Embracing the World

NCKU

2019 Annual Report

Contents

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。

Members of the National Cheng Kung University (NCKU) community clearly understand their value within the global context. The NCKU community contributes to the welfare of local, Taiwanese, and global communities significantly. Faculty, staff, and students utilize a culture of knowledge and technological innovation for the betterment of society underpinned by a commitment to support the disadvantaged while connecting Tainan to Taiwan and humanity's common future.

President
National Cheng Kung University (NCKU)

Huey-Jen Jenny Su

Breaking Boundaries

From National Tainan Industrial High School before restoration, to Taiwan Provincial College of Engineering after restoration, and finally Taiwan Provincial Cheng Kung University, the name which was settled on during the 1970s-National Cheng Kung University. over the last 88 years, contributions of NCKU students and alumni is felt in multiple industries. This includes Taiwan's public transportation systems, national energy agencies, agriculture, engineering, high technology, architecture, finance, etc. Standing at the edges of society, NCKU students and alumni have taken a global view in various subjects; culture and arts, new pharmaceuticals, space satellites, gene decoding, quantum computing, and smart healthcare. They are creating their future and establishing values while moving forward and exploring the truth.

Simply put, NCKU is a university that exerts high self-expectations for the future of the country and for social responsibility. Today, NCKU has become an international university with students from more than eighty countries. Currently, there are about 22,000 students enrolled at NCKU with the number of alumni reaching 190,000 people globally. NCKU believes that a university should nourish the culture of society and all citizens, while acting as an integral element of enlightenment among individuals. NCKU embraces "educational innovation", "research excellence" and "social responsibility" as the main axis to build a pioneering university with "teaching, research and social responsibility" as the vision for excellence. To attain this goal, NCKU has planned a five-year strategy in the following four approaches:

Global Rankings

 # 15
QS Graduate Employability Rankings in "Employer Student Connections"

 # 17
THE University Ranking in "industry income"

 # 38
THE Impact ranking 2020 (#2 in Asia)

 # 225
QS worldwide 2019

 # 399
NTU Ranking 2019

 # 601-800
THE worldwide 2019

Regional Rankings

 # 35
QS Asia 2019

 # 78
THE Asia 2019

 # 114
U.S. News Best Global Universities in Asia

National Rankings

 # 1
Best University Social Responsibility (CommonWealth Megazine)

 # 1
Most Favorited Graduate 2020 (Cheers)

 # 2
Best University 2019 (Global Views Monthly)

 # 2
Best World's Universities for Three University Missions (MosIUR)

Subject Rankings

 # 97
QS Engineering and tech 2019

 # 265
QS Life Sciences and Medicine 2019

 # 155
U.S. News Engineering

 # 131
U.S. News Computer Science

1. **Deeper Learning through an Engaged Academy**
   To cultivate elite talent that cares for society and possesses cross-disciplinary integration and leadership abilities.
2. **Excellence in High Impact Translational Research**
   To develop key technologies with industrial value for application to societal needs that will further enhance national and social development.
3. **Deliver an Innovative Paradigm for Industrial Collaboration**
   To ally with industry, be a pioneer in innovation and startup, and contribute to industry transformation.
4. **Multicultural Fusion Generates Global Clusters**
   To cultivate international talents with global competence and create a borderless campus for the world.

Together We Conquer
in the time of COVID-19

During the global spread of coronavirus, Taiwan took several significant early steps compared to other countries and thus far has managed to contain the situation on an unprecedented level! **Meng-Ru Shen, the Superintendent of NCKU Hospital,** activated a prevention response immediatley after the virus outbreak. To lower the risk of coronavirus contaminating NCKU hospital, Dr. Shen established a quarantine station outside of the hospital. Simultaneously, the distribution of internal resources and the arrangement of medical personnel were all completed within a day.

NCKU is put forth great effort and teamed up with the hospital. **Wen-Chien Ko, the vice CO of epidemic prevention of the Southern district,** and **Nan-Yao Lee, the director of NCKU Center of Infection Control,** directed the establishment of the Center of Infection Control. **President Huey-Jen Su** integrated the efforts of the university and NCKU Hospital resulting in multiple smart healthcare processes. NCKU colleagues and students were required to report their daily healthcare information by scanning a QR-code before entering buildings or classrooms. This allowed the university to supervise students' daily health status and their location.

Responding to the Pandemic Crisis

NCKU Hospital cooperated with multiple college departments to form several interdisciplinary, cross-departmental teams to synthesize medical resources and use science and professional expertise in the fight against the virus.

QurE

In the face of this long-running battle, NCKU has unveiled a project to build the island's first deployable quarantine hospital in late April 2020. The project titled the **Quarantine Unit for Recovery, Emergency, and Ecology, (QurE),** aimed to build a deployable quarantine hospital that meets the authorities' coronavirus response standards while concurrently reaching its goal of sustainable development. Led by the NCKU president, the team developed a full-sized prototype of a quarantine unit on the school campus within two weeks. The design is overcame the drawbacks faced by mobile cabin hospitals used in other countries during the fight against the coronavirus. Each quarantine unit is built to function as a negative-pressure isolation ward, which greatly improves the safety of medical workers as they treat patients. Furthermore, the quarantine unit is easily assembled and quickly deployed to different locations thanks to its prefabricated, modular design, and locally available materials. It is estimated that a single unit can be set up within three days and put to use within one week.

AI Pitches into Fight COVID-19 Pandemic

To help make a diagnosis more complete and accurate, AI technology is involved in assisting the detection of inflammation in the lungs. The **AI-assisted system** was developed by the AI and information team of NCKU Hospital under the leadership of **Yi-Shan Tsai** of the NCKUH Department of Radiology and Jung-Hsien Chiang, the NCKUH Chief Information Officer. The team used an advanced AI-automated chest radiograph reading model for pulmonary tuberculosis developed at the AI Innovation Research Center to which they incorporated images of lung inflammation from the NCKU Hospital. The system provides sensitivity and accuracy as high as 80 and 90 percent respectively. To make these diagnoses more complete, the latest epidemiological developments provided by the Centers for Disease Control (CDC) are incorporated into the system. A **Smart Healthcare Clinical Decision Support System,** which is built into the inspection station computer system, can effectively relieve some of the personnel's pressure in making clinical decisions when responding to a potential virus infection. The entire process - from entering the station to the doctor's decision of whether to report for hospital quarantine

or at-home inspection - is shortened from 2.5 hours to just 30 minutes.

In addition, the NCKU interdisciplinary team, led by **Professor Nai-Ying Ko** and **A Mobile Intelligent,** has collaborated on the development of a smart-monitoring wristband. The wristband continuously monitors the wearer's body temperature and heart rate. By closely monitoring the trend of changes in body temperature and providing timely alerts for abnormalities, the wristband can alert the wearer to take early and appropriate action.

Pneumonia Detection System

An automatic pneumonia detection system developed by a team from Tainan-based National Cheng Kung University (NCKU) has become one of the winners of an online competition organized by the World Health Organization (WHO) to seek solutions for tackling challenges related to the COVID-19 coronavirus pandemic. The team, na**med "MedCheX,"** headed by **professor Jung-Hsien Chiang,** was announced in April as one of the 89 highlighted projects among 1,560 submissions in the **COVID-19 Global Online Hackathon.** The **E-alert system** can detect pneumonia from chest x-rays and automatically alert the doctor quickly. It is also the only Taiwanese team to win this honor.

The "Bridge of Hope and Prospect", connecting the NCKU Hospital in-patient and out-patient buildings, demonstrates the heroic momentum of crossing victory (the Sheng-Li Road) and heading to success.

Protective Device for COVID-19 Care

Pin-Hui Fang, a physician with the Tainan-based university's **Department of Emergency Medicine** who helped develop the concept, said doctors must be protected from infection, including during intubation after COVID-19 patients suffer respiratory failure. The intubation process in particular exposes doctors to the risk of aerosol-based transmission of the virus, especially if they lack protective gear. This has been in short supply in hospitals around the world. The tent-like device, Fang said, was inspired by an umbrella and a raincoat that consists of two L-shaped frames and a transparent PVC film, materials that are easy to find and relatively inexpensive.

Multi-language Diagnostic System

The NCKU Hospital self-developed diagnostic system, which was previously available only in Chinese, enables patients to fill in data on their travel, occupational, contact, and virus cluster history electronically before being seen by a doctor. Now the NCKU Hospital has added **6 languages** to the system, which will help reduce the medical staff's burden . To improve accessibility, the hospital added versions of the service in **English, Vietnamese, Indonesian, Thai, Japanese, and Korean,** which then automatically translates the patient data for hospital staff.

Reshaping the Post COVID-19 World

Sharing Experience with the Global Community

Starting from February 2020, the Taiwanese government introduced necessary policies and guidelines in advance of the semester's start to give schools sufficient time to prepare. Amid the ongoing pandemic of the virus, MOST and NCKU jointly organized the **2020 NCKU International Virtual Forum on COVID-19** on April 21. The goal of the event was to create a platform for NCKU and its partners around the world to share their experiences, knowledge, and best practices on epidemic prevention. Given the objectives of the forum, NCKU invited all of its local and global partners to join, including 104 member universities of the Presidents' Forum of Southeast Asia and Taiwan Universities (SATU), and scholars and administrators from over 100 countries. **Po-Lin Chen,** the **vice director of the NCKU Center of Infection Control,** has shared an examination method for coronavirus, medical treatment plans, face mask control policy, and ways of controlling the number of confirmed caseswith approximately 9,000 Indian health care workers through online streaming.

In addition, **President Su** joined a cross-regional online conference hosted by the **World Bank** in May and provided insights on how Southeastern Asian nations could maintain their educational systems despite the ongoing pandemic. President Su emphasized that scientific research and humanitarian considerations are equally important in deciding what measures an educational institution should take to balance teaching and safety of its students. She was certain that the pandemic could be successfully resolved if countries join forces and collaborate.

1. NCKU 2030 – COVID-19
2. COVID-19 Information Platform@NCKU
3. COVID-19 Prevention Guide for International Students
4. QurE

Pursuing Academic Excellence

NCKU developed into a university with a broad academic scope after building a foundation in engineering and then expanding into liberal arts and science. 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, with achievements in these areas well recognized globally. Currently, NCKU is expanding 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

Meet the New Fellows

YuShan Scholars

The **Yushan Scholar Program** aims to assist various universities in recruiting top international scholars to teach in Taiwan by providing internationally competitive salaries. In 2019, NCKU recruited two outstanding seniors and five young scholars who are expected to expand the international academic capacity of NCKU's academic environment and enhance the international influence of Taiwan's higher education.

Chia-Hsiang Menq
Ralph W. Kurtz Endowed Chair in Mechanical Engineering
Department of Mechanical and Aerospace Engineering,
The Ohio State University

Professor Menq's research has focused on physical understanding and mathematical modeling of linear/nonlinear dynamic systems and of the dynamic interactions between these systems, including probes and manipulators, and the associated biological samples or engineered objects. He has used advanced mathematical models, modern sensing/actuation techniques, and fundamental engineering principles to design and realize novel engineered systems and one-of-a-kind instruments. He has also used high-speed electronics, e.g., FPGA, along with state-of-the-art digital control techniques and real-time computation to achieve superior performance relevant to three distinct research areas. His research has been supported primarily by the National Science Foundation (NSF), National Institutes of Health (NIH), Air Force Research Laboratories, and industry.

Kai-Nan An / Professor Emeritus
Mayo Clinic College of Medicine

Kai-Nan An is a prominent and well-respected leader in orthopedics and rehabilitation biomechanics. His early work led to the development of experimental and analytical methods to quantify and model the human musculoskeletal system. His research has had a profound clinical impact, substantially improving the quality of life for tens of millions of patients who have received a joint replacement and soft tissue repair. In his more recent work, he has pioneered the novel application of medical imaging to characterize the biomechanical properties of tissue which complement successful diagnosis and treatment of the musculoskeletal system in this era of regenerative medicine.

Sheng-Heng Chung / Assistant Professor
Department of Materials Science and Engineering

Dr. Chung's research focuses on electrochemical energy technology, including material, device, fabrication, and process analysis. He has served as reviewers and editorial members in over 50 international journals for over 500 peer-reviewed papers. He is currently establishing electrochemical energy storage and conversion research group.

Ching-Hao Chang / Assistant Professor
Department of Physics

Dr. Chang is currently working on two fields: The first is to study the higher-order terms in the Hall effect by using both semiclassical transport theory and also test-particle simulation to confirm this higher-order Hall effect appearing in electron gases in a spatially modulated magnetic field and anti-ferromagnetism material. Another is to develop a first theoretical model to study electronic states and transport in carbon nanoscrolls.

Ching-Hsing Wang / Assistant Professor
Department of Political Science

Dr. Wang's recent work has focused on how personality affects individual political attitudes and behavior. Specifically, He uses survey data from Taiwan to examine the effects of the Big Five personality traits on individual attitudes toward social issues, policies, and political participation such as voter turnout and protest.

Chung-Wei Kung / Assistant Professor
Department of Chemical Engineering

Dr. Kung's research group focuses on the design and synthesis of chemically robust metal-organic frameworks (MOFs), MOF-based hybrid materials, and MOF-based nanocomposites with tunable porosity, electrical conductivity, and unique chemical functionality. These functional and nanoporous materials were utilized in a range of clean energy and environmental sensing applications that convert solar energy into useful fuels.

Pin Chieh Wu / Assistant Professor
Department of Photonics

Dr. Wu focuses on the nano-optics and nano-photonics especially in the field of plasmonics, metamaterials, and metasurfaces for light manipulation. His research group dedicates to establish a highly interdisciplinary field that incorporates active materials, nanophotonic metasurface, and quantum optics for the development of low-profile optical components as well as investigation of light-induced processes at nano-scale.

1. Pin Chieh Wu
2. Ching-Hsing Wang
3. Chung-Wei Kung

A Place Where Bold Dreams Begin

The **Columbus and Einstein Program** is a governmental subsidy program created to expand international perspectives and influence. This is done by encouraging young academics to explore the unknown, gain a broader international outlook, pursue excellence and encourage long-term investment in important innovative concepts. They do this by visiting overseas institutes to carry out research and exchange, and setting up groups for international collaboration.

Chia-Hsiang Lin / Assistant Professor
Institute of Computer and Communication Engineering

Dr. Lin's project endeavors to key topics in satellite remote sensing, including blind source separation (BSS) and hyperspectral super-resolution (HSR). As benchmark BSS/HSR criteria all induce non-convex or NP-hard problems, Dr. Lin introduces novel mathematical theory (convex geometry, functional analysis) in developing fully unsupervised learning methods by designing convex criteria with provable identifiability guarantee, and accordingly devises fast algorithms.

Yu-Chi Chang / Assistant Professor
Department of Engineering Science

Dr. Chang's project includes the following topics: development of self-healing materials to enhance the lifetime of electronics; using self-healing ability to weave 3D resistive memory array; introducing carbon nanotubes into transistors; fabrication graphene-based transistors without graphene-transfer processes; using graphene quantum dots to design a new type active channel layer; development of nanostructured hydrogels to enhance the sensing properties of sensors; design a super-thin sensor system that can go inside diapers to inform caretakers.

Yuh-Shing Chou / Assistant Professor
Department of Photonics

Even though scientists have already been working on pushing limits of laser devices, current manufacturing technology only enables nanolasers to operate at low temperatures under optical pumping. Dr. Chou's research goal is to gradually carry out material analysis, structural simulation and manufacturing improvement, and realize a room temperature electrical driven nanolaser.

1. Yu-Chi Chang
2. Yuh-Shing Chou

Yu-Ze Chen / Assistant Professor
Materials Science and Engineering

Dr. Chen's project proposes a reliable method of growing single element 2D materials by employing catalyzing metals and exploring the diffusion behavior between the catalytic metal and Te vapor interface. The projects work on developing a more effective manufacturing approach which will benefit basic research and other applications.

Yu-Yu Chang / Assistant Professor
Institute of International Management

Dr. Chang's current research focuses on work creativity and entrepreneurship. His project explores the role of maker spaces around the world in boosting entrepreneurship and technology advancement. He aims to develop an effective governing mechanism that facilitates cooperative innovation, reduces the resource barriers to value creation, and avoids the social dilemma in the peer collaboration processes.

Ting-Yuan Tu / Assistant Professor
Department of Biomedical Engineering

The main research field of Dr. Tu is to help researchers and physicians identify mechanisms of disease through the establishment of in vitro cell and tissue culture models. Each research topic requires a high synergy between engineering and biomedicine, overlapping across the areas of microfluidic technology, extracellular matrix materials, rapid prototyping, and imaging analysis.

1. Yu-Ze Chen
2. Yu-Yu Chang
3. Ting-Yuan Tu

Kung-Chien Wu / Professor
Department of Mathematics

Dr. Wu is working on the mathematical theory of the kinetic equations. He focuses on the Boltzmann equation and the Landau kinetic equation. He tries to complete the explicit structures of the solution of those equations.

Matthew M. Lin / Professor
Department of Mathematics

Dr. Lin's project focuses on investigating quantum entanglement, aiming to develop mathematical foundations for data reconstruction. This research stems from a real-world problem, and its mathematical model could be massive. To this end, expanding the theoretical background and developing the relevant core technologies for high-speed and parallel computing are required.

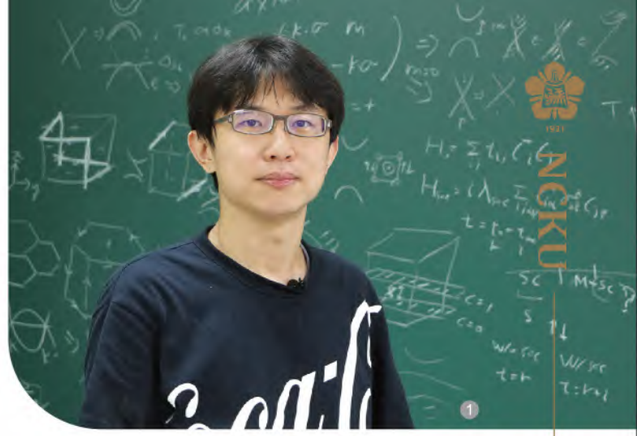
Carol Strong / Associate Professor
Department of Public Health

Dr. Strong's research includes adolescent health, HPV in men who have sex with men, behavioral intervention, and social network analysis. She is the principal investigator of a grant funded by the MOST to develop a prediction-oriented adaptive intervention for adherence to pre-exposure prophylaxis to prevent HIV in men who have sex with men.

Chung-Chan Hung / Distinguished Professor
Department of Civil Engineering

Dr. Hung's research is to develop durable, earthquake-resistant, and sustainable concrete infrastructure. He is currently developing ultra-high performance concrete (UHPC), which has a strength 5-10 times that of traditional concrete. Moreover, its excellent durability effectively enhances the service life and reduces future maintenance for structures.

1 2 3 1. Matthew M. Lin
2. Pin Chieh Wu
3. Chung-Chan Hung



2019 Highly Cited Researchers

Three distinguished scholars of NCKU are listed in the Clarivate Analytics "2019 Highly Cited Researchers". **Professor Jo-Shu Chang** has developed a new technique, utilizing waste gas for the cultivation of microalgae, which is not only a world-leading technique but also has already been adopted in the industry. His H-index is 73 while his research articles have been cited more than twenty thousand times. **Professor Wei-Hsin Chen's** highly cited article topics include; biomaterial torrefaction and pyrolysis, thermoelectric system, biomaterial thermal degradation equation, and biomass alcohol. He has published 225 articles in SCI journals with a total number of cities at 6,300 and his H-index is 43. He specializes in biomass energy and applies torrefaction to coal production. The articles that focus on this field account for 4.2% of the total number of articles published worldwide and accounts for 10.32% of the total number of citations worldwide. **Professor Tay-Rong Chang** mainly focuses on topological and two-dimensional materials and the basic physical phenomenon of novel materials, for example topological phase transition or spintronics. This research is expected to be applied to quantum computers or low energy and heat consuming electronic components. Currently, Professor Chang has published 98 research articles with 37 of them published as an NCKU faculty member. These articles have been cited more than 5,800 times.

1. Tay-Rong Chang
2. Jo-Shu Chang
3. Wei-Hsin Chen

Unboxing NCKU Research

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. Collectively, these colleges offer 44 undergraduate programs, 42 independent graduate institutes, and 11 degree programs. In 2019, NCKU launched the pioneering School of Computing (SoC) in Taiwan. The purpose of the SoC is innovative interdisciplinary learning, teaching, and research in order to quickly adapt to a challenging and changing society.

New Spaces, New Ideas, New Opportunities

Interdisciplinary Biomedicine and Preclinical Animal Testing Center (iBPAT)

Expanded from the original NCKU Laboratory Animal Center (LAC), the iBPAT is built for supporting breeding and pre-clinical animal testing services. The iBAT integrates NCKU's laboratory animal research facilities. It not only adopts SPF-grade and international level standards, but also equips a safe and high-quality environment. It is expected that the iBPAT will build the linkage between science and animal well-being to drive collaborations of industry, government, and academics.

Digitalization of Manufacturing

NCKU repurposed through development specific areas as the **Working Space for Robot-Aided Creation & Construction (RACCoon).** RACCoon has two robotic arms that can maneuver payloads up to 300 kgf. This can be applied to the construction and manufacturing procedure for creating AI digital control modes and developing innovative construction methods. With the help of Taiwan's local automated machine manufacturer, the RACCoon will start to work on the development of multi-field open courses, practical-based cross-department joint research, and establishing the R&D platform for future industrial cooperation.

Smart Learning with AI

The **AI Experience Classroom** erves as both a classroom and space to present creative works. Based on the features of spatial structure, this classroom has a 3D television wall and smart electronic control projector screen, allowing teachers and students to experience face recognition, virtual reality, and instant reactions. It not only has a high-speed network projector, but is also equiped with an environment control system and smart lighting fixtures. Faculty and students can teach, use, and enjoy AI through stimulation, internet connection, animation, and more abundant elements.

Featured research

Future Computing

New Cradle of Future Talents

Macronix **International Co.,** a leading global manufacturer of integrated non-volatile memory components, has generously provided NCKU with a NTD$420 million donation for the construction of the **Macronix Innovation Center.** This historic new space on campus will fuse the energies and talents of Macronix with NCKU. **CEO Miin Wu** is not only an alumnus of NCKU but also the donor of this generous funding.

The Center will be expected to provide a creative space for teaching and research. This will provide synergism, foster future talents, and demonstrate the company's dedication to corporate social responsibility. NCKU believes the facility will encourage new models for teaching and research, and incubate the **School of Computing (SoC).**

Mr. Miin Wu (the third from the right), the CEO of the Macronix International Co., donates NTD$ 1 billion for supporting the operation of the School of Computing (SoC).

The future space planning of the SoC

Transforming the present with computing
Weaving the future with intelligence

The Launch of School of Computing

The SoC will take advantage of AI computing technology and utilize the operating models of top internationally renowned universities of MIT and CMU. NCKU proposes this innovative operating concept is different from the current domestic education operating system. It provides a comprehensive cross-disciplinary teaching and research environment. In addition to responding to current development trend of various AI applications, SoC also provides competitive talent training programs from the aspects of basic science education, basic technology research, and social needs. It is hoped that through innovative operations, the vision of SoC can be implemented; Cultivating cross-disciplinary creative talents with both "domain-specific" and "computing" expertise.

Warm-up for the Future

At the end of 2019, NCKU held the **Workshop on Future Computing (WFC)** with 75 prominent members from academia or elites in the industry. They came together to discuss the prospects and future development of the computing field. The main organizer, NCKU's Executive **Vice President Cheng-Wen Wu,** pointed out that NCKU's SoC will break from the mold of the existing faculty structure in that it will primarily be a cross-field research degree program. It will work closely with universities in Japan and Singapore to develop curricula that offer international academic credits. Finally, centers for AI research in different fields will be set up to enhance the research and development efforts in the field of computing.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
17 PARTNERSHIPS FOR THE GOALS

QFort

Quantum technology, particularly quantum information science and the development of future electronics, is a major technologies that can enhance societies and lead us into the Fourth Industrial Revolution. It lies at the heart of many future technologies artificial intelligence, the Internet of Things, and their future development and potential are all based on and limited by the power of computation and communication. Over the past decade, NCKU has invested significant resources and manpower towards quantum science and technology. This investment has led to the finest research outcomes in Taiwan and a new Center for Quantum Frontiers of Research and Technology (QFort). QFort focuses on three strongly correlated research directions: theory for quantum devices and quantum computations; superconductor-semiconductor (and other emergent materials) hybrid quantum devices and qubits; and a quantum material foundry. It successfully integrates scholars with different expertise – ranging from theoretical prediction to numerical simulation, epitaxial growth and material characterization – to achieve cutting-edge breakthroughs in quantum materials.

A light controllable multi-state quantum material.
Provided by QFort & Department of Physics, NCKU.

Featured research

Quantum Science

New Possibility of Open Quantum System

Professor **Yueh-Nan Chen** in the **Department of Physics** and **Assistant Professor Hong-Bin Chen** in the **Department of Engineering Science** developed a method for the detection and certification of the nonclassicality of dephasing dynamics. After proving the feasibility of the Hamiltonian-ensemble simulation method, Hong-Bin Chen gave the theory a formal rewrite by describing and examining the dephasing in the frequency domain rather than in the time domain, as is generally done. This opened up a new path for research, is considered groundbreaking, and was published in *Nature Communication* in August 2019.

BiFeO3-Higher Eff iciency, Less Waste

A research team led by **Professors Jan-Chi Yang** and **Yi-Chun Chen** of the **Department of Physics** have developed bismuth ferrite (BiFeO3), a multi-digit memory material which is capable of recording eight logic states (0-7) simultaneously in a single memory unit. The application of multi-digit materials in conjunction with light control technology can greatly reduce memory storage volume and energy consumption/dissipation levels compared to existing memory devices. A report of this work was published in May 2019 in the prestigious international peer-reviewed journal *Nature Materials*.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
17 PARTNERSHIPS FOR THE GOALS

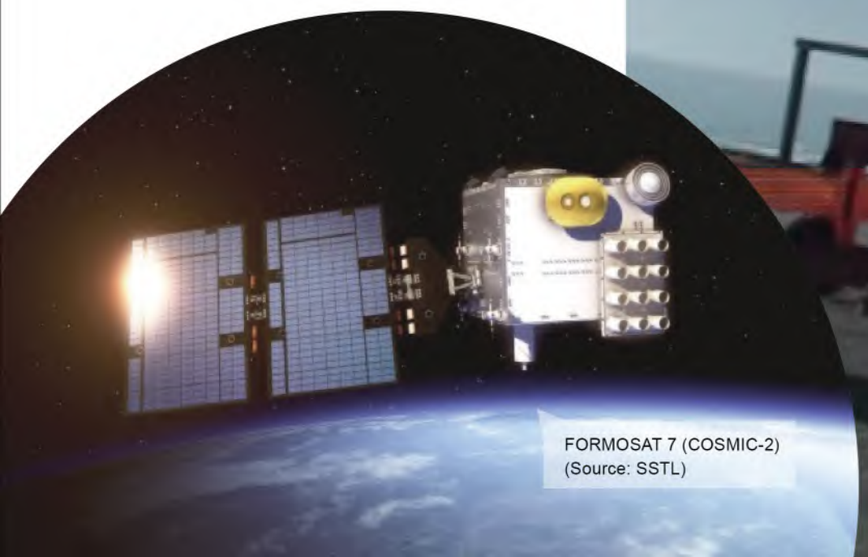
1. Professor Yueh-Nan Chen
2. Professor Tse-Ming Chen
3. Professor Yi-Chun Chen
4. Professor Jan-Chi Yang

Featured research

Aeronautics and Astronautics

Set Light to the Future by Satellite

The FORMOSAT-7, an international collaboration between Taiwan (NSPO) and the United States (NOAA), has been successfully launched from a NASA base on June 7th, 2019. In this project, NCKU is in charge of decoding the GPS weather information where at least seven departments and ten teachers are involved in the research and development for this space mission. Talents from NCKU are involved in all aspects of this project, including **Bing-Chih Chen,** the Director of the **Institute of Space and Plasma Sciences, Professor Chia-Hung Chen** and **Charles Lin** from the **Department of Earth Sciences** and **Professor Shau-Shiun Jan** from the **Department of Aeronautics and Astronautics.** This launching is expected to improve the accuracy of weather forecasting, especially for the subject of precipitation.



FORMOSAT 7 (COSMIC-2)
(Source: SSTL)

Pushing the World Forward

A 1,500 kgf two-stage Hybrid Rocket, designed by the **Hybrid Rocket research team of the Department of Aeronautics** and Astronautics at NCKU has successfully launched at Mudan Township beach in Pingtung County. Not only did it pass several crucial tests, the designing, technique, and manufacturing of critical parts and instruments of the payload was performed by research teams and experts from Taiwan. The biggest advantage of a hybrid rocket is the first stage of the rocket can be separated after the fuel has run out, allowing the rocket to accelerate and go higher. The Director of the research team, Professor Yei-Chin Chao pointed out the team has magnified the force from 30 kgf to 1,500 kgf, proving that NCKU has grasped the technique of force magnification.

The STAR Is Born

The "STAR" experiment at Brookhaven National Laboratory (BNL) involves over 600 scientists from 14 countries, including a NCKU research team. In the forward tracking detector upgrade project, **Assistant Professor Yi Yang** in the **Department of Physics** is in charge of designing and analyzing the mechanical structure and manufacturing and testing of sensors for the forward tracking upgrade. This is not the first time for Professor Yang to be a part of a major physics experiment, though. Majoring in high energy physics, Yang and his research team have taken part in severalhigh level international projects. For instance, since 2014, Yang has led the team to participate in the data analysis and manufacture of the Upgraded Tracker Thermal Pump System (UTTPS) radiator. With tremendous professional experience, Professor Yang is expected to significantly contribute to the project with his abundant expertise.

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Photo shot before the launch of a rocket with thermal control system of AMS-02 in Virginia. Starting from the left: Nobelist Samuel C. C. Ting, President Su, and Professor Yang.

Featured research

Green Energy

Hierarchical Green-Energy Materials Research Center (Hi-GEM)

Hi-GEM is a research center focusing on the development and application of green energy materials, specifically integrating domestic materials, chemical, electrical, optoelectronic, physical, industrial design, as well as other academic fields. The center is expected to complement the "Key Green Energy Materials" puzzle that Green Energy Technology lacks, and form a green energy R&D settlement with distinctive features and international visibility in the south of Taiwan. Hi-GEM's goal is to closely follow the international trend of the United Nations Sustainable Development Goals (SDG). These goals are expecting to achieve reliable and sustainable green energy in response to climate change and build a resilient infrastructure to promote sustainable industrial development and productive industries. The model will enhance national talent competitiveness and strengthen the partnership between Taiwan and the countries throughout the world.

7 AFFORDABLE AND CLEAN ENERGY · 12 RESPONSIBLE CONSUMPTION AND PRODUCTION · 17 PARTNERSHIPS FOR THE GOALS

Booster of Future Transportation

In Shalun, Tainan, the Ministry of Science and Technology built the Taiwan CAR (connected, autonomous, road-test) Lab; a closed testing ground and the first of its kind to incorporate the complex traffic environments often seen in the Asia-Pacific region. The NCKU connected autonomous vehicle research team developed the crucial software for connected and automated driving in 2017, and created a prototype that uses technologies such as navigation and positioning, environment sensing, decision-making and planning, and drive control. **NCKU President Huey-Jen Su** and NARL **President Yeong-Her Wang** signed a collaboration agreement to promote the research and development of verification venues for self-driving vehicles and create a comprehensive traffic detection system.

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Flexible Rechargeable Batteries

Fei-Yi Hung, the professor of the **Department of Material Science and Engineering,** has led his research team to develop a type of flexible rechargeable battery based on magnesium fabric. This magnesium fabric-based chargeable battery is the world's first flexible solid-state model. It uses a magnesium alloy/ceramic powder and nonwoven fabric and is produced by KNH Enterprise. A small patch of the fully charged battery can support over 36-hours of continuous light emmitted by an LED light bulb. In addition, unlike some types of rechargeable batteries that run the risk of explosion when batteries are overcharged, this newly developed battery features no electrolytic solutions!, This makes it not only safe but also environmentally friendly. Professor Hung indicates that this battery can be stacked to increase power storage capacity and multi-layer packaged into battery packs for electric vehicles.

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Professor Fei-Yi Hong with the rechargeable battery

The "Brain" is running in a test facility for autonomous vehicles in Shalun

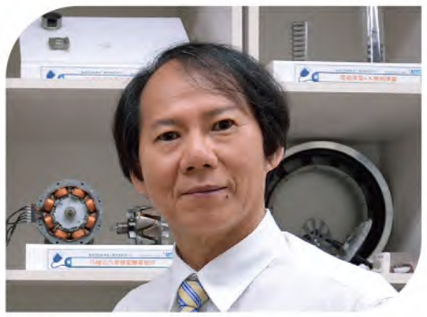
Featured research

Engineering

Winners of the MOE Academic Awards

Professor **Mi-Ching Tsai, from the Department of Mechanical Engineering,** along with **professor Tung-Yang Chen,** from the **Department of Civil Engineering,** are the award winners of the 63rd Academic Awards from the Ministry of Education (MOE). This is the first time for NCKU to have two professors receiving this award in the same research field. Professor Tsai is also the director of NCKU Electric Motor Technology Research Center. His specialties include robust control, servo control, motor design, and mechatronics. Professor Chen currently holds the chair for the division of structural engineering in the Department of Civil Engineering. His specialties include civil engineering, structural mechanics, and solid mechanics.

Professor Tung-Yang Chen



Professor Mi-Ching Tsai

NCKU x Purdue Dual Degree Program

To enhance global competency, NCKU and Purdue University have entered an agreement to collaborate on a dual degree program in 2020. NCKU is the first national university in Taiwan to collaborate in a cross degree and dual degree programs with a foreign university. From the first through the third year at NCKU, students will be studying electrical engineering, mechanics or computer science and information engineering. During the fourth year and for one year of master's degree, students may head to Purdue University and study aeronautics and astronautics, electrical engineering, and computer engineering. It is expected that students can earn a bachelor's degree from NCKU and a master's degree from Purdue University after five years. This year, NCKU has recruited 20 students. There is fierce competition between high school graduates from twelve top-notch high schools, showing that this program has been h-ighly approved.

Featured research

Architecture and Design

Imagine Future Cities with Papers

Starting from 2019, the **Department of Architecture** has declared it will use paper and replace the traditional use of styrofoam in making models during their teaching. This helps fulfill the NCKU's social responsibility. **Professor Yang-Ting Shen** designed a topic and assigned freshmen to build their full-scale architectural models out of corrugated paper. Because of the challenging high plasticity of paper, this triggered the ability of students to learn and explore independently. **Professor Kwang-Tyng Wu,** the Dean of the **Department of Architecture** mentioned that using paper as the building material can effectively reduce the amount of waste. By attending this physical sion and creation practice class, students are expected to cultivate a curiosity of "problem researching" and an ability of "problem-solving" from different perspectives of the design experience. This is regarded as the 'main substance' of this course, he pointed it out.

sky_Associative

When design production obscures the boundaries between consumer, designer, and manufacturing, society can shift from one built upon information to one centered on imagination. The **sKY_Associative,** initiated by **Professor Kane Yanagawa,** seeks to address the nature of today's industrial mass-production practices.It will investigate the the shift to mass-customization through CNC fabrication, smart factory automation, and cyber-physical systemsThis will promote the advancement of an increasingly open and nurturing environment for young artists, designers, and innovators. The sKY_Associative is founded on the notion that architectural design not only evolves from research, innovation, and collaboration, but that society equally contributes to the advancement of each of these core components.

When Technology and Art Meet

Professor **Yen-Ting Cho** who is an expert in Interactive digital media design, had the first official Open Studio of his eponymous design label in November 2019. Opening his working environment to the public for the first time, Yen-Ting Cho showcased the operation of the brand and the process of his product design. This was the result of a combination of practice and research at C-Hub. Yen-Ting Cho has adhered to innovative design and development of technology and art. His design label applies interactive software technology to pattern design, which is a brand new concept compared to graphic and 3D design.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION

1. Professor Kane Yanagawa
2. Professor Yen-Ting Cho

Featured research

Austronesian Archaeology

400 years of Zeelandia: Where the Stories Begin

NCKU has been one of the leading research units for major historical events and archeological excavations in Taiwan. In February of 2019, NCKU with the Tainan City Government published the result of excavating the “Ancient Tayouan Town” which was set during the Dutch Period in Anping, Tainan. Soon, NCKU will integrate this research with literature that is related to Tainan during the Dutch Period, both at home and aboard.

400 years ago, the Dutch set up a trading post in Anping, Tainan. The main economic development model of Taiwan has always been foreign trade. The perspective of **Professor Yi-Chang Liu,** the Director of **NCKU Institute of Archaeology,** suggests this development is related to the Dutch incorporating Taiwan into the world trade system in 1624. Needless to say, the time of Dutch rule plays an essential part in Taiwan's history. The discovery of this ancient Town is thrilling news for not only archaeologists but the world too.

It is also worth mentioning that the excavation of the “Ancient Tayouan Town” is part of the **“400 years of Zeelandia”** research project spanning from 2018 to 2024. Implemented by NCKU, this project aims to explore ancient Tainan in the Age of Discovery. This will be based on the mutual confirmation of three orientations; the literature based on the 1643 Zeelandia Town Cadastral Register, excavation site mapping, sketching and archeological excavation. In addition to the ongoing research of the Tayouan Town and Zeelandia, the project will also explore the relationship and interaction between the Dutch and indigenous Taiwanese people.

Fort Zeelandia

Fort Zeelandia was a fortress built during a ten year period from 1624 to 1634 by the Dutch East India Company (VOC). It was located in the town of Anping on the island of Formosa, the former name of Taiwan, during the 38-year Dutch rule over the western part of the island. The site has been renamed several times as Orange City, Anping City, and Taiwan City. The current name of the site is 'Anping Old Fort'.

An Archeological Center of the South

After years of hard work, the NCKU Institute of Archaeology was established in 2015. This institute plays an important role in training skilled talents. The Archeological Center of the South is not limited to Tainan but expands its horizon engaging in historical and archeological research throughout Southeast Asia,. Establishing a base in the Eastern District of Tainan, the Institute is exploring the land and the history of Zeelandia during the Dutch Period. This will be the cornerstone to further explore Austronesia and Southeast Asia and allows them to discover more historical facts. Most students of the institute come from different academic backgrounds yet want to understand the lives of ancestors and are interested in society and events during prehistoric times.

11 SUSTAINABLE CITIES AND COMMUNITIES
17 PARTNERSHIPS FOR THE GOALS

Preparing Student for the Future

In order to provide a reassuring learning environment, NCKU offers a 24-hour hotline to assist them during emergencies and to assist those needing help. The hotline organizes evening escort angels and volunteer groups on campus to take care of and support each other. In addition, students can find something that suits their interests from among the 238 student clubs and associations available, which provide lively, diverse learning opportunities to help students develop a broader perspective of life.

Starting in 2020, NCKU launched a new dual degree program with Purdue University and began to recruit outstanding high school graduates. It is believed that the program will cultivate future talents with strong global mobility and broad perspectives. Furthermore, 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 establish scholarships and grants to assist those who need financial help. To support minority groups, including the disabled and overseas Chinese and foreign students, NCKU has set up special programs including counseling, consultations, and special equipment for those who need of it.

Care for Our Society

USR IMPACT

USR **IMPACT** is a 2-year project under the University Social Responsibility (USR) Practice Program subsidized by the Ministry of Education since 2018. The project is titled “Implementation plan adapted to environmental change in Tainan coastal areas (IMPACT).” This group consists of teachers, assistants, and students from the **Department of Architecture, Department of Hydraulic and Ocean Engineering, Hydrotech Research Institute, Department of Environmental Engineering, Department of Urban Planning, and Department of Geomatics.**

The purpose of this project is to explore the issues facing Tainan's coastal areas during environmental change. To accomplish this the project will nurture young students' concern for local environmental and social issues and lead students to the coastal communities to help them adapt to climate change. Furthermore, the project will actively implement the United Nations' Sustainable Development Goals (SDGs) and international standards to fulfill the university's social responsibility. The expected outcomes of this project are to create a living space that can adapt to environmental changes in the coastal areas of Tainan. The project strives to integrate nature and industry into the landscape, create innovative education that connects communities and universities, and link up this model with t climate adjustment for international coastal areas.

13 CLIMATE ACTION | 15 LIFE ON LAND | 17 PARTNERSHIPS FOR THE GOALS

Professor Chung-I Lin, NCKU Vice President and the Director of the Research Center for Humanities and Social Sciences

[NCKU BOOKS ONE CITY]

The **[NCKU BOOKS ONE CITY] Mobile Library** is a new course created by the NCKU Library in collaboration with the Office of Academic Affairs and the Center for General Education. In total, 20 teachers took 120 students and 15 buses containing library books on 15 themes (including reading, climate change and adaptation, and plant technology for sustainable agriculture) to engage in service-learning. They visited 15 administrative districts throughout Tainan City. The mobile library received positive responses from the collaborating schools. They not only mentioned that this library makes reading a lot more interesting but also praised the positive attitudes of the NCKU students. The students designed games and read relevant books that helped younger students become more interested in topics they previously thought were boring! Furthermore, many hands-on activities were offered to create a more enjoyable reading experience for the kids. On the other hand, students from NCKU who had taken part in the mobile library also learned significantly from this course, including gaining experience in interpersonal interactions and sharpening their presentation skills. Most importantly, this course reinforced the idea for the students that teaching benefits both teachers and students synergistically. One can learn something from everyone and we should never stop learning.

4 QUALITY EDUCATION | 17 PARTNERSHIPS FOR THE GOALS

Rise of the Young Generation

A Grand Slam – iGEM

NCKU **cross disciplinary team iGEM** took part in the 2019 iGEM Synthetic Biology Contest in Boston, USA. Their topic was chronic kidney disease and was named “Oh My Gut”. Among the 346 teams from all around the world, iGEM won first place in the college student group. This is the highest performance Taiwan has ever achieved in the past ten years. In addition to the overall performance, the NCKU team was nominated for 10 awards and won 5 of them, including Best Therapeutics Project, Best Presentation, Best Hardware, Best Model, and Best Measurement. This year, the NCKU iGEM team has applied the concept of an ‘Escape Room’ to present their research result. Their research aims to provide a new treatment for the accumulation of urotoxin for Chronic Kidney Disease patients.

3 GOOD HEALTH AND WELL-BEING

Future Leader of the Global Community

Po-**Chin Li,** a sixth-year NCKU medical student, was elected as the next president of the **International Federation of Medical Students’ Association (IFMSA).** Now, he is IFMSA’s regional director for the Asia-Pacific region and previously was the Federation of Medical Students Taiwan president. In this year’s general assembly, the members were curious about the government’s response to the pandemic of COVID-19, as well as the nation’s healthcare system. Li and other IMFSA representatives from Taiwan explained to federation members about the government’s disease prevention measures. In the future, Li hopes to help IMFSA members, future leaders in the field of medicine to understand Taiwan to build a better foundation for Taiwan’s cooperation with the international medical community.

17 PARTNERSHIPS FOR THE GOALS

Responding to COVID-19 precautions, the 2020 commencement ceremonies at NCKU were broadcasted in real time online for parents and graduates unable to attend. One graduating student called parents to express her gratitude.

Skills, Logic & Hard Work

A research team led by **Professor I-Lin Wang of the Department of Industrial and Information Management** won 2nd place out of 54 teams from 15 countries in the 2019 Problem Solving Competition held by Railway Application Section (RAS), Institute for Operations Research and the Management Sciences (INFORMS). To solve the competition problem, one requires experiences and skills of mathematical modeling, logical reasoning, and algorithmic design and implementation. The NCKU team proposed several innovative techniques and solution methods, including the K-th short path algorithm and linear mathematical models. As a result, the NCKU team demonstrated its competitiveness and strength in conducting challenging research topics.

11 SUSTAINABLE CITIES AND COMMUNITIES

Impress Londoners with London Impressions

Yen-Ting Cho, **Associate Professor of NCKU Institute of Creative Industries Design,** led students to the London Saatchi Gallery. For the first time they displayed their design brand during the London fashion show Scoop. This year, the theme of Professor Cho's brand new series is "London Impressions". By applying abundant colors and patterns, the brand hopes to give the audience the impression and imagination of London. This is created by reinterpreting Buckingham Palace, afternoon tea culture, and theater activities which locals are most familiar with. Not only did several buyers place immediate orders but Dr. Cho and the students also earned several collaboration opportunities. Through connections with international trends, the latest information and opportunities are brought back to Taiwan helping the young generation of students and the industry to both move forward.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

Soaring Phoenix, Roaring Success

Students from the **Department of Mechanical Engineering** formed the **"NCKUME Racing"** team. They build everything from scratch, from designing to development. For example, the making of the outer skin of the car, circuits, steering components, and transmission system. After six months of hard work, the team completed its extreme lightweight race car the Phoenix. Its total weight is 60 kg, and can accelerate to a top speed of 60 mph. NCKU President Su stated the key to achieving a significant breakthrough is to combine hand-crafted custom engineering with novel techniques.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

Cultivation of Future Elites

Source: Office of the Vice President

Dr. William Ching-Te Lai
Vice President of the Republic of China (Taiwan)

Reconstruct the Beauty of Hometown

Malaysian architect **Mu-Jin Huang** is an **alumnus of the Department of Architecture.** In 1990, he headed back to his hometown Penang and devoted most of his effort to monument restoration. From 2002 to the present, Mu-Chin Huang's architects and planners have been working on residences and business development. Among them, the reconstruction of Chaozhou ancestral shrine was awarded the **UNSECO Asia-Pacific Cultural Heritage Reconstruction Award** in 2006. George Town and Malacca, Malaysia has been successfully listed as a **World Cultural Heritage** in 2008.

11 SUSTAINABLE CITIES AND COMMUNITIES

The Pilot of the Nation

Inaugurated in May, 2020, **Vice President William Ching-Te Lai** is an alumnus of the NCKU Post Baccalaureate Medicine program. After graduation from NCKU, Dr. Lai performed clinical duties at NCKU Hospital for many years. His love and care for society urged him to give up a steady career as a doctor and devoted himself to politics in 1996. Dr. Lai has been the representative of the National Assembly, legislator, and the first Tainan City Mayor when Tainan City was reformed into a special municipality in 2010. In 2014, he was re-elected with a large majority vote and became the head of the Executive Yuan from 2017 to 2018. As a result, Dr. Lai has made a significant contribution to the reformation and transformation of modern Taiwan.

Face Mask National Team

Due to the outbreak of COVID-19, the desperate demand for face masks around the world is an urgent problem. Thanks to the selfless and spontaneous effort of multiple industry owners, Taiwan added extra assembly lines to increase production of face masks in short time. Among the contributors, **Jui-Hsiung Yen,** who is an **alumnus of NCKU Department of Mechanical Engineering,** is the chairman of TTGroup and was the one who inititated the creation of the "face mask national team". The Fask Mask National Team assisted the government to shorten the expected production time of face masks from 2 months to 25 days. Jui-Hsiung Yen and his teammates hope that their effort can help stabilize the need of medical workers and the domestic market for protection in the time of COVID-19.

3 GOOD HEALTH AND WELL-BEING

TTGroup Chairman Jui-Hsiung Yen

Full Sail to Success

Yih-harn Liu, **alumnus of Department of System and Naval Mechatronic Engineering,** entered the Boat International yacht design competition and won the **Young Designer of the Year Award 2019.** She became the first Taiwanese to win a major award in the international yacht community. Yih-harn pursued both her bachelor's degree and her master's degree in the Department of System and Naval Mechatronic Engineering at NCKU. After obtaining her master's degree in 2016, she studied yacht design and interior design in Italy and the U.K. Winning this major international award in the yachting community, Yih-harn Liu expressed with excitement that it was a great recognition and encouragement, and that she was thankful to NCKU for providing her education as a solid foundation.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

Yih-Harn Liu selected the stingray, a listed endangered species, as inspiration, highlights the design philosophy behind "Manta", which is to create an elegantly modern form and to raise ecological awareness.

A Brave Adventure in Eswatini

As one of the first graduates of the **NCKU cross-college elite program, Yun-Xuan, Shih** stepped out from the campus and accomplished a mission impossible! In the summer of 2019 she headed for Eswatini, Africa to complete her education volunteer independent study. In Eswatini, Shih and her partners did their best to promote education to local kids. They prepared a variety of courses, from crafting to drama to photography. The team was moved by the love and passion they received from the kids. The cross-college elite program aims to explore and develop students' interdisciplinary learning motivation and ability. Through this wild and brave adventure, Yun-Xuan Shih successfully proved that she has made a valuable and meaningful choice.

4 QUALITY EDUCATION

Forging International Networks

As a prestigious, leading Taiwanese research university, NCKU began internationalization long ago due to the belief that creating an international environment is conducive to the cultivation of global citizens. Currently, NCKU offers 33 programs taught in English with a total of 694 courses. The total number of international degree students peaked at 1,899 in 2019, accounting for 8.8% of the student body at NCKU. Additionally, 846 international scholars have visited NCKU for teaching, research, and exchange.

Internationally, NCKU exerts a global impact through 486 international cooperation agreements with 294 foreign universities or institutions distributed in 38 countries. Currently, the agreements are inclusive of 53 dual degree programs and 144 active exchange student programs that greatly enrich the international experience of NCKU students. In 2019, 815 local students were able to study abroad, and 70% of the departments at NCKU have been involved in study abroad programs.

Face up to all of the World

Respect for Diversity

After the Ramadan holiday, Muslim students in NCKU, along with other Muslims in Tainan district, gathered together in the temporary prayer room on campus to celebrate Eid Al Fitr (the "Festival of Breaking the Fast"). About 200 Muslims listened to the leader praying from the Quran as is the etiquette of Islam. Taiwan is developing and being perceived as a multicultural society. **President Su** hoped that attendees not only remember NCKU but also the respect and equal treatment they experienced in Tainan and Taiwan. In fact, from departments to dormitories, NCKU has established several prayer rooms for Muslim students, showing respect for their religion. The celebration of Eid Al Fitr has provided Muslims an environment to gather, reflect, and enjoy a great moment.

10 REDUCED INEQUALITIES

Launch of the Indian Student Association

After four years of intense preparation, the 1st NCKU Indian Student Association was officially established in 2019. It provides a platform for Indian students from different departments to exchange their thoughts and ideas. In 2015 the Indian students started to arrange the establishment after receiving encouragement and support from the NCKU administration. There are currently about 75 Indian students at NCKU, making India the fourth-largest source of international students. Prashant, the President of the association, hopes the association can provide counsel to help Indian students get accustomed to the lifestyle in Taiwan and promote cultural exchange between Indians and Tawianese locals.

10 REDUCED INEQUALITIES

TU Darmstadt Asia Office

In order to strengthen the academic cooperation between Germany and Taiwan, NCKU and Technische Universität Darmstadt have established the Asia Office at NCKU to form the basis of a long term partnership. There will be an on-site German scholar station at the officeand this is the first instance for a German university to have an on-site representation in Taiwan. Both sides are expecting cooperation; student exchange, short term lecturing, academic exchange, scientific research, and cultural exchange.

17 PARTNERSHIPS FOR THE GOALS

A Great World with no Boundaries

The 2019 World University Conference held by the **World Universities Network (WUN)** invited students from their member schools for the first time. As the only student representative team from Asia, NCKU assigned three students who have backgrounds in international exchange, student government, and genetic engineering. In this conference, the three student representatives exerted tremendous effort. **Sawadogo Pingdwende Loucmane** mentioned that discussions at the conference will not be limited to the conference, there will be a ripple effect in the future. It is helpful that participants from faculty and students of different universities can sit together and focus on future actions when facing humanitarian crises.

17 PARTNERSHIPS FOR THE GOALS

WUN WORLDWIDE UNIVERSITIES NETWORK

TAIWAN

57+

MEMBERSHIP

SATU Presidents' Forum

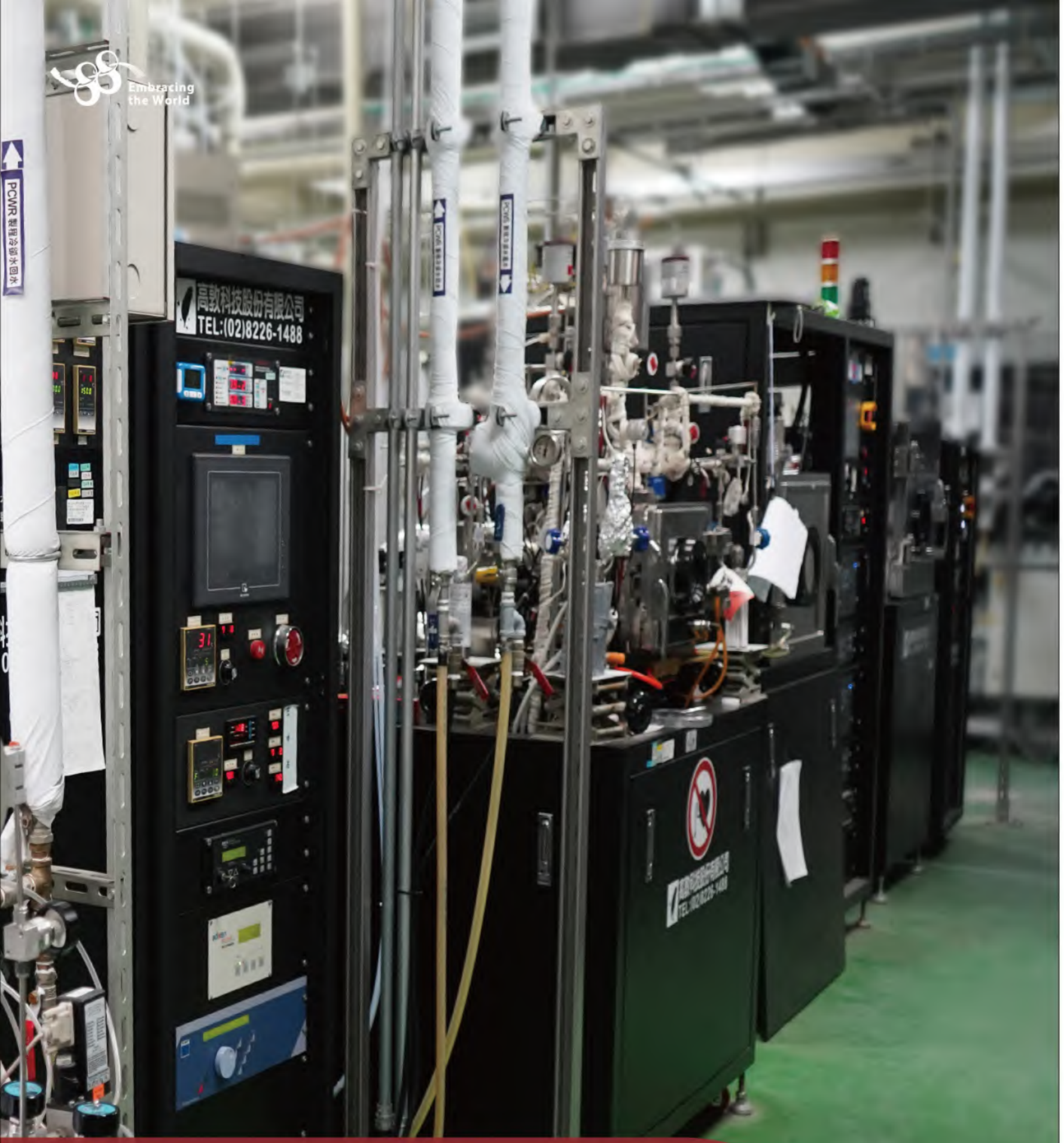
THAILAND 11 — MALAYSIA 8 — VIETNAM 7

SINGAPORE 2

BRUNEI 1

SWITZERLAND 1

INDIA 7 — PHILIPPINES 6 — INDONESIA 5



New Breakthrough in Interventional Therapy

Dr. **Xi-Zhang Lin,** professor of the College of Medicine, has created a TRUST-U project team under the support of MOST. Using three kinds of composite materials, embolization microspheres, X-ray contrast injection oil, and hydrogels, for endoscopic mucosal resection (EMR) and mucosal dissection (ESD) the team was able to enhance treatment results of interventional therapy for embolization liver cancer and endoscopic mucosal resection patients. The team is composed of experts from NCKU, NCKU Hospital, the Industrial Technology Research Institute, and the Food Industry Research and Development Institute. It has successfully raised NT$80 million in seed rounds and established a new company "T-ACE Co., Ltd." in 2019. This is great news for doctors and patients who implement interventional therapy.

Turn Theory into Reality

the NCKU-Butterfly Program

On December 24th 2019, **Delta Electronics (Thailand) Public Co., Ltd. (DET)** signed a memorandum of understanding (MOU) with NCKU to recruit Thai and Indian students, cultivate international talent, and launch the NCKU Butterfly Program. The Program provides a diversified talent-cultivating platform for industry-academia cooperation and solid support for the development of international enterprises. According to DET President Xie, talent cultivation creates momentum for industrial development. Signing an MOU with NCKU is therefore of great significance. DET will provide opportunities for Southeast Asian students studying at NCKU to do summer and winter internships in Taiwan or Thailand, and will welcome new graduates to join their team. Further DET-NCKU cooperation to promote and support talent cultivation is expected.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE | 17 PARTNERSHIPS FOR THE GOALS

Outstanding Entrepreneur Award

NCKU **Department of Chemical Engineering Chair Professor Jo-Shu Chang** is the leader of "The CEOs", a microalgae research team. Under the joint instruction of the NCKU University Center for Bioscience and Biotechnology, The CEOs took part in the first stage of the **From IP to IPO (FITI)** contest and won first prize for Outstanding Entrepreneur Award. The team aims to create a better environment for humankind by improving Taiwan sewage disposal. The CEOs team is confident that microalgae can be recycled and deal with sewage disposal in a more effecient way. For now, the team has signed a Letter of Intent with the Plastics Company of Taiwan. "The CEOs" is expected to establish their own company and enter the international market with their innovative techniques.

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Angels on the Shoulder

The **NCKU Alumni Angels (NCKUAA)** was inititated in 2014 in Silicon Valley. It is a group of NCKU alumni who are interested in investing their time, expertise, and capital into exciting startups. NCKUAA hosts networking events, educational forums, and formal presentation meetings around the world to help build and support NCKU entrepreneurship. The NCKUAA is managed and led by a group of passionate alumni who believe there should be an angel network to support NCKU entrepreneurs and participate in our venture ecosystem back. The dedicated NCKUAA team is committed to creating a large network that can support, mentor, and invest in promising ventures.

Partner enterprises in the Shalun Smart Green Energy Science City Plan

臺南 TAINAN · 永豐銀行 Bank SinoPac · 台糖 · Linker Networks · AIDC · 九典 BoF · RAINMAKING · nextDrive · ARBOR · Qisda · TEPCO · Mitacs · wistron Innovation • Integrity · TSS Taiwan Smart Solutions · 天氣風險管理開發 WeatherRisk Explore Inc. · DAIKIN · LILEE SYSTEMS · wiedu · MEDICAL DEVICE INNOVATION CENTER · 遠傳 FET · 中租控股 CHAILEASE HOLDING · SAMPO 聲寶 · 華立集團 · 鳳凰創新創業股份有限公司 · 美商康華全球生技股份有限公司

NCKU Profile

In the past five years, although the proportion of undergraduate and graduate students has changed slightly, the total number of our students in 2019 remained at around 21,500. In terms of the number of industry-academic cooperation performance, it maintains at about 2,500 projects per year, and the total amount has been increasing in recent years, which presents NCKU's strength and advantages in this field. When it comes to internationalization, the number of international students is also increasing year by year. The 1,899 international students account for about 8.8% of our student body. The top three countries of origin are Indonesia, Vietnam, and Malaysia.

Faculty

1,349	Full-time faculty
715	Part-time faculty
24.5%	Female full-time faculty members
32.4%	Papers involve international cooperation
36.4%	Papers are published in the world's top 10% journals
3.3%	Papers are published in the world's top 1% journals

Student

21,456	Student number
52.9%	Undergraduate students
47.1%	Graduate students
37.1%	Female students
242	Student Clubs
16	Student-Faculty Ratio
2,243	Financial Aid Students
2,311	Tuition Waiver Students

Internationalization

1,899	International students
1,519	International scholars visits
287	International partner universities
477	International agreements
815	NCKU students have studied abroad
70%	Departments and institutes have sent students abroad