First Agricultural UAV

**Guided** by **Prof. Wei Hsiang, Lai** (Dept. of Aeronautics & Astronautics) and **Prof. Chaur Shiuh, Young** (Dept. of Accountancy), **Earthgen Tech** developed the first agricultural drone in Taiwan. It provides farmers with the advantage of introducing high-efficiency self-developed agricultural unmanned aerial vehicles (UAVs) for pesticide spraying. The UAV has advantages that include uniformity and high spraying efficiency, and its atomizing nozzle can refine pesticide particle size to enhance absorption by crops, thus effectively reducing the amount of pesticide used. This has the potential to solve the serious problem of rural labor shortage and the Taiwan "Brain drain." The development of a UAV team can provide rural jobs that require professional and highly technical skills to attract young people back to their Taiwan home. This technology also improves the efficiency and safety of farmers resulting in added value. Success achieved in this program is proof of concept and will be possible to transfer it to other fields, thus creating a sustainable, friendly environment for Taiwan's agricultural industry.

## A Car with a "Brain"

In 1934, students in the Dept. of Mechanical Engineering at NCKU created a voice-controlled counting robot using industrial waste, for counting visitors to the anniversary exposition. Eighty-three years later, NCKU launched its first AI service and data center (the AIS&D) at the end of 2017, which was a bold declaration of the university's ongoing commitment to AI research and applications. The NCKU-based multidisciplinary team developed the technologies and artificial intelligence applications, comprising the sensory devices, judgment and decision-making, driving control, and systemic integration of an **AI autonomous vehicle Brain**. With additional data from the AIS&D, the car will be able to navigate through complex urban environments.



1. Prof. Charles Lin and RISEsat
2. Self-driving car "Brain" (provided by AIS&D)
3. Agricultural UAV (provided by Earthgen Tech)

Featured research

## Medicine

In 2018, the proportion of individuals over the age of 65 in Taiwan reached 14 percent, officially making Taiwan an aged society and is predicted to be a super-aged society in eight years. In response to Taiwan's aging society, the Medical Device Innovation Center at NCKU has been systematically connecting innovative medical device companies with domestic and overseas venture capital providers with NCKU Hospital. The goal is to develop innovative medical devices with high potential commercial value, such as **i-Transport**, which combines an electric wheelchair with standing frame functions allowing the patient to safely stand up. Meanwhile, the Southern Taiwan Biomedical and Optical Imaging Core Platform at NCKU is happy to share its many cutting-edge instruments that are unique to Taiwan, providing technological support, advice and production services to research institutes and biotechnology and pharmaceutical industries throughout Taiwan.



1. A student is learning surgical skill
2. da Vinci Surgical System
3. Prof. Jo-Shu Chang and the microalgae cultivation plant



### Geriatric Hospital

By 2022, NCKU's medical center will build its **first geriatrics hospital**, which will introduce smart technology to create a hospital without walls. NCKU and Quanta Computer have agreed to collaborate and use artificial intelligence (AI) with the Internet of Things (IoT) to co-develop patient-centered medical and healthcare services. The hospital will include 440 beds, research and education facilities, and space for collaborative research with pharmaceutical and biotechnology companies. NCKU is gathering the resources necessary to develop new smart geriatric healthcare for Taiwan and the world.

### AI Companion Robot

In order to improve the quality of human life, an interdisciplinary team led by **Professor Jung-Hsien Chiang (AI Biomedical Research Center)** collaborating with ASUS, focuses on designing and developing an AI companion robot for family doctor care teams, patients with diabetes, the elderly and so on. The robot was first designed for accompanying children, by using deep learning, adding events and seasonal information to the inference procedure, they've successfully broadened the scope of applications in order to achieve a more user-friendly environment for elderly care users.

### 3D Technology in Medical Education

In addition, the College of Medicine took the lead in Taiwan by integrating 3D technology, Mixed/Virtual Reality, for the purpose of setting up the **Surgical Skills Development Center**, intended to close the gap between traditional teaching and clinical applications and curriculum. A gross anatomy room that combines basic and clinical medical science education is located next to the center. By teaching students how to meticulously operate delicate craniotomy drills, they will simultaneously learn respect for cadavers.

Featured research

## Biotechnology

### Unveiling the Genome Sequence and Evolution of Orchids

As the largest extant family among flowering plants, the diversity of orchids has been an attractive topic of study for scientists since the time of Darwin. "I never was more interested in any subject in my life, than in this of Orchids," wrote Darwin to one of his friends. A team including 35 researchers from 17 research institutes including Taiwan, China, Belgium, and Japan was formed to investigate this fascinating plant species, among which are **Professor Wen-Chieh Tsai (Institute of Tropical Plant Sciences)** along with 5 other NCKU researchers. The team sequenced the *Apostasia shenzhenica* genome and annotated 21,841 protein-coding genes to solve the hundred-year-old puzzle of the orchid's evolution and published a paper *The Apostasia genome and the evolution of orchids* in Nature.

### Microalgae Carbon Reduction Technology

Taiwan has introduced legislation to reduce carbon emissions 50% by 2050 as a result of research institutes being more active in developing novel technologies. Microalgae are the most efficient carbon dioxide sequestrators on earth and utilize photosynthesis. Due to their fast growth rate, minimal land area requirements, and can be cultured in seawater, various countries have put forth a significant amount of effort to develop carbon sequestration technologies for microalgae. Led by **Professor Jo-Shu Chang (Department of Chemical Engineering)**, the largest microalgae cultivation demonstration facility uses waste gas from a factory and wastewater from fish farms to cultivate

microalgae and to develop microalgae carbon reduction technology. 1kg of microalgae can consume 2kg of carbon dioxide, thus constituting a novel weapon through which Taiwan can enter the era of carbon reduction. After carbon sequestration, this method transforms the microalgae into health food and animal feed nutrition additives, with high economic value, thus converting waste gas into gold.

### Grouper Disease Control

Known as "the grouper kingdom," Taiwan ranks 1st in the world with annual grouper production, creating revenue of more than NT \$8 billion annually. Recently however, there have been frequent outbreaks of highly contagious and fatal grouper virus infection. If just one grouper is infected, a large number of groupers will die very quickly, causing significant monetary losses to the industry. In 2018, **Professor Jiann-Ruey Hong (Department of Biotechnology and Bioindustry Sciences)** developed a combination treatment of functional additives. Through autophagy inhibition, virus reproduction can be effectively reduced, and virulence can be reduced more than 100-fold improving cell survival and increasing fish growth rate from 30% to 50%.





## Featured research

# Manufacturing

## Intelligent Manufacturing and Industry 4.1

Over time, due to its growth as an OEM (original equipment manufacturer) and ODM (original design manufacturer), Taiwan has developed an irreplaceable base of strength in the global manufacturing industry chain. The achievements are obvious and well recognized in the global market. In the face of a demand for changes in the digital production line, Taiwanese manufacturers are feeling pressure to move product production towards a lower degree of quantity and customization. To become more flexible in terms of production, Taiwanese firms must rely on intelligent software development, helping to initiate the industry 4.1 wave.

Industry 4.0 typically stresses improving corporate productivity, but there is less emphasis on quality. This makes it impossible for factories to achieve the goal of zero defects due to a lack of an affordable, practical online real-time total inspection system. **Professor Fan-Tien Cheng (Dept. of Computer Science and Information Engineering)** and

his innovative Automatic Virtual Metrology (AVM) technology can achieve the near zero defect goal because AVM can provide information and data for products online in real-time. When defects are found, the defective product can be screened out. Through this method, almost all deliverables will have zero defects. The defective products will go through the Key-variable Search Algorithm (KSA) to pinpoint the main cause so problems can be resolved. The improvements are continuous, eventually accomplishing the near zero defect goal with most products.

In 2018, the **Intelligent Manufacturing Research Center (iMRC)** was established at NCKU, using the AVM technology to develop the Advanced Manufacturing Cloud of Things (AMCoT) platform to assist all types of manufacturing industries and help achieve the goal of nearly zero defects for all of their products.



1. Prof. Fan-Tien Cheng  
2. Prof. Wu-Chou Su

## Featured research

# Nano Tech

The application of nanotechnology in the prevention and treatment of human diseases is a new interdisciplinary subject. The **Center of Applied Nanomedicine (CAN)**, which was established in 2018, gathers talents from the College of Science, Engineering, Medicine, and the Center for Micro/Nano Science and Technology, inviting scholars from UCLA, the University of Toronto, and other teams to enrich research energy and link external resources to engage cross-school and international teams.

## Saliva Biochips for Cancer Detection

Non-small-cell lung carcinoma (NSCLC) is often fatal because most cases are diagnosed at an advanced stage preventing surgical intervention. **Professor Wu-Chou Su (Department of Internal Medicine)** collaborated with UCLA, and is currently conducting clinical research in the United States, China, and Taiwan on nano biochips using saliva tests to detect diseases. The accuracy rate of predicting stage 3 and 4 lung adenocarcinomas was 90%, and that of stage 1 and 2 lung adenocarcinomas was approximately 70%. This new technology tests the blood or saliva of

early-stage lung cancer patients to identify two cancer-linked mutations discussed in a study published in *The Journal of Molecular Diagnostics*.

## Thinner, Faster, and More Power-efficient

Intel Corp co-founder Gordon Moore developed Moore's Law in 1965, which predicted that the number of transistors on a chip would double every 18 to 24 months. It has since become a guiding principle in the computer chip industry. However, in the past few years, the physical transistor channel size limit has been reached, and the consequent challenges faced by the industry have given rise to questions as to whether the speed of innovation suggested by the law may have ended. **Professor Chung-Lin Wu (Department of Physics)** and **Dr. Chia-Hao Chen** have successfully extended and potentially laid the groundwork for going beyond Moore's Law with a monolayer diode, which could lead to a breakthrough in the semiconductor industry. Their research published in *Nature Communications*, discusses the development of a 2D monolayer diode.



2

## Featured research

# Energy

In response to the government's 2025 non-nuclear home policy, NCKU has continued its momentum in the areas of energy technology research, urban planning, and smart healthcare applications and has aspired to ally with top institutions in the Asian region to look into the future of sustainable, smart eco-cities. Currently, there are 32 research teams under the **Research Center for Energy Technology and Strategy (RCET)** focusing on solar cells, LED lighting, fuel cells and hydrogen power, wind power, biomass energy, and energy saving technology.

## Outreach Cooperation

In June, NCKU invited **TEPCO PG**, the largest electric power group in Japan, to collaborate and further develop experience in equipment planning, construction, and dispatching applications in power transmission and distribution businesses with the goal of strengthening industry-academia linkage and developing a lean energy future in Asia.

The Magic School of Green Technologies

In addition, NCKU will work with the Industrial Technology Research Institute (ITRI) on building a **"Low-carbon Energy Park"** on the Gui-Ren campus. It will be the largest and the only multi-fuel technology development platform in Taiwan. These partners will also collaborate on technology development and product performance verification for energy-efficient buildings in subtropical climates, building an **"Intelligent energy-saving building rotation test and verification platform"** in the Shalun Smart Green Energy Science City.

## R&D on Green Materials

Led by **Professor Jow-Lay Huang**, the **Hierarchical Green-Energy Materials Research Center (Hi-GEM)** was established in 2018. Hi-GEM is engaged in developing novel green materials in six domains, including all solid-state batteries, secondary batteries, super capacitors, solar cells, fuel cells, and integrated energy systems, as well as cultivating talents for green energy R&D. By recruiting outstanding young scholars at home and abroad, and by connecting with the Shalun Smart Green Energy Science City, it will become the only green energy research center with the core concept of new material development in Taiwan.

## Featured research

# Architecture

Since the establishment of NCKU, the **Dept. of Architecture** has contributed significantly to the training of architectural professionals, to the advancement of knowledge, and to the improvement of Taiwan's building industry and urban environment. The department values the breadth and multi-disciplinary scope inherent in architectural education and strives to provide top quality facilities, environments, and programs to support creative, critical learning and innovative, relevant research.

## Smart Campus

The NCKU Smart Campus is a three-year project initiated in 2016 by a group of NCKU professors in the fields of architecture, computer science, and urban design, for which "action" is the fundamental underlying idea. Based on mobility, energy, sustainability, health, education, and data, it combines a vision for Tainan City to incorporate six main axes, including mobile devices, energy savings, sustainability, a healthy environment, education without boundaries, and big data. Eventually moving towards a future "smart university city" goal. Several important experimental projects have been completed in the past two years, for example, **the C-Hub, CK Bike, ESCO system, and the Ecological Museum Park**. In 2019, more data analyses will be conducted, more demonstration bases will be established, and more networks will be built. It will soon be integrated with the Tainan Smart City System to provide a model for cooperation among universities, the government, and industry.

## C-Hub

To answer the question as to whether it is possible for educational goals to be achieved by cooperation between universities, industries, and cities, in 2015, a group of people began trying to break down barriers between these systems. The result was the development of C-hub ("C" represents the word Creative). They strongly believe that multidisciplinary talent is no longer a fantasy and can be applied in real life. The current educational environment can be changed into a C-Hub for the purpose of cultivating a spirit of self-learning for students at NCKU. By exchanging ideas and thoughts in a creative factory, and thereby prototyping, students can develop their design skills in C-Hub and connect these with resources from industry before ultimately bringing them into practice in the city.



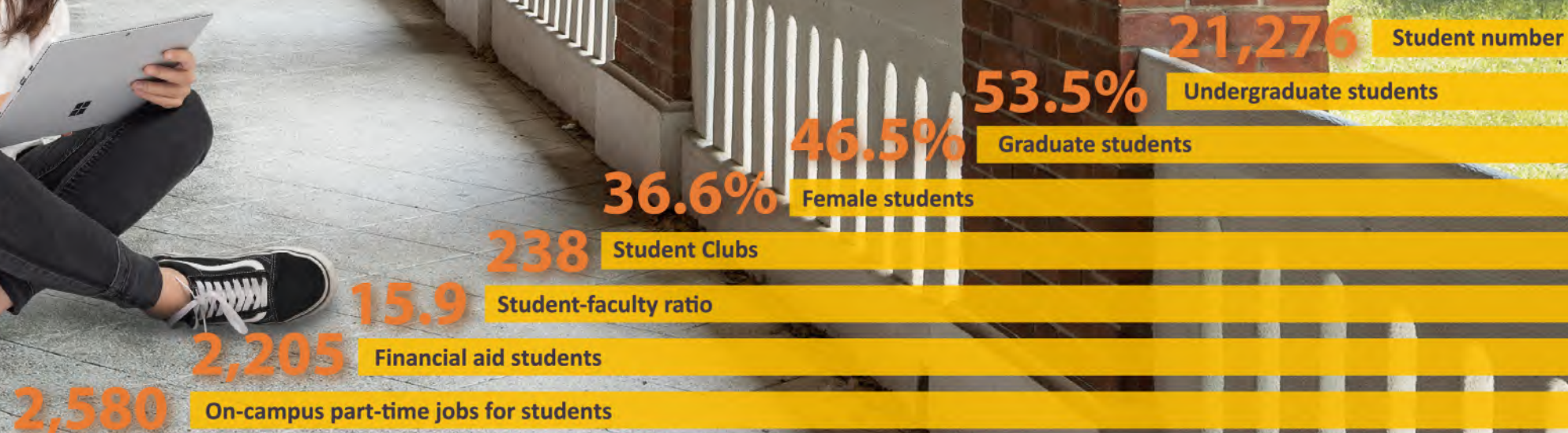
# Equipping Students

## The Heart of Education

Students studying at NCKU can investigate both literature and technology as they reach maturity. A **24-hour hotline** is available to assist them during emergencies or those needing help. Student organized groups, **evening escort angels** and **volunteer groups on campus**, promote student self-proficiency. Furthermore, students have multiple options to choose from to suit their interests from among the **238 student clubs and associations**. These provide lively, diverse learning opportunities to help students develop a broader perspective of life.

In order to help students who have outstanding grades but are from disadvantaged families, NCKU not only offers public funds and loans from the Ministry of Education but will also provide scholarships and grants to assist those who are in need of financial help. To support minority groups, including the disabled, overseas Chinese, and foreign students, NCKU has set up special programs including counseling, consultation, and special equipment for those who need it. Starting in 2018, NCKU also began to assist high school students from resource-deficient areas to establish more complete learning profiles.

### Students at a Glance



# Education for the Future

NCKU has three main pillars for aims: *Developing Quality Education, Building Global Partnerships and Eliminating Inequality*, by linking the global trends for reforming higher education by “supporting the community, connecting to the world, and embracing the future”. The UN Sustainable Development Goals (SDGs) will be utilized as NCKU’s development guidelines. Utilizing the integration between research and teaching, termed research-teaching oneness, concepts related to diversified integration of various fields and sustainable social transformation, as well as those helping break down barriers between departments, are intended to educate NCKU’s students to become the **knowledge practitioners** of the future. In addition, by incorporating a **diverse, unique selection of high school graduates** into the student body, we intend to abandon the traditional idea of an entrance examination, which emphasizes paper-and-pencil tests, and build a more innovative and inclusive learning environment at NCKU.

## University without Borders

To promote interdisciplinary learning and to become a superior knowledge hub, NCKU is establishing College X, which is aimed toward breaking down departmental barriers, integrating problem-oriented teaching and industry links with SDG issues, and implementing interdisciplinary courses and activities. This strategy will inspire students to develop their problem-solving skills and enhance the awareness of both teachers and students about the future needs of society.

## Learning University

An interdisciplinary teaching community is fundamental to an interdisciplinary curriculums/programs. Cooperation among teachers stimulates students to learn in an interdisciplinary manner. A diversified teaching community promotes the reorganization of the curriculum used by each teaching unit, renovates teaching content and methods, demonstrates real teaching innovation, and reverses the phenomenon of an overemphasis on research and an under-emphasis on teaching.

## Learning Innovation

NCKU plans to establish a friendlier self-learning environment to strengthen student learning and support interdisciplinary learning through flexible education systems, such as the **“Cross-College Elite Program,”** by relaxing the rules for offering courses, and implementing a course creation platform.

## Participatory Learning Program for Students

In order to develop the students’ abilities to plan, implement their own ideas, and learn by themselves, teachers from both the school and industries will guide students to develop these abilities by using the campus as a practice project. By thoroughly understanding the characteristics of the campus environment and its administrative needs and challenges and linking this knowledge with novel collaborations between the administrative and teaching units, an innovative plan will be proposed and implemented.

## Supporting Disadvantaged Students

To reduce the inequality that exists in terms of educational opportunities, NCKU will open multiple admission channels for disadvantaged students, integrate the existing mechanisms in the school, and provide learning resources and financial aid for these students. By assisting students in both the educational arena and by obtaining post-graduate employment, NCKU will strengthen its social responsibility to truly support vulnerable students.

## E-PCK Teacher Development and Research-Teaching Oneness

*Research-teaching oneness* can be defined as teaching based on research and research benefiting from teaching. In order to implement this concept and promote both a complete integration of the colleges and E-PCK (Educational-Pedagogical Content Knowledge) based on collaboration between teachers, university-level organizations will focus investment of additional resources to strengthen cross-college and interdisciplinary teacher exchange.

1. Phoenix flower (photographed by Tzong-Shi Wu)
2. Golden Trumpet-tree in the College of Medicine



# Redefining Student Success

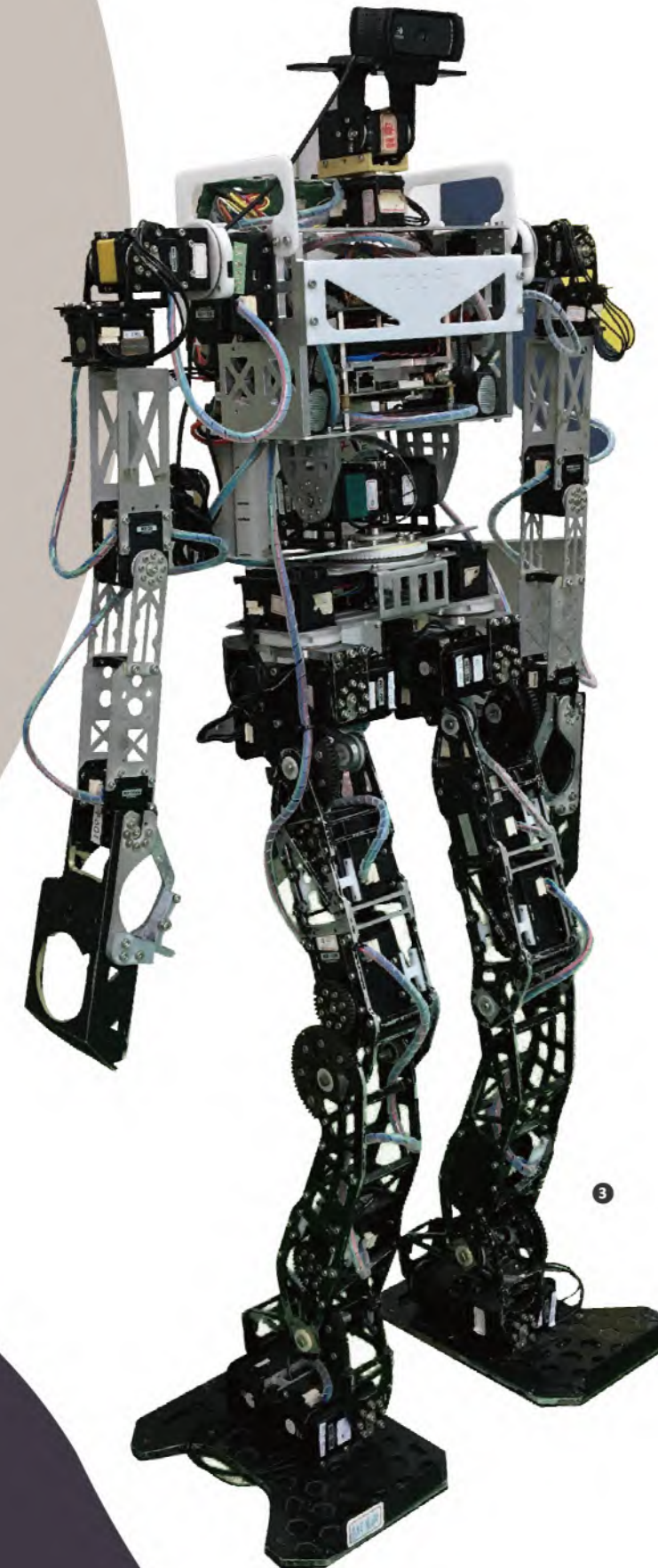
Student success is not limited to achieving high grades or becoming exemplary role models. Students should be honest about their learning, become their own role models, and should be willing to work toward realizing their dreams by tenaciously pursuing their goals until met. Our responsibility is to facilitate a sound environment in which students can accomplish this.



## iGEM

In 2018, the NCKU's team iGEM, which won the annual world-wide synthetic biology competition, made an attempt to reduce CO<sub>2</sub> concentrations using a synthetic biology approach. A carbon fixing E. coli species was constructed by cloning enzymes from the Calvin cycle. The team measured the function of each enzyme in the pathway and proved the engineered pathway can utilize carbon. The team also designed a bioreactor containing an air valve in which CO<sub>2</sub> can be pumped. The bioreactor is monitored by sensors that will send data to a cloud database. By combining IoT and synthetic biology, we believe that this device can be applied to industrial settings.

To promote their synthetic biology design, iGEM has collaborated with numerous experts in various professions and visited enterprises willing to apply their design. iGEM believes people should be cognizant of CO<sub>2</sub> production levels and resulting effects on the environment. This project can help communities get one step closer to a low carbon society.



## BIM & VR Design Contest on Cloud Services

In recent years, the rapid development of Shanghai's financial industry has attracted many white-collar workers, resulting in the deterioration of Shanghai's transportation system. **Five students from the Dept. of Civil Engineering and the Dept. of Urban Design** won 1<sup>st</sup> place in the World Cup Prize for the "Sharable urban system of the future Shanghai" theme in the BIM & VR Design Contest on Cloud Services. They designed a system applicable to white-collar daily life and established a system capable of carrying various shared resources by building an air bridge system across blocks, sharing combined spaces, sharing electric cars, among other things related to commuting, in hopes of solving the commuting problems of business people and promoting the overall development and optimization of the region.

## aiRobots Lab: David

David, a new generation of large humanoid robot, approximately 96 cm tall and weighing about 9.1 kg, with a total of 31 motors in his body, was designed by **the aiRobots Lab led by Professor Tzuu-Hseng S. Li (Dept. of Electrical Engineering)**. It won the championship in the all-around competition with a total of 4 gold, 1 silver, and 3 bronze medals in the 2018 Federation of International Robot-Soccer Association (FIRA). Unlike other teams who bought machines to participate in the competition, David's software, hardware, and mechanism were completely designed by NCKU faculty and students.



1. iGem team members
2. BIM & VR team members
3. aiRobot: David (provided by aiRobots Lab)

# Enjoying life as an NCKU Student

NCKU students benefit greatly from the rich cultural heritage of Tainan City and enjoy famous snack foods offered throughout the city. The library, public artworks, historic buildings, tree-shaded campus, and a variety of extra-curricular activities contribute to a wonderful campus life. The experience of studying and living in the historic city of Tainan is treasured by students from many places in Taiwan and around the world.

Historic buildings shaded by old trees form part of NCKU's unique character. **The NCKU Museum**, which was once the administrative center of Tainan Technical College, is the first museum at a public university in Taiwan to be officially integrated into the school's organizational structure. The NCKU campus boasts rich cultural assets that tell the story of the school's past. Laid out in a straight line, the **Li Xian Building, Da Cheng Hall, and the Department of History building**, with their white Roman-style six-pillared porticos, red brick walls, and green window lattices creating a time-tunnel ambiance of dappled light and shade. Such a classic scholarly environment generates the perfect environment for students to concentrate on their studies and obtain spiritual enrichment simultaneously.

In addition to a great learning environment, NCKU also has a strong sports culture. There are 11 outdoor basketball courts and 11 volleyball courts, a 400-meter track field, a football field, a standard swimming pool, and a comprehensive court for baseball, softball, and football. At least 12 billiards or 12 badminton courts can be planned in the indoor center hall, ranking the highest among the surrounding universities. A new swimming pool and ball stadium opened at the end of 2018 and will promote a sound sports and leisure atmosphere that is also conducive to the cultivation of professions and research literacy for faculty and students.



## Feeling the Campus and the City

NCKU's main campus is conveniently located in downtown Tainan City and is adjacent to the Tainan Railway Station, providing easy access to various transportation networks and **Southern Taiwan Science Park** as well. With multiple colleges residing on the main campus, NCKU can easily facilitate interdisciplinary learning and cooperation leading to the development of competitive, multifaceted professionals, and students that can expand their international perspective by interacting with their peers from diverse ethnic backgrounds and nationalities.

Outside the campus, fascinating backstreets and historic buildings can be found throughout Tainan, and the famous traditional local eats are particularly popular with NCKU students. There are more than 1,600 temples located in Tainan city which preserve traditional cultural legacy and the sensory richness of life that helps NCKU students to uniquely excel in fields such as urban innovation, history, and literature. A variety of resources, whether artistic, cultural, historical, or scientific, along with its convenient location, helps NCKU students enjoy an atmosphere of academic professionalism and a wonderful lifestyle that effectively prepares them for success in an ever-changing world.

### Rich Ecological Resources

Tainan enjoys very rich natural resources and multiple ecosystems. For example, the **Sicao Green Tunnel**, enjoying the name "mini Amazon River", is a mangrove forest on either side extending over the water to form a tunnel. In this tranquil, secret part of the city, one can experience the world-class wetland ecosystem and see nature co-existing in harmony with the city. In addition, Tainan is the ideal place for observing the endangered and rare **Black-faced Spoonbill**. Through the efforts of NGOs and local governments initiated in 1988, a popular conservation philosophy gradually developed to aid this species survival. In 2018, their worldwide population stands at around 4,400, of which 2,400 wintered in Taiwan, and Tainan has the highest population attracting many international tourists coming for photo shooting each winter.



1. Black-faced Spoonbill (photographed by Jyh-Jia Chen)
2. Sicao Green Tunnel (provided by Tourism Bureau of Tainan City Government)
3. AnPing Old Fort (provided by Tourism Bureau of Tainan City Government)

# Connecting Society

**Upholding** NCKU's motto, "Pursuit of truth through exhaustive reasoning," the school's graduates enjoy great confidence from the business and industry community. NCKU's high-quality graduates are historically famous in Taiwan. According to the Commonwealth Magazine, Global Views Monthly, and CHEERS, NCKU has enjoyed the title of **The Most Popular University Students Among Enterprises** since 1993 because of the teamwork and professionalism of its graduates.

The spirit of NCKU alumni is like **a spreading banyan with its branches and stems connecting and supporting one another**. Many NCKU alumni have achieved great success in education, academia, politics, business, arts, and the media. Since its founding, NCKU has produced over 180,000 graduates. NCKU alumni are to be found not only in Taiwan but throughout the world, and their far-reaching influence can be felt from Europe to North America to Southeast Asia.

## Asia

NCKU Alumni Association of Hong Kong  
 NCKU Alumni Association of Macau  
 NCKU Alumni Association of Malaysia  
 NCKU Alumni Association of Thailand  
 NCKU Alumni Association of the Philippines  
 Japan Flamboyant Alumni Association  
 NCKU Alumni Association of Japan  
 NCKU Alumni Association of Vietnam  
 NCKU Alumni Association of Indonesia  
 NCKU Alumni Association of Myanmar  
 NCKU Alumni Association of East China

## North America

NCKU Alumni Association of Southern California  
 NCKU Alumni Association of Northern California  
 NCKU Alumni Association of North West  
 NCKU Alumni Association of New England  
 NCKU Alumni Association of Greater New York  
 NCKU Alumni Association of Washington D.C.  
 NCKU Alumni Association of East Virginia  
 NCKU Alumni Association of South-East, Atlanta, GA  
 NCKU Alumni Association of Florida  
 NCKU Alumni Association of Ontario, Canada

## Taiwan

NCKU Alumni Association of Taipei  
 NCKU Taichung Alumni Association  
 NCKU Tainan Alumni Association  
 NCKU Alumni Association of Kaohsiung  
 NCKU Alumni Association of Taoyuan  
 NCKU Alumni Association of Hsinchu  
 NCKU Alumni Association of Miaoli  
 NCKU Alumni Association of Yunlin  
 NCKU Alumni Association of Kinmen  
 NCKU Alumni Association of Yilan  
 Cheng Ta Business Administration R.O.C.  
 EMBA&AMBA of NCKU

## England

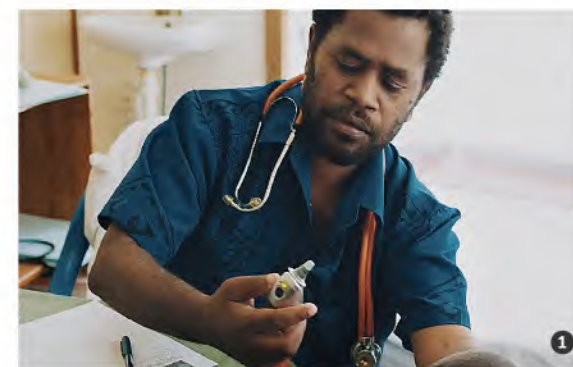
NCKU Alumni  
 Association of England



## Love across the World

"When I was working at NCKU Hospital, I witnessed the selfless efforts and contributions of many doctors, nurses, and volunteers. I knew I had to bring this medical technology back to my country."  
 Dr. Paul Bosawai Popora, graduate of NCKU's College of Medicine

After receiving his bachelor's degree in July 2014, Dr. Popora returned to his home in the Solomon Islands to serve as the country's sole professionally trained doctor. In 2017, he took the first step towards realizing his dream career by starting his own clinical practice. His clinic, which is the first standard medical building in the country, is located on Guadalcanal, the principal island among the Solomon Islands, where he treats 2,500 patients free of charge monthly.



During the four years since he returned home, Dr. Popora has maintained close contact with his NCKU teachers and classmates. He says that he has never once forgotten his experiences in Taiwan, and he expresses immense gratitude to his professors, advisors, and the employees at NCKU Hospital.



1. Dr. Popora  
 2. Dr. Popora's clinic in Guadalcanal, Solomon Island  
 (source: An Island Doctor On Call/ Trending Taiwan)

# International Network

AS a prestigious, leading research university in Taiwan, historically NCKU began its internationalization very early because an international environment is conducive to the cultivation of global citizens. Currently, NCKU offers **33 programs taught in English and 694 courses**. In 2018, the total number of NCKU international students totaled 1,762, accounting for more than 8% of the student body at NCKU, and 846 international scholars have visited NCKU for teaching, research, and exchange.

For the internationally, NCKU exerts its global impact through **406 international cooperation agreements** with 251 foreign universities and institutions distributed over **37 different countries**. Currently, the agreements are inclusive of **35 dual degree programs and 103 active exchange student programs** that greatly enrich the international experience of students. In 2018, **460 local students** were able to study abroad, and **70%** of the departments at NCKU have been involved in study abroad programs.

## Internationalization Summary

International students **1,762**

International scholars visits **846**

International partner universities **251**

International agreements **406**

NCKU students have studied abroad **460**

Departments and institutes have sent students abroad **70%**



# Internationalization at Home

## Mingling of Cultures

Having firm relationships with universities in South-east Asia, the number of students from ASEAN and South Asian countries in 2018 was **1,011**, ranking NCKU 1st among the universities in Taiwan. Currently, there are more than **200** Muslim students studying on campus. To meet their religious needs, several **prayer rooms** have been built at different campuses for their daily use. In addition, **13 international student associations** for Japan, South Korea, Indonesia, Vietnam, etc. and the **United International Students Alliance (UISA)** are supported by the NCKU to help international students overcome their assimilation problems and deepen their degree of interaction with local students.

## A Wonderful Chinese Learning Environment

Traditional Chinese characters are a treasured cultural legacy and the product of thousands of years of linguistic evolution. **The Chinese Language Center (CLC)** at NCKU is the only one in Taiwan selected by the U.S. Department of State's **Critical Language Scholarship (CLS)** program for American undergraduate and graduate students. It is also the second largest among all national universities in Taiwan offering a complete Chinese language training program to promote international cultural exchange. Each year, more than **1,100** foreign students from over 50 different countries come to study Mandarin Chinese at the CLC. The students are of all ages, ranging from the early teens to retired seniors.

## A New Chapter

The **Circular Economy (CE) Program** is the first inter-college, international program among Taiwanese universities targeted to a mixed student body composed of working professionals, mid-career students, and continuing university students who are enrolled in at least one of the master's degree programs offered at NCKU. Created in 2018, this program provides students with professional skills that are linked with each other but distributed throughout the existing departments at NCKU.



In addition, NCKU and **Purdue University** entered into a collaboration for a **3+1+1 dual degree program** and **2+2 doctoral dual degree program** with the Purdue online campus. A scholarship will be offered by the Aerospace Industrial Development Corporation of Taiwan (AIDC) to excellent students in the Dual Degree Program, with summer intern opportunities and job vacancies at the AIDC US.



Chikan Tower  
(photographed by SJ Wu)



# We are the World

NCKU, one of the leading research universities in Taiwan, received the second highest funding support from the "Aim for the Top University Plan" initiated by the Ministry of Education (MOE) from 2006 to 2015. Furthermore, in 2018, NCKU was awarded additional funding by another important MOE project "Higher Education Sprout Project." NCKU was chosen as one of the four "Global Taiwan" universities that received additional funds to compete internationally in the global higher education market. With this support and effort from faculty and students over the past ten years, NCKU has gained momentum and developed internationally to attain a globally engaged university.

Because the Southeast Asian region faces been facing critical challenges in their economic, societal, and political sectors, there is a requirement to recruit experts and educators to exchange ideas and face shared challenges. NCKU,

together with other prestigious universities of Southeast Asian countries, initiated the "Presidents' Forum of Southeast Asia and Taiwan Universities" (SATU Presidents' Forum) in 2003. In the past 15 years, this forum has provided a venue for academics to share their valuable experiences to improve higher education and international cooperation in the region. The International Secretariat of the SATU Presidents' Forum was established at NCKU to coordinate and promote related activities. In 2018, 72 representatives of SATU member universities endorsed the 2018 SATU Manifesto, which reaffirmed the shared belief that excellent universities in tandem can increase the competitiveness, productivity, resiliency, and well-being of the regions' population and society.



## Top-tier Research Centers in Southeast Asia

Based on the SATU partnership, NCKU launched three overseas research centers: the University of Malaya in Malaysia, Ho Chi Minh City Medicine and Pharmacy University in Vietnam, and Mahidol University in Thailand in Southeast Asia in the past two years, aiming to create innovative models for academic-industry collaboration. In the future, NCKU will build more in depth cooperation with other top medical universities in Southeast Asia, hoping to promote integration of international talent and industries through academic exchange in order to enhance regional growth and create shared value.

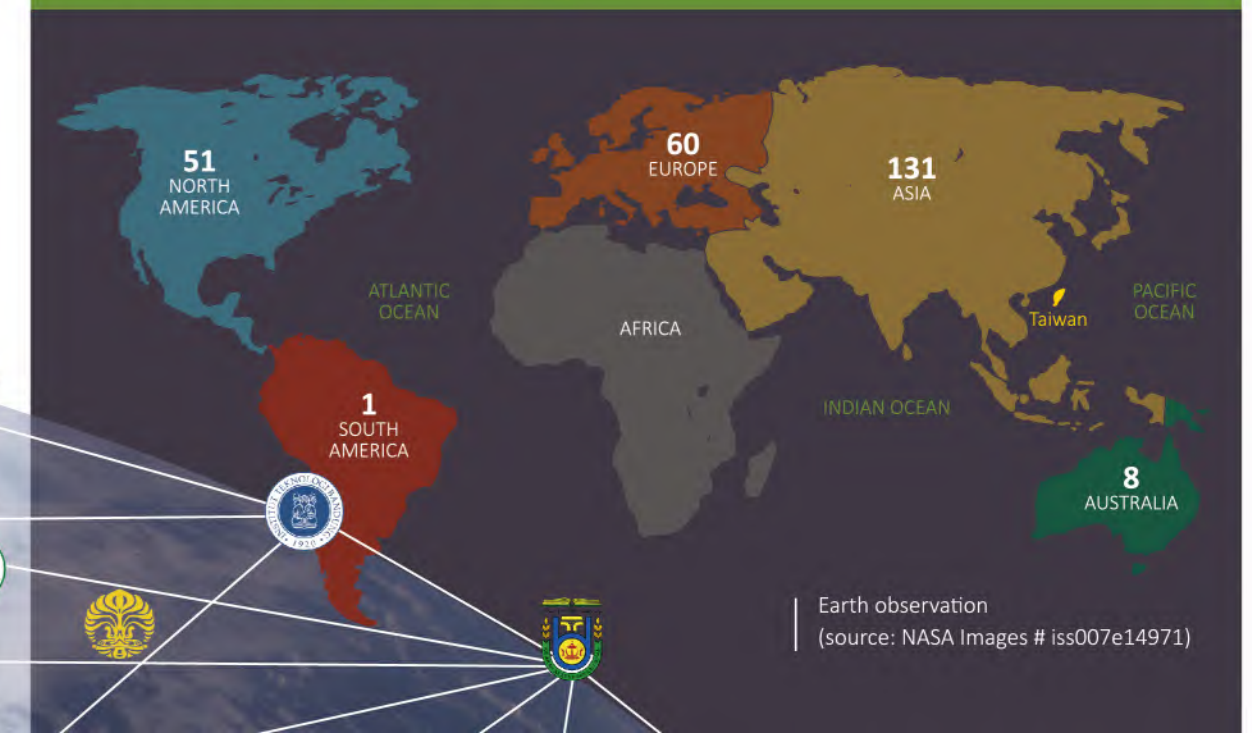


Furthermore, NCKU was the first university from Taiwan to join the Worldwide Universities Network (WUN) in 2016, which is a leading global higher education and research network made up of 23 universities around the world. With the support of WUN's Research Development Fund, Professor Su-lin Yu (Center for Gender & Women's Studies) is collaborating with 11 female scholars from Hong Kong, Macau, and Japan to launch the "Marriage Migrants in Asia" project. They hope that their efforts will effect positive change in society and ameliorate public preconceptions and misconceptions of married migrants. In terms of student exchange, NCKU will start a summer school for WUN member university students and start sending local students to the member universities. By initiating this short, intensive program, NCKU aims to promote the idea of a "Third Semester" at NCKU.

## Partner Schools around the World

### Levels of cooperation

University-wide: 199 College-wide: 124 Department: 69  
Center-oriented: 11 Others: 3



Earth observation (source: NASA Images # iss007e14971)

# Social Impact

Over the last decade, universities have faced steady criticism for elitist practices such as political bias and providing insufficient economic returns for students. Universities should thus turn their attention to serving the public good and delivering lasting value. Some universities are embarking on innovations intended to support social engagement among students as well as initiating efforts to educate students and faculty about their social impact in order to develop the social conscious leaders for the future. Reshaping incentives within the university to support faculty research that responds to real-life challenges is imperative.

In the past, NCKU has had the advantages of outstanding academic research and industry-university cooperation ; however, the university was not able to better combine research excellence with interdisciplinary teaching. Although the university has numerous collaborations with Tainan City, many of them were participated in at the individual faculty and student level. With the current emphasis on the social responsibility of universities (USR) in recent years, NCKU has been actively working on integrating on-campus resources to systematically drive more integral, sustainable governance.

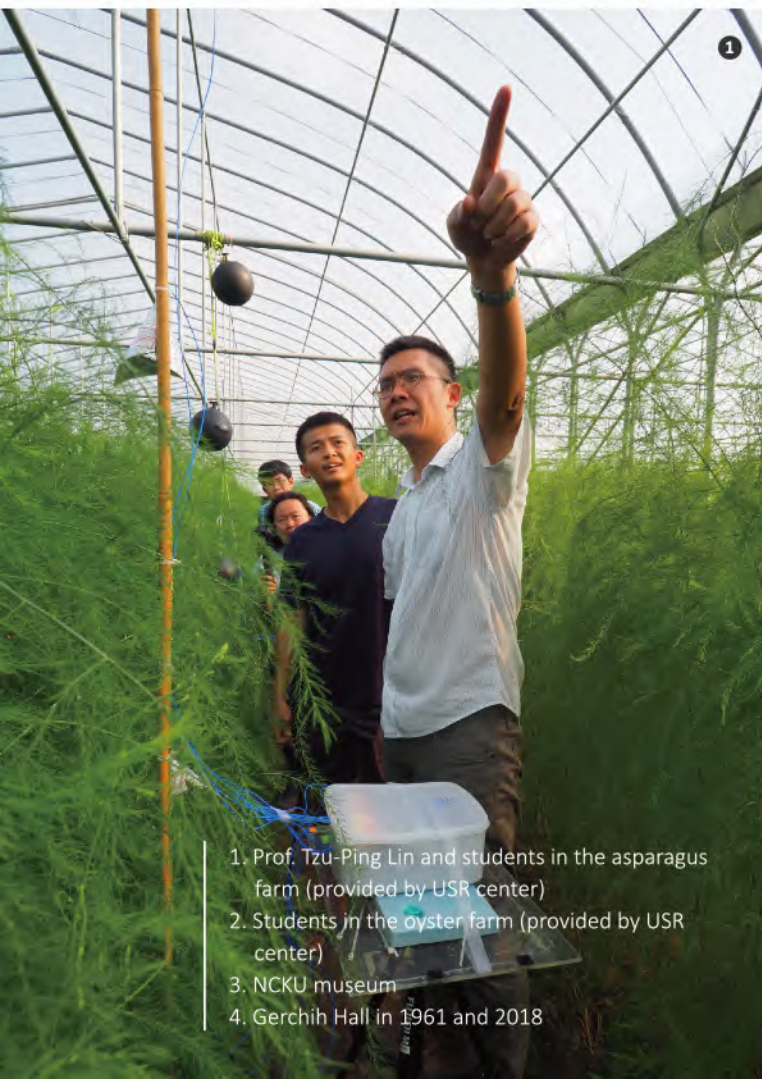
# Thinking Globally, Acting Locally

By placing an emphasis on the social responsibility of a university, NCKU focuses on regional specialties, developmental needs, and future visions to enhance the prosperity and advancement of the area by actively engaging with residents and communities. Following the idea of cultivating **Engaged academics**, we believe that the field of teaching should not be confined to the classroom but should be focused on solving practical field problems. In 2018, NCKU initiated an "IMPACT" project on the Tainan coast that significantly affected the communities involved.



**Professor Jiann-You Rau (Dept. of Geomatics)** used a drone to build a high-resolution 3D model for a team at the Dept. of Hydraulic and Ocean Engineering to carry out a community flooding simulation, and for students at the Dept. of Architecture who carried out a parameterized landscape and architectural design for microclimate simulation. **Professor Yi Chang (Dept. of Hydraulic and Ocean Engineering)** brought students to the seashore with their improved monomer oyster farming technology to aid farmers combating the oyster population decimation caused by climate change. **Professor Tzu-Ping Lin and his team (Dept. of Architecture)** applied stratified monitoring and analysis of the thermal environment of an asparagus farm, as well as cooling and ventilation strategies to improve high temperature issues for the farmers in the field, thus helping them improve the quality and yield of asparagus.

By engaging actively in social responsibility, the university not only explores problems faced by the Tainan coastal areas under threat due to environmental change, but is also able to cultivate students' level of concern related to environmental and social issues. By adopting core professions and technologies, it will be possible to solve the problems of climate change and actively implement the UN SDGs, thus fulfilling the social responsibility of the university.



1. Prof. Tzu-Ping Lin and students in the asparagus farm (provided by USR center)
2. Students in the oyster farm (provided by USR center)
3. NCKU museum
4. Gerchih Hall in 1961 and 2018

# The Future Stands on the Past

**Tainan** City is an ancient capital with the highest density of temples in Taiwan. It has over 50 cultural assets, accounting for nearly one-fifth of the total cultural capital in Taiwan. Tourists from home and abroad can enjoy the beauty of the religious art and culture in this compact city.

**The NCKU Museum**, the first public museum in Taiwan to be officially incorporated into the school's organizational structure, was opened in 2007 to promote NCKU's traditions, preserve significant historical and cultural artifacts, provide services to present the research activities of faculty members and students, and foster cultural education for the public, with the aim of integrating NCKU campuses into a wall-less cultural center of the community. At the end of 2017, the museum held an "I C Taiwan" exhibition in Europe, which compared the position of Taiwan as a maritime hub of East Asia with the Czech Republic as a land center of Europe in order to stimulate discussion of Taiwan's industry, culture, and relationship with the sea. The exhibition was awarded **the 2<sup>nd</sup> place UMAC award**, which brought the museum to the world stage.



NCKU's spirit of sustainable innovation has also been applied to rejuvenating the historic city of Tainan. The school's **Satellite321 program** has transformed an old house into an art gallery to help revitalize the city and promote international cultural exchange. C-Hub-NCKU's creativity base and platform-enables interactive events such as brainstorming among students and the faculty, experimental learning, and creative thinking. It facilitates academia-industry interaction in Tainan, where it also serves as an urban incubator, and in turn creates a win-win situation for Tainan, local industries situated in the city, and the school.



# Learning by Exploring

Education is the foundation of progress and innovation in both civilization and society, and higher education is key to the development of a civilized society. NCKU – with its solid research strengths and numerous research achievements – is therefore willing to shoulder more social responsibilities related to promoting industry ecosystem development and to take the initiative to assist the governmental policy development and implementation of sustainable green energy. In addition, NCKU makes excellent use of its expertise in disease prevention and control, disaster response, food safety, etc. and is dedicated to social care in the hopes of adding value as well as having a forward-looking social influence on Tainan City, Taiwan, and the world.

Tainan is an important city with roots stemming from Taiwan's antiquity. The city encompasses rich prehistoric and aboriginal history comprising a unique and unparalleled cultural tradition. Located in a city full of such unique historical and cultural assets, in 2017, NCKU created an unprecedented general education course called **"Exploring Tainan"** for freshmen. There are a total of 14 theme routes, including 5 major trails and 9 minor routes that cover archaeology, history, ethnic groups, figures, religious beliefs, cultural heritage, architecture, agriculture, water conservancy, ecology, environmental geography, the urban and industrial economy, and other aspects of the entire greater Tainan region. Each student must choose 1 major trail and 2 minor routes and write a report on his/her field visit at the end of the semester. By stepping out of the campus walls, students can be closely integrated with the pulse of the city and cultivate their ability in the field to help them understand the social value of interdisciplinary application and practice.



踏 | 溯 | 臺 | 南



# ARCADE

## Infusing Industry

Employers today are looking for a different kind of candidate. They want students and graduates with not only qualifications indicating a high level of ability to do the job, but also experience that demonstrates the skills, ability and tendencies to think and act uniquely and creatively to solve a problem or approach a project.



NCKU is committed not only to increasing students' professional abilities and interdisciplinary knowledge but also to developing their social awareness and ability to solve practical global issues in a rapidly changing world. NCKU has a strong R&D history and outstanding industry-academia cooperation performance and has long been devoted to establishing a connection between students and industries. Conforming to the needs of new approaches for teaching and learning, several unused classrooms and offices on campus were remodeled in 2018 into innovative spaces for creative thinking and discussion.

# The Cradle of Future Entrepreneurs

## Incubator Seed Selection

In 2018, we had the first incubator seed selection, a program designed to welcome students to use cross-disciplinary knowledge to solve real-world problems. In the 1st phase, 12 teams were selected and supported with kick-off funding, advising sections, and guidance by experienced mentors from relevant fields of study. The Air-Structure Lab, in which an idea was proposed to form air into structures, won 1st prize in the associated competition. In the future, every six months, NCKU will hold a competition related to the SDGs theme, and the winner will have the opportunity to gain more resources and funding in College X.

## Dream it! Do it!

By means of active search or open selection, the **Innovation & Startup Center** selects potential commercialized R&D technologies on campus and provides not only the professional knowledge needed by the start-up team at the initial stages of their projects, but also the necessary assistance to enable each start-up company to obtain necessary resources. The center also offers a series of courses related to entrepreneurship and holds regular venture capital matchmaking meetings, so as to obtain external capital injection and related links for the new team, create customized professional services, and fully promote the innovation and entrepreneurship of teachers and students on campus, so as to accelerate the establishment of a company based on the innovation, research and development of technical teams on campus and help them realize their dreams.

In addition, with the rapid evolution of global technology and the imminent transformation of Taiwan's financial industry, the capacity and talent available in university research programs will help shape the future blueprint of finance. Bank SinoPac and NCKU set up **Atelier Future** to engage in industry-university cooperation and prepare for the development of AI Fintech applications. Based on joint research and development of resources from both sides, they were able to explore the topic of industry and science to jointly create changes in industrial ecology. In 2018, they produced impressive results in the areas of credit risk assessment and credit reporting automation, certificate blockchains, community exploration, intelligent monitoring, wealth management, and the future AI campus.

## The Maker Factory

One of the original spirits of NCKU is to learn by doing and to share the outcomes for social improvement. In the Maker Factory, which was opened at the end of 2017, NCKU provides wood-working tools, power tools, electronic circuit tools, 2D/3D digital manufacturing tools, sewing tools, and 3D color spraying, for students to develop their ideas in a creative space. It is not only a work area for creative minds but also a hub that can facilitate cooperation between experienced makers and allow them to synergistically share their knowledge and skills. The goal of the factory is to build more connections and mutual assistance between NCKU and the community. The Maker Factory will attract local citizens to attend the multiple activities offered and will help contribute to sustainable development.

# Next Silicon Valley in Asia

#16

THE University Ranking in "Industry Income"

Top 100

Worldwide Universities Granted U.S. Utility Patents 2012-2017



**Universities** can guide the results of research and development and assist with translating them into products and applications that have industrial or social value through industry-academia cooperation for social development. Major international universities regard campus innovation and entrepreneurship as the mainstream model of industry-academia cooperation that accelerates responses to social needs.

NCKU performs extremely well in terms of industry-academia cooperation not only locally but also worldwide. In 2018, NCKU's income from industry-academia cooperation, including funds from government departments and enterprises, was **USD\$ 150 million**. According to the **Times Higher Education (THE) university rankings**, NCKU ranked among the **world's top 3%** universities in "industry income" for seven consecutive years.

The **Research and Services Headquarters (RSH)** has been involved in technology transfer business incubation, intellectual property, industry cooperation, and innovation entrepreneurship in NCKU since 1996. Today, it includes 77 Research Centers that develop technologies intended to meet industrial needs. In addition, the **Technology Transfer & Incubation Center (TTBIC)** supports NCKU inventors throughout the patent application & renewal process and plays a vital role in the entrepreneurial ecosystem. The TTBIC provides an array of services intended to educate entrepreneurs and foster breakthrough technologies generated from faculty members and students. Specifically, it serves as a negotiator with new companies to craft an agreement that is consistent with other licenses to help innovations become successful. Technologies invented on campus, for example, Automatic Virtual Metrology (AVM), microalgae cultivating for preventing air pollution, and earthgen, have been assisted in terms of commercialization and converted into tangible benefits. Since 2009, NCKU's technology transfer has generated over **USD\$ 3.3 million in revenue for the university each year for nine consecutive years**, a tremendous accomplishment in the history of Taiwanese universities.

## GLORIA NCKU

**Research** excellence at NCKU is centered on providing creative, practical solutions to establish and support high-growth enterprises. Supported by the Ministry of Science & Technology, the **Global Research & Industry Alliance at NCKU (GLORIA NCKU)** was established in 2018 and is dedicated to creating and strengthening mutually beneficial relationships between the institution and corporations worldwide.

Since NCKU has strong alumni resources around the globe, it can broadly expand its strategic partnerships in Southeast Asia, North America, and Europe. With such a platform, it is possible to provide more services to NCKU's corporate members, including international cooperation projects and business matchmaking.

In 2018, GLORIA sponsored a delegation to the annual Livestock Asia 2018 event in Malaysia with the aims of expanding exchanges and seeking technology transfer in the Southeast Asian market. At this meeting, negotiations for a Taiwan-based steel manufacturer helped procure international cooperation for corporate transformation. In addition, GLORIA also supported its corporate members and start-up companies to attend Southeast Asia's most definitive event for the medical and healthcare industry. Opportunities such as overseas business matchmaking and attending world-renowned international exhibitions, such as the MEDICA and HANNOVER MESSE in Germany, the CES in the U.S., the iREX in Japan, etc. will be provided to our corporate members in the near future.





# NCKU Profile

In the past five years, the total number of our students roughly remained at more than 21,000. However, the proportion of master's and doctoral students is changing. The proportion of doctoral students decreased year by year, while master's students increased. In terms of the number of industry-academic cooperation performance, although it maintains at about 2,500 projects per year, the total amount has been increasing in the past five years, which presents NCKU's advantages in this field. When it comes to the internationalization, the number of international students is also increasing year by year. The 1,762 international students account for about 8.3% of our student body. The top three countries of origin are Indonesia, Vietnam, and Malaysia.



## Faculty

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<b>1,337</b>	Full-time faculty
<b>728</b>	Part-time faculty
<b>24.5%</b>	Female full-time faculty members
<b>30.2%</b>	Papers involve international cooperation
<b>155</b>	International projects
<b>40.8%</b>	Papers are published in the world's top 10% journals

## Student

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<b>21,276</b>	Student number
<b>53.5%</b>	Undergraduate students
<b>46.5%</b>	Graduate students
<b>36.6%</b>	Female students
<b>238</b>	Student Clubs
<b>15.9</b>	Student-faculty ratio
<b>2,205</b>	Financial aid students
<b>2,580</b>	On-campus part-time jobs for students

## Internationalization

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<b>1,762</b>	International students
<b>846</b>	International scholars visits
<b>251</b>	International partner universities
<b>406</b>	International agreements
<b>460</b>	NCKU students have studied abroad
<b>70%</b>	Departments and institutes have sent students abroad

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