NCKU

2020 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 makes significant contributions to the welfare of local, Taiwanese, and global communities. Our 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

Achieve Securely, Prosper Mutually

In 1931, a government order was issued, announcing the formal establishment of Tainan Technical College. It served as a foundation for Taiwan's industrial development and became the predecessor of National Cheng Kung University (NCKU). After laying a solid foundation in the fields of Mechanical Engineering, Electrical Engineering, and Applied Chemistry, it added the departments of Electrical Chemistry, Construction Engineering, and Civil Engineering in 1940. In 1946, it was reorganized as Taiwan Provincial College of Engineering.

Today, NCKU has nine colleges: Medicine, Liberal Arts, Sciences, Engineering, Electrical Engineering & Computer Science, Management, Social Sciences, Planning & Design, and Bioscience & Biotechnology. Within these colleges are 43 undergraduate programs, 36 independent graduate institutes, and nine degree programs, making the school the most academically comprehensive research-oriented university in Taiwan.

Following 89 years of dynamic growth, NCKU is entering its 90th anniversary as an international university with students from more than 80 countries. At present, NCKU has around 22,000 students and 1,336 faculty members. The number of alumni around the world has reached 198,510. For decades, NCKU has made remarkable local and international contributions through research and cooperation with various industries, governments, and research institutions. NCKU's graduates are prized by enterprises, and we are proud to have built an institution with a vision for excellence that aims to forge new paths for civilization.

NCKU 1931

Global Rankings

 # 1
THE University Ranking in "Industry Income"

 # 38
THE Impact Ranking

 # 234
QS Worldwide

 # 501-600
THE Worldwide

National Ranking

 # 1
Favorite Graduates of Companies 2020

 # 3
Best Global Universities in Taiwan (U.S. News)

 # 3
Best University 2019 (Global Views Monthly)

 # 3
Best University – Social Responsibility

 # 2
World's Best Universities – Three University Missions (MosIUR Moscow International University Ranking)

Regional Ranking

 # 42
QS Asia 2020

 # 103
THE Asia 2020

 # 129
Best Global Universities in Asia (U.S. News)

Subject Rankings

 # 93
Biotechnology and Applied Microbiology (U.S. News)

 # 132
Energy and Fuels (U.S. News)

 # 145
Engineering and Tech (QS)

 # 185
Chemical Engineering (U.S. News)

 # 190
Engineering (U.S. News)

 # 286
Life Sciences and Medicine (QS)

The spirit of a university lies in the hope that it can drive growth in knowledge, lead the intellectual zeitgeist, and pass on its valued traditions from generation to generation. We believe that our set of core values will serve as the foundation for our pursuit of excellence.

- **Deeper Learning through an Engaged Institution**
  We cultivate elite talents who care for society and possess cross-disciplinary integration and leadership abilities.
- **Excellence in High Impact Translational Research**
  We develop key technologies with industrial value and social applications that will further enhance national and social development.
- **Creation of Innovation Paradigms for Industrial Collaboration**
  We ally with industries, aim to be a pioneer in innovation and startup, and contribute to industry transformation.
- **Blending of Diversity to Generate Global Communities**
  We cultivate international talents with global competence, and create a borderless campus around the world.

A Historical Vision to Value the Past

The Museum of NCKU was established to promote the traditions of the University; preserve significant historical and cultural artifacts; provide services to faculty members and students; and foster cultural education within the public, with the aim of turning NCKU campuses into a wall-less cultural center for the community.
Since opening in 2007, the Museum has built upon the university's longstanding belief that campus cultural properties are an important part of education. The Museum is thus carrying out missions of the school and NCKU's 90th anniversary including:

Collecting and preserving the University's significant historical artifacts

The museum will promote the preservation and legal protection of the school's cultural relics and assets from a school level, and extend the preservation to colleges and departments.

Researching and publishing cultural properties from the University's history

Museum Director Ping-Sheng Wu says there is a long-term plan in place to write NCKU's history, and the NCKU History Compilation group is compiling the school's history in chronicle form by decade.

Exhibiting and expanding the teaching and research accomplishments of the University's faculty members and students

The mission of the museum for NCKU's 90th anniversary is to publish books and make videos that express NCKU's value and connect with alumni, as well as connect Taiwan and the world.

Promoting and assisting in multidimensional social education

The Museum will construct a school history database to preserve the school's historical materials.

Historical ideas

Museum Director **Ping-Sheng Wu** says that NCKU's written history won't be presented as traditional historical chronicles. Instead, history will be interpreted from ideas and themes. For example, NCKU was established as Tainan Higher Technical School in 1931, became a college, and then became a university. After the medical school was established in the 1980s, NCKU became a comprehensive university that combined the fields of medicine, technology, and humanities. As it evolved from a local technical school into the top university in Taiwan, it took on greater social responsibility and performed benchmarking. The presentation of the school's history will be linked with Taiwanese society, as NCKU's growth mirrored Taiwan's historical and social development.

The Transformation During the COVID-19 Pandemic

For many people around the world, the COVID-19 pandemic has been one of the most destabilizing experiences of their lives. Taiwan is the place where has undergone the least change amidst the pandemic. We are facing the challenges in defining education in the future when higher education systems around the world are having to tackle the impact of having all of their courses to go online and of remote learning.

In addition, higher education is facing various issues such as students' mental health and a decrease in the enrollment of international students as a result of COVID-19. At the social level, socioeconomic relationships were restructured after the pandemic. NCKU can make a difference by helping individuals to equip themselves with the resilience they need when handling pandemic-related threats.

Taiwan Assists India in the Fight Against COVID-19 with Oxygen Concentrators and Oxygen Cylinders

AS India faced a second wave of COVID-19, NCKU Hospital cooperated with the Taiwanese government to assess Taiwan's oxygen concentrator production capacity, with the aim of assisting in the humanitarian aid mission to send epidemic prevention supplies to India. The first batch of medical supplies, including 150 oxygen concentrators and 500 oxygen cylinders, arrived at Indira Gandhi International Airport in Delhi on the morning of May 2. Gourang Das, the Indian envoy to Taiwan, expressed gratitude for Taiwan's friendship and assistance. NCKU Hospital continuously works in conjunction with governmental policies to promote medical and health cooperation and humanitarian assistance between Taiwan and India.

3 GOOD HEALTH AND WELL-BEING | 10 REDUCED INEQUALITIES | 17 PARTNERSHIPS FOR THE GOALS

Casting the Light of Knowledge

As a higher education leader in Taiwan, NCKU exists not merely to survive but also to thrive during difficult times. To do so, it prepares for different possible scenarios, identifies creative solutions, and stays flexible in the face of continuous change. "Casting the Light of Knowledge" is a chronicle of NCKU's efforts to combat COVID-19 in 2020. In this book, NCKU shows how its core values contributed to the critical responses of the university and how its scientific knowledge shored up Taiwan during this critical time. It hopes to continue creating hope for Taiwan and our common future.

iNursing Space Opening

NCKU Department of Nursing has a new teaching space, "iNursing Space." The department is the first one in Taiwan to combine livestreaming with digital technology to create a virtual reality interactive nursing teaching space. This classroom is a great asset to have during a pandemic, as it can provide students with access to international graduate school classes, thereby cultivating cross-national human resources. "iNursing Space" can also increase opportunities for cross-border meetings on research cooperation and interactive exchanges during pandemics.

4 QUALITY EDUCATION | 17 PARTNERSHIPS FOR THE GOALS

KUAP for COVID-19 Prevention

“KUAP, NCKU Can Help!” The mobile phone app KUAP (NCKU Announcement Platform) was developed by National Cheng Kung University using top smart technology, and is a Taiwan version of a comprehensive pandemic prevention app. KUAP utilizes big data analysis to conduct risk assessments based on users’ footprints records and daily body temperature and symptom records. The system also links to QR code screenings at hospitals, PCR test results, rapid screening results, and vaccination records. This allows for the comprehensive protection of users’ health and safety during a pandemic. NCKU has openly shared this app with the public.

3 GOOD HEALTH AND WELL-BEING 17 PARTNERSHIPS FOR THE GOALS

Rapid Screening Station at NCKU Begins Operating

At the start of the semester, National Cheng Kung University set up a rapid screening station that provides free rapid screening tests to NCKU faculty, students, and staff. The rapid screening station gives users a safe environment to conduct their own screening tests. The integration of KUAP (NCKU Announcement Platform) makes the service more efficient, as reservations can be made via the mobile phone app. After users complete the test, they can upload their results to KUAP, allowing the data to be integrated both offline and online. QR codes that link to video instructions can be found around the station. Users can follow the instructions given by the nurse in the video to conduct tests.

NCKU is utilizing technology in the fight against the pandemic and connecting with the world. It is protecting its students with practical actions, and operating meticulously to ensure everyone’s safety.

3 GOOD HEALTH AND WELL-BEING 17 PARTNERSHIPS FOR THE GOALS

Yu Shan Scholars

Tony Q.S.Quek

Visiting Professor
Department of Computer Science and Information Engineering

Dr. Quek's research focuses mainly on wireless communications and networking, network intelligence, big data processing, internet-of-things, and wireless security. In particular, Dr. Quek is interested in 6G and making fundamental breakthroughs in connectivity, intelligence, and softwarization to support smart networks and services of the future.Dr. Quek's main achievements are Clarivate Analytics Highly Cited Researcher for 5 consecutive years in a row, 2020 IEEE Stephen O. Rice Prize, 2020 IEEE Communications Society Young Author Best Paper Award, 2020 Nokia Visiting Professorship.

Masaru Takagi

Visiting Chair Professor
Institute of Tropical Plant Sciences and Microbiology

Dr. Takagi's research project is a comprehensive analysis of the function of the transcription factors encoded by the Arabidopsis genome using Chimeric REpressor gene Silencing Technology (CRES-T), a novel gene silencing technology that allows plant transcription factors to work.

Kwan-Lok Li

Assistant Professor
Department of Physics

Professor Kwan-Lok Li is an astronomer who is interested in compact stars, i.e., black holes, neutron stars, and white dwarfs. The environments of these systems are extreme, and observations of X-rays, gamma rays, and even gravitational waves are required. Professor Li is a well-known expert in the field of classical novae. In 2017, he published a paper in *Nature Astronomy* on the discovery of the correla tion between the gamma ray and optical emission in a nova. Recently, his team joined the KAGRA project (a new gravitational-wave observatory in Japan) and is aiming to uncover more mysteries in the universe.

MOST Outstanding Research Award

Yung-Chun Lee

Distinguished Professor
Department of Mechanical Engineering

Dr. Lee's research focuses on developing innovative micro/nano-fabrication methods and their corresponding systems that have industrial applications. Micro/nano-structures can be produced at a high throughput, in large areas or sizes, and at a low cost.

Tzong-Yueh Chen

Distinguished Professor
Department of Biotechnology and Bioindustry Sciences

Dr. Chen's research focuses on developing a whole genome marker/molecular-assisted breeding system, an artificial intelligence fry production system, a microfluidic pathogen detection platform, and an immunosuppressive functional technology platform into an automatic environment for grouper, and using smart aquaculture to help the industry increase production and decrease costs.

Yan-Shen Shan

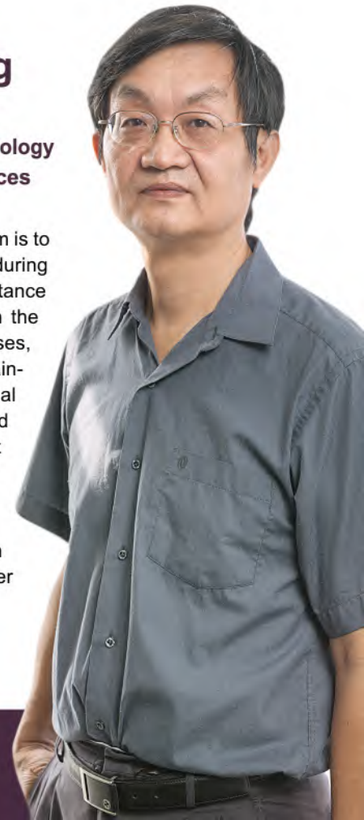
Distinguished Professor
Institute of Clinical Medicine and Department of Surgery

Dr. Shan's work involves the clinical treatment of and basic research into the tumor microenvironment of pancreatic cancer and gastric cancer. He is the principal investigator of pancreatic cancer of the MOHW's Excellent Cancer Project and the leader of MOST's UGI Cancer Taiwan Clinical Trial Consortium (TCTC), which develops and assists clinical trials to improve patient survival.

Jan-Jong Hung

Distinguish Professor
Department of Biotechnology and Bioindustry Sciences

The goal of Dr. Hung's team is to prevent drug resistance during cancer therapy. Drug resistance remains an important issue in the treatment of various diseases, including cancer. How to maintain genome stability is a crucial focus in cancer prevention and treatment studies. In the past 10 years, Hung's team has developed a series of important conditional lung cancer animal models, including an in vivo tracing system for cancer research.



MOST Outstanding Research Award

Tsair-Fuh Lin

Distinguished Professor
Department of Environmental Engineering

Dr. Lin focuses his studies on the monitoring, treatment, and modeling of cyanobacteria, cyanotoxins, and taste and odor (T&O) compounds in source and drinking water. His team, one of the world's leaders in drinking water T&O issues, has developed technologies for the monitoring, treatment, and risk management of cyanobacteria and metabolites in drinking water.

Trai-Ming Yeh

Distinguished Professor
Department of Medical Laboratory Science and Biotechnology

Dr. Yeh's research is focused on the pathogenic mechanisms of dengue virus (DENV)-induced vascular leakage and hemorrhage. In his study, he found that DENV nonstructural protein 1 (NS1), which can be secreted in patients' sera, is a pathogenic factor that can induce endothelial hyper-permeability and glycocalyx degradation through macrophage migration inhibitory factor-induced autophagy. DENV NS1 can also bind to platelets and induce their activation and apoptosis, leading to thrombocytopenia. On the other hand, monoclonal antibodies against NS1 can protect mice from the lethal challenge of all four serotypes of DENV infection.

Chih-Ping Wu

Distinguished Professor
Department of Civil Engineering

Professor Wu's research mainly focuses on the development of novel and high-performance computational methods to evaluate the multi-field coupling structural behavior of macro-, micro-, and nano-scale structures. He is currently developing a unified couple stress plate theory for the static bending, free vibration, and buckling analyses of multi-layered functionally graded (FG) microplates and multi-layered graphene sheets.

Shyy-Woei Chang

Distinguished Professor
Department of Systems and Naval Mechatronic Engineering

Dr. Chang's research focuses on heat transfer enhancements, with applications for gas turbine rotor blades, heat exchangers, electronic chipsets, and electric motors. Several novel techniques that raise the heat transfer effectiveness of single- and two-phase flows at rotating and swinging conditions were developed to improve the thermal performance at realistic engine conditions for aero gas turbine engines and shipping machineries.

MOST Outstanding Research Award

Tzung-Fang Guo

Distinguished Professor
Department of Photonics

Professor Tzung-Fang Guo studies the fundamental topics of high-performance O/PLEDs, polymer PVs, n-type pentacene OTFTs, and the magnetic field effect of organic electronic devices. He firstly developed the perovskite-based hybrid solar cells of p-i-n device configuration and applied p-type nickel oxide electrode interlayer in fabricating efficient perovskite photovoltaics and LEDs.

Yueh-Nan Chen

Professor Department of Physics Center for Quantum Frontiers of Research &Technology

Dr. Chen's project focuses on the investigation of quantum information science, aiming to analyze the fundamental underlying assumptions of temporal quantum correlations within a broader context. In studying these concepts, he hopes to shed light on both the power and limits of temporal quantum correlations, including the advantages in quantum communication and the benchmark in quantum computations.

Ju-Ming Wang

Distinguished Professor
Department of Biotechnology and Bioindustry Sciences

Professor Wang's laboratory focuses on the dissection of cell-cell communications in response to inflammation or inflammation-like cellular stress. According to the idea that controlling inflammation can effectively control diseases, they identified a novel druggable target and developed protein drug candidates for use in the therapy of chronic inflammation-related diseases, including cancer.

Ming-shi Chang

Chair Professor
Department of Biochemistry and Molecular Biology

Dr. Chang focuses on the discovery of new drugs for devastating diseases. She demonstrated that the IL-20 antibody is a potent drug for treating pancreatic cancer. She has been granted 50 patents for her discoveries.

Columbus Scholars

Chyuan-Chuan Wu

Assistant Professor
Department of Biochemistry and Molecular Biology

Dr. Wu's project focuses on the quality control of mitochondrial genome (mtDNA) in our cells. Failure in mtDNA maintenance leads to mutations and deletions accumulated on the genome, resulting in mitochondrial dysfunction and development of diseases including aging-related diseases and cancer. As a structural biologist, Dr. Wu aims to dissect the molecular structure of the key players involving in mtDNA quality control mechanism, to provide insights into mtDNA's role in disease development, and potential therapeutic opportunities behind it.

Shih-kang Lin

Professor
Department of Materials Science and Engineering

Dr. Lin's project focuses on developing new materials and processes for emerging engineering applications based on computational thermodynamics and critical experimental validation.

Shih-Chieh Lin

Assistant Professor
Institute of Basic Medical Sciences, College of Medicine

Dr. Lin's project mainly focuses on the clinical usage of prostate cancer drugs. The U.S. FDA recently approved enzalutamide and abiraterone for metastatic castration-resistant prostate cancer (mCRPC) patients, but several critical issues such as drug selection, treatment sequential order, drug resistance, and lack of effective therapy after drug resistance arose during clinical usage. Dr. Lin and his team aim to resolve these issues through their work.

Shih-Hung Yang

Assistant Professor
Department of Mechanical Engineering

Individuals with spinal cord injury would like to control external machines by their intention for the assistance of hand activities of daily living. Invasive brain machine interfaces (BMIs) translate neural activities into control command of the external machines and possess higher decoding accuracy than noninvasive BMIs. However, the temporal variation of neural recording conditions is the key research problem. This project designs a spike tensor to retain spatial relationship of the neural activities, whose spatial features are extracted by a dilated convolutional operator in order to reduce the effect of the temporal variation of neural recording conditions.

Yen-Chen Liu

Associate Professor
Department of Mechanical Engineering

Professor Liu's research interests include the development of advanced resilient and intelligent control frameworks and algorithms for multiple mobile robots under cyber-physical systems to enhance robotic systems with the ability to adapt to, deal with, and recover from various malicious attacks or communication malfunctions in networked robotic systems.

Chien-Hung Yu

Assistant Professor
Department of Biochemistry and Molecular Biology

The genetic code is the conserved rule for all organisms to translate their inherited information into functional proteins. There are sixty-one codes to encode twenty amino acids- most amino acids have more than two codes. Intriguingly, the usage frequency of the same-meaning codes is usually unequal. He wants to know why such usage bias existed across evolution.

Ching-Hsiang Fan

Assistant Professor
Department of Biomedical Engineering

The main research field of Dr. Fan is the development of noninvasive therapeutic agent delivery techniques for brain disease treatment by ultrasound. Current topics include designing ultrasound-responsible multifunctional microbubbles; ultrasound with microbubble-induced blood-brain barrier opening; acoustic vortex related biomedical applications; and ultrasound-mediated neuromodulation.

Einstein Scholars

Chia-Yuan Chang

Assistant Professor
Department of Mechanical Engineering

Professor Chang has focused on the ultrafast laser related research and applications. The research includesadvanced 3D nonlinear optical microscopy for fast biomedical and structural imaging. His lab has self-build multiphoton excited fluorescence microscopy system and a novel temporal focusing system is under development. The adaptive optics system (AOS) is adopted for compensaitng optical aberrations.

Chen-Yu Huang

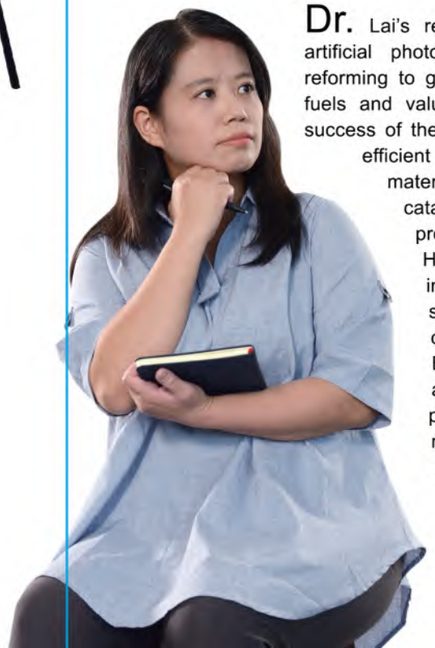
Assistant Professor
Department of Medical Laboratory Science and Biotechnology

Dr. Huang's projects use human induced pluripotent stem cell (hiPSC)-derived cardiovascular cells to recapitulate in vivo key functional properties of the cardiac and cardiovascular systems. Her project will develop new technologies with microfabricated tissue gauges and magnetic sensor systems that can give a real time readout of the kinetic force response. She has started an international collaborative pilot project that focuses on inherited cardiac diseases (i.e., arrhythmogenic right ventricular dysplasia/cardiomyopathy and vascular Ehlers-Danlos Syndrome), which are affected by mechanical stress and cause early death.

Hsin-Tien Lin

Assistant Professor
Department of Environmental Engineering

Dr. Lin's research approaches the circular economy through life cycle assessments and material flow analyses. Her team works on the quantification of resource consumption and waste steam in industries and social systems. She is currently forecasting the resource recovery potential of current and future end-of-life vehicles under modal shift. The results obtained from this research can be applied to evaluate the trade-off or payback time between different vehicle types.



Yi-Hsuan Lai

Assistant Professor
Department of Materials Science and Engineering

Dr. Lai's research interests include artificial photosynthesis and organics reforming to generate sustainable solar fuels and value-added chemicals. The success of these technologies relies on efficient and stable light-absorbing materials and highly selective catalysts, which can be produced on a large scale. Her lab focuses on developing effective, robust and selective materials and catalysts based on the Earth-abundant elements and scalable synthetic processes. Uncovering the reaction mechanisms in artificial photosynthesis and organics reforming is another essential scope in her research.

Ryosuke Takahashi

Assistant Professor
Department of Mathematics

The main research fields of Dr. Takahashi are gauge theory and differential geometry. Recently, he focused on the study of the relationship between higher dimensional gauge theory and its topological meaning.

Hsun-Ping Hsieh

Associate Professor
Department of Electrical Engineering

Dr. Hsun-Ping Hsieh's research interests include urban computing, big data mining, data governance, and AI-based smart cities. H.P.'s recent recognitions include: 2021 Outstanding Youth of Taiwan, 2020 MediaTek Social Innovation Special Award, 2019 MOST Einstein Young Scholar Fellowship, 2021 TSC Best Thesis Award (as a supervisor), and 2021 Excellent EE Engineer from the Chinese Institute of Electrical Engineering.

Ying-Lan Chen

Assistant Professor
Department of Biotechnology and Bioindustry Sciences

Dr. Chen's project focuses on studying the regulation of plant immunity and the agronomically important pest, the root-knot nematode. Her area of expertise is mass spectrometry-based OMICs technologies, including proteomics, peptidomics, and metabolomics analysis. She applies these analytical approaches to reveal the signal transduction and regulatory mechanisms of plant-nematode interaction and further develop environmentally-friendly strategies to enhance plant resistance to nematodes.

Sheng-Sheng Yu

Assistant Professor
Department of Chemical Engineering

Dr. Yu's lab focuses on new materials for additive manufacturing, also known as 3D printing. The design of 3D printable ink utilizes sustainable feedstocks such as cellulose to enhance the mechanical properties of the printed object. Complex and customizable structures can be achieved by different printing techniques such as direct ink writing and digital light processing.

Wei-Hsuan Hsu

Assistant Professor
Department of Food Safety / Hygiene and Risk Management

Dr. Hsu focuses on Extracellular vesicles (EVs) secretion, Prokaryotes and eukaryotes release nano-sized and spherical EVs that encased with cargo and deliver to extracellular environment. The function of bacteria- derived EVs. Andn their role among microbes still remain unknown. Dr. Hsu isolate EVs affect the growth of gut microbiota and gut microenvironment, clarify possible mechanisms to understand the interaction between bacteria and host It is expected that the new reagents will be developed to treat intestinal related diseases.

Hou-Chun Liu

Assistant Professor
Department of Earth Sciences

Dr. Liu's expertise is isotope geochemistry. He is working on the development of high-precision analytical techniques for non-traditional stable isotopes and combining them with numerical simulation analysis to explore the dynamic relationship between the erosion and weathering of the earth's surface under climatic and environmental changes.

Hui-Chun Chen

Assistant Professor
Department of Resources Engineering

Dr. Chen's current research focuses on determining whether the increase in δ18O of the continental crust was a consequence of the oxygenation of the atmosphere. Dr. Chen and her team aim to shed light on the complex relationship between the earth's surface environment and life and the deeper lithosphere through the examination of subduction-related granitoids.

Artificial Intelligence Spaces

NCKU is First University to Establish a Smart Campus Security Center Incorporating AI

National Cheng Kung University (NCKU) established the Research Center for Campus Security (the Security Center) by integrating a surveillance system, emergency notification system, and campus police dispatch, and by placing 18 red emergency booths with security cameras on all sides around the NCKU campus. This is the first security center in a Taiwanese university to incorporate AI. When an emergency button is pressed, the system immediately connects to the Security Center, thereby reducing the time it takes for support to arrive from 10 minutes to three minutes. The Security Center assisted with several traffic accidents and emergencies on the NCKU campus within six months of its establishment.

Dr. Huey-Jen Jenny Su, President of NCKU, pointed out that NCKU is working very hard to construct a smart campus. Therefore, a more effective security system will support friendly interaction on NCKU campus, enhance safety and comfort, and ensure an environment that is suitable for learning, research, and innovation.

NCKU College of Medicine unveiled southern Taiwan's first virtual reality (VR) classroom. The purpose of the classroom is to use high technology to actively create an immersive teaching experience and improve teaching and learning effectiveness. Human anatomy is a required course for students at all of the medical school's departments, so this course will be given priority in the use of the VR classroom. Teachers and students will be encouraged to make VR lesson plans. The College of Medicine also plans to collaborate with the science and engineering departments in the future to develop more realistic interactive VR teaching materials by leveraging artificial intelligence, developing precision medicine, and cultivating a new generation of medical talents.

Smart Vehicles

NCKU Establishes Nation's First Smart Autonomous Instructional Module

Jyh-Ching Juang, Professor at Department of Electrical Engineering of National Cheng Kung University (NCKU), leads a team dedicated to the innovation and research and development of smart driving technologies. Their research has gained support from Taiwan-based international corporation Acer, which donated three electrical mule cars for autonomous driving tests. By enhancing the instructional energy for the Cyber-Physical System (CPS) in unmanned vehicles, the program aims to boost the development of critical technologies for autonomous vehicles and the cultivation of interdisciplinary talents.

The team led by NCKU Professor **Jyh-Ching Juang** established the nation's first instructional module with centralized system of unmanned vehicles as the main objective. Featuring multiple courses on key technologies of autonomous vehicles, the module includes materials for simulation software and mule car connections, autonomous driving manipulation technology, application of Robot Operating System (ROS), and the development of Simultaneous Localization and Mapping (SLAM) technology.

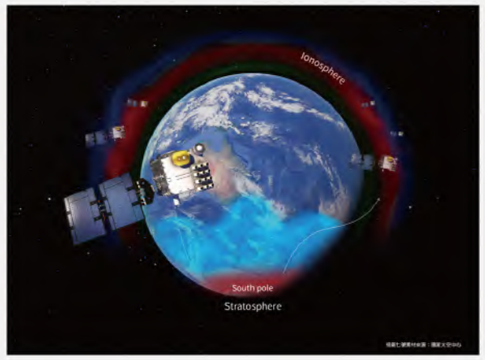
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
11 SUSTAINABLE CITIES AND COMMUNITIES

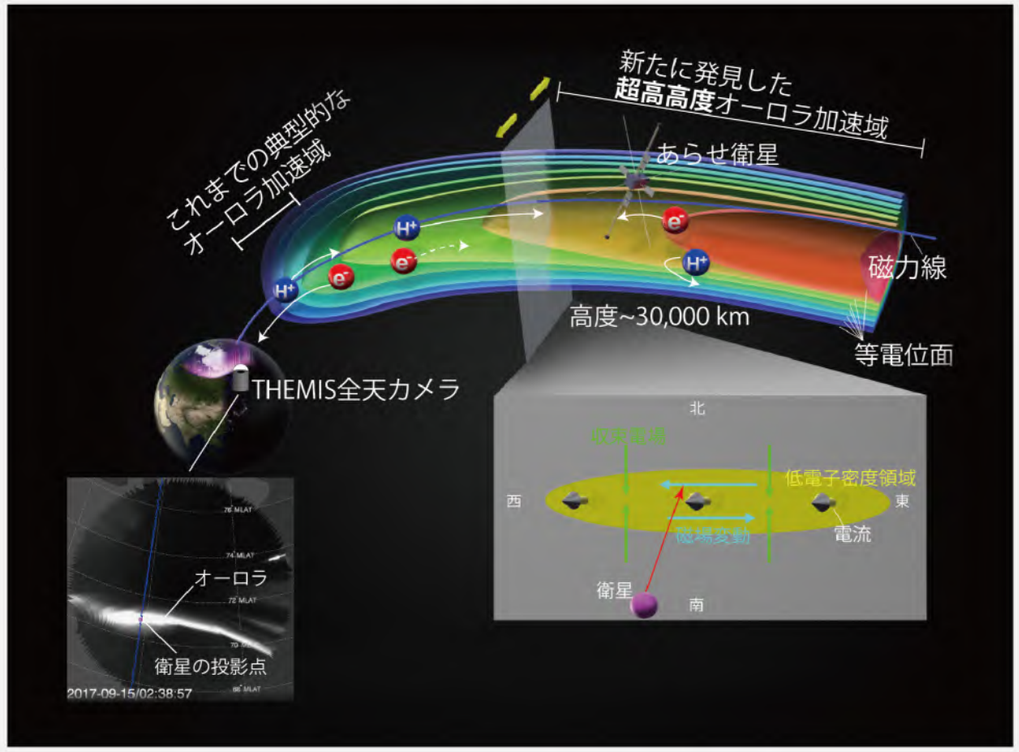
Advanced Satellites

Aurora Physics Breakthrough: Japan-Taiwan ERG Satellite Reveals New Findings about Auroras

National Cheng Kung University and the Academia Sinica took part in an ERG satellite mission by the Japan Aerospace Exploration Agency (JAXA) using self-made, high-precision space science measuring instruments. The research team found auroral electrons were accelerated at an altitude of 30,000 kilometers. This unexpected finding revealed that what scientists had believed about auroras for 50 years was incorrect.

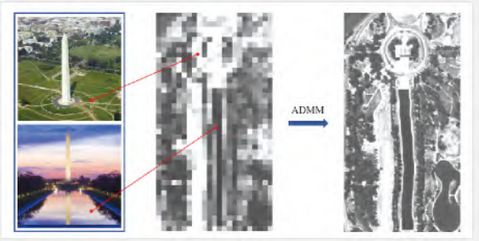
The study was published in *Scientific Reports*, which is under the international journal *Nature*. The study result overturned the previous belief that auroral electrons were accelerated below an altitude of 20,000 kilometers. The Low-Energy Particle Experiments-Electron Analyzer (LEP-e), which was made by the Taiwanese ERG team and on board the satellite, allowed the team that included NCKU Institute of Space and Plasma Sciences **Professor Sunny Wing-Yee Tam** and **Assistant Professor Tsu-Fang Chang** to achieve this major breakthrough. This also marked the first time that a Taiwan-made particle instrument cruised in the magnetosphere. It explored regions with intense ionizing radiation and directly observed phenomena that may affect space weather.





Mathematical Theory and Metagrating Design for Advanced Satellite Imaging

For any miniaturized satellite applications, lightweight onboard hardware is desired, and the keytoward this aim lies within the newly emerging technology – metasurface. However, the design of metasurface is challenging, and is know as an NP-hard combinatorial problem. **Professor Chia-Hsiang Lin** developed a genetic-type tree search (GTTS) algorithm combined with unsupervised clustering for the automatic inverse design of high-performance metasurfaces. Bt GTTS, we realize highly directive beam-steering metasurfaces via the cooptimization of the amplitude and phase, which has important application in 6G as well. The optimized beam-steering metasurface specifically exhibits a nearly constant directivity, and can diminish the requirements of scattering light properties with substantially enhanced angular resolution, enabling the realization of high-performance metasurfaces for a wide range of advanced nanophotonic applications.



NCKU Research Team Announces Significant Discovery Through FORMOSAT-7 Radio Occultations

NCKU's research team observed the global ionosphere with radio occultation data from FORMOSAT-7, and detected a rare SSW (sudden stratospheric warming) event over the Antarctic stratosphere. The extreme weather, which occurred in the polar region, caused ionospheric variability over Taiwan and other low latitudes. The oscillation can influence GPS, long-range radios, and satellite communications, and will have an impact on GPS, self-driving cars, and air navigation in the future.

This research achievement has already been published in the top journal, *Geophysical Research Letters* (GRL). FORMOSAT-7 enhances the accuracy and precision of space observations, and of surface weather's influence on GPS and communications. Most important of all, NCKU will play an essential role in the research of atmosphere-ionosphere coupling.

Engineering Pioneers

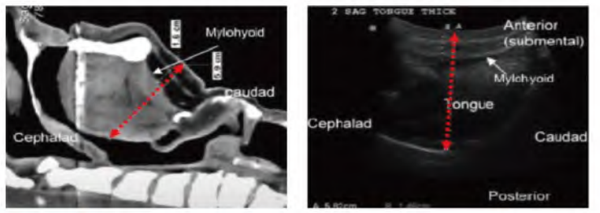
Wearable ultrasound device for diagnosis of sleep apnea

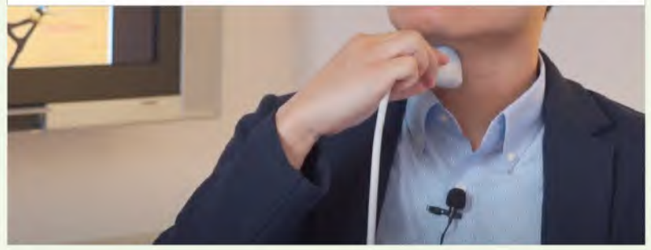
Professor **Chih-Chung Huang**'s team at the Medical Device Innovation Center (MDIC) developed a wearable ultrasound monitoring device to monitor the collapse of tongue roots of sleep respiratory patients throughout the night, and completed clinical trials at the sleep center. The device won the 2020 Future Tech Award. Experimental results show that this device can effectively monitor tongue structure changes during sleep and integrate the ultrasound information into commercial PSG systems. It is expected that customized wearable ultrasound transducers will be used for sleep apnea syndrome. This device has the ability to check without disturbing natural sleep, and can record long-term sleep for a long time.

3 GOOD HEALTH AND WELL-BEING
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

Professor Chih-Chung Huang (second from right)

Distance to posterior surface of tongue





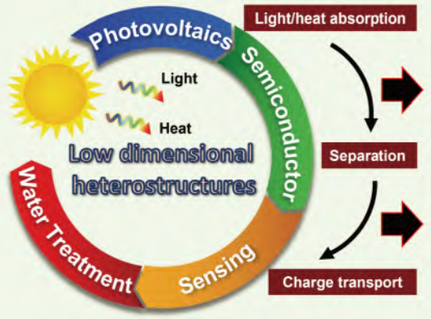
Normal breathing

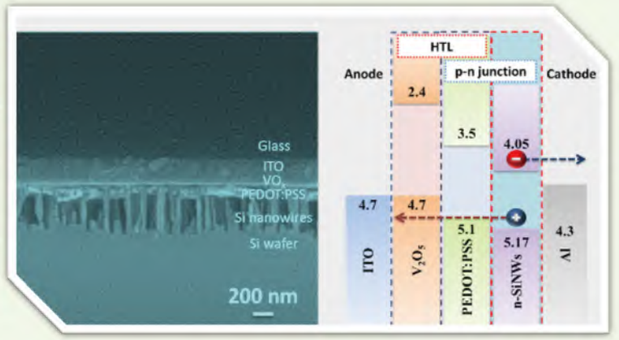
Obstructive sleep apnea

Semiconductor-based Heterostructures

Dr. **Chia-Yun Chen**'s research goal is to analyze the control and characteristics of semiconductor-based heterostructures, with the aim of translating materials research into practical applications. His research interests include functional nanomaterials and devices; semiconductor processing; hybrid solar cells; thermoelectric devices; and advanced optoelectronic applications. Dr. Chen won the MOST Ta-You Wu Memorial Award in 2020.

7 AFFORDABLE AND CLEAN ENERGY
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE





High-entropy Materials for Green Hydrogen Technology

Entropy research team led by **Professor Jyh-Ming Ting** from the Department of Materials Science and Engineering has developed a series of high-performance, high-entropy electrocatalysts for the bottleneck anodic oxidation reaction in the electrolysis of water in the generation of green hydrogen. New high-entropy materials for various applications where a catalyst is required can be developed based on the extraordinary electrocatalytic performance of these materials.

7 AFFORDABLE AND CLEAN ENERGY
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

Medical Assistance

Social Behavior Cause Identified by Biomedical Science Research

A social interaction deficit is often observed in people with psychiatric disorders. While it's known that intestinal bacteria affect social behavior in mice, the gut-brain connections that regulate this complex behavior and its underlying neural basis remain poorly understood. The NCKU-Caltech team, led by **Professor Wei-Li Wu** and his team from the Department of Physiology at NCKU, revealed that the microbiota modulates neuronal activity in specific brain regions in male mice to regulate stress responses and social behavior. A social deficit in mice without gut bacteria is associated with elevated levels of the stress hormone corticosterone. The team identified a specific bacterial species, *Enterococcus faecalis*, that promotes social activity and reduces the stress hormone in mice following social stress. These discoveries, published in the journal *Nature* in 2021, have solved a missing piece of the connection between the gut and the brain.

3 GOOD HEALTH AND WELL-BEING

Virtual Reality Mirror Therapy (VRMT)

The innovative, cross-functional NCKU team was composed of multi-disciplinary members from the Department of Biomedical Engineering at National Cheng Kung University (NCKU) and the Department of Physical Medicine and Rehabilitation at NCKU Hospital. The clinical trial at NCKU Hospital proved the efficacy of the VRMT system, which is able to enhance the upper limb motor functions of stroke patients. The NCKU VRMT team triumphed over 30 international competitors to win a silver medal in the Technology Category of the 2020 Global Student Innovation Challenge – Rehabilitation Engineering and Assistive Technology (gSIC-REAT).

4 QUALITY EDUCATION 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

Bed-Exit Alarm System

Chih-**Lung Lin**, a Distinguished Professor and the Chairman of **Department of Electrical Engineering**, led his research team in developing the Bed-Exit Alarm System, which is based on multiple sensors and augmented reality (AR). The system utilizes sensors and pre-trained KNN models to classify multiple stages in bed-exit movements, effectively reducing false alarms. When the elderly get out of bed, a warning message is sent out to the cloud database through a ZigBee mesh network. The Bed-Exit Alarm System allows for the efficient reporting of bed-exit movements.

3 GOOD HEALTH AND WELL-BEING 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

Quantum Discoveries

A Quantum Leap Towards Understanding the Quantum World

4 QUALITY EDUCATION 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

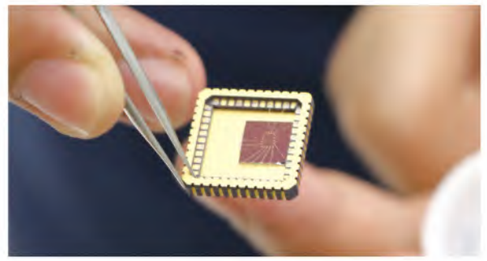
Quantum theory is essentially impeccable when it comes to describing the behavior of microscopic systems, However, there is no consensus on whether the theory applies at all scales, including that of observers. Since the seminal work of Bell in 1964 that if Nature is to conform to the predictions of quantum theory (at all scales), then some commonly held beliefs would have to give way. Bell's theorem is based on 4 very natural premises: (1) Absoluteness of Observed Events (2) No-Superdeterminism (3) Locality, and (4) Outcome independence. **Professor Yeong-Cherng Liang** from the Department of Physics showed that even if we drop the fourth assumption used in establishing Bell's celebrated no-go result, we still have an incompatibility between quantum predictions and the other three widely held beliefs. The findings, which have since been published in the world-leading journal *Nature Physics* mark an important breakthrough, after half a century, in our understanding of the world depicted by quantum theory.

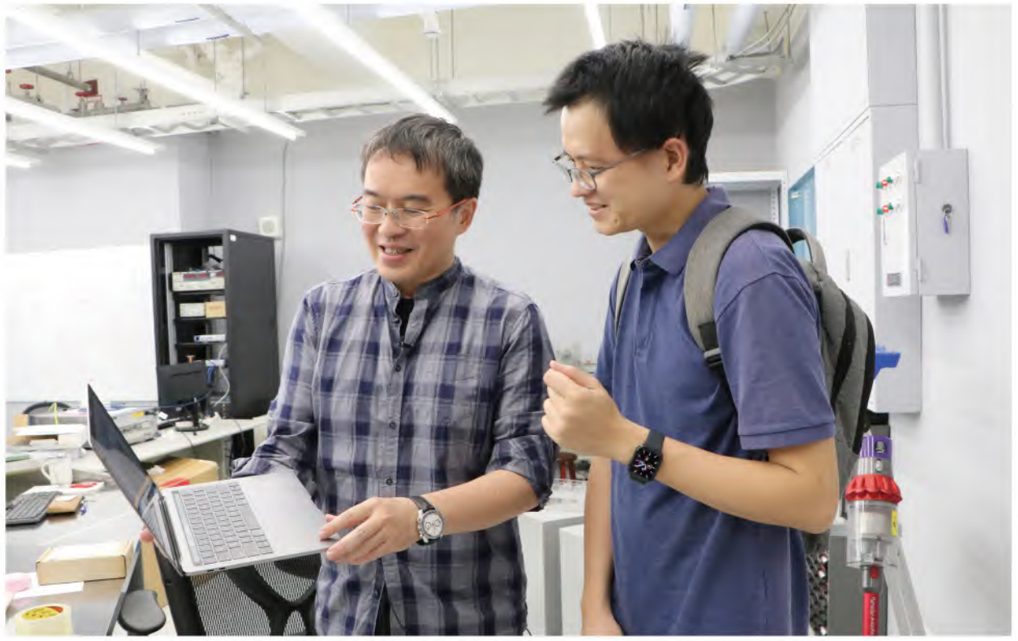
Enter Quantum Electronics via Patterned Strain Engineering

4 QUALITY EDUCATION 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

A joint research team led by **Professors Ching-Hao Chang** and **Tse-Ming Chen** from the Department of Physics and Center for Quantum Frontiers of Research & Technology (QFort) developed new techniques to etch the surface of hexagonal boron nitride (hBN) substrates, enabling the graphene placed upon it to conform to the surface topography and be lattice deformed accordingly.

This research work was published in the premier research journal *Nature Electronics* in February 2021.

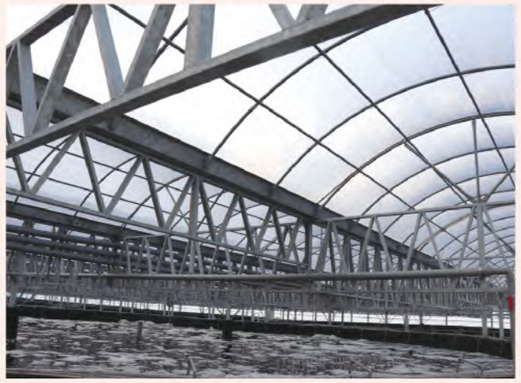




Contributions to Ecology

NCKU Professor Becomes First Taiwanese Researcher to Receive OIE Meritorious Award

As an NCKU chair professor and former Director of the **ICDSA**, Dr. **Grace Chu-Fang Lo** has spent decades studying the white spot syndrome virus (WSSV), which causes an extremely lethal disease in shrimp. In recent years, she has extended her area of research to also include acute hepatopancreatic necrosis disease (AHPND). In recognition of her lifetime contributions, the World Organisation for Animal Health (formerly the Office International des Epizooties, OIE) has presented her with the 2020 Meritorious Award, thereby making Professor Lo the first researcher in Taiwan to receive this honor.



Internationally Recognized NCKU LAC

The Laboratory Animal Center

The Laboratory Animal Center (LAC) of NCKU was established in 1987.
The LAC is located on the College of Medicine's basement level B1 and 12th floor, and has an area of around 2,530 square meters. The LAC's animal rooms are all equipped with air conditioning systems capable of full ventilation, consistent temperatures, consistent humidity, and dynamically controlled differential pressure to provide a stable animal husbandry environment. The LAC provides excellent, high-quality holding areas for different species, including rodents, rabbits, swine, and zebrafish, and produces over 10,000 laboratory animals for researchers. In addition, the LAC has operating rooms with modern anesthesia machines, perioperative monitors, and synchronous surgical video teaching systems, which offer comprehensive surgical care for laboratory animals and educational training. This high-quality infrastructure improves the welfare and management of animals and enables the LAC to meet international standards.

In addition to the infrastructure, a professional team of veterinarians, technicians, and staff provides comprehensive services and consultations, including animal production; daily care; health monitoring; clinical rounds; disease diagnosis; disease prevention and treatment; and practical training courses. The LAC also has several professional facilities, including a clinical biochemical laboratory, imaging core facility, transgenic laboratory, and zebrafish core facility.

Researchers can take advantage of these state-of-the-art services to conduct advanced studies.

Furthermore, the LAC joined the Taiwan Animal Consortium supported by the Ministry of Science and Technology in 2019, and has started to offer high-quality, customized preclinical animal test services for industry, academia, and research institutes.

The LAC uses customized management software, and has integrated the Animal Use Protocols supervised by the NCKU Institutional Animal Care and Use Committee with a cage management system, further enabling veterinarians, staff members, and research scientists to provide in-depth care and conduct experiments in accordance with the 3Rs (replacement, reduction, and refinement). Over 300 biomedical research projects that encompass the fields of educational training, biomedicine, materials science, mechanical engineering, aeronautics, environmental science, engineering, and social science are executed annually at the LAC.

Most importantly, the LAC earned full accreditation from the Association for Assessment and Accreditation of Laboratory Animal Care (AAALAC) in 2020 thanks to its dedicated efforts over the years. This accreditation enhances the reliability and accuracy of animal research studies. As a result, the LAC will boost applications for grants, projects, and patents; improve the development of new drugs and medical devices; and increase the transfer of technology licenses. Finally, the LAC will reinforce its connections with industry, government, academia, and research institutes to establish itself as a benchmark for laboratory animal research facilities in southern Taiwan.

Smart Construction

Building Temples Using Robotic Arms

NCKU Robot Aided Creation and Construction (RAC-Coon) utilized robotic arms to construct Fu-De Temple (Temple of the Earth God) in Xitun, Taichung. Using hot wire cutter arms and template manufacturing technology, NCKU RAC-Coon collaborated with Tai Architect and Associates, an architecture firm established by NCKU alumnus Yu-Tse Tai, to tackle the difficult design of curved walls.

Xitun's Fu-De Temple has been a local religious center for over 100 years, and is now moving to a new location with a design that has gone through three international contest rounds. Professor Yang-Ting Shen, vice president of RAC-Coon, stated that with the advancement of hot wire cutter technology, the robotic arms are capable of manufacturing templates that can fit into the building's curves. This technology allows for greater possibilities in wall construction, breaking through the limits of traditional methods.

Sparkling from the Past to the Future

Be pragmatic, seek innovation and change

Vincent **Mao**, Sitronix Technology Corporation. With wise product positioning and strategic alliance, Mr. Mao earned Sitronix a place in the IC design industry and now occupies the largest market share of functional mobile phones in the world.

Mr. Mao embodies the principle of "seeking the best professional talent and giving them space to develop". Talent is Sitronix's biggest asset. The zero-capacitance technology is a breakthrough in R&D that was cultivated in such an environment; not only putting Taiwan on the world stage and saving billions of ceramic capacitor elements every year, but also achieving carbon reduction and contributing to environmental protection.

Mr. Mao is enthusiastic about public welfare, focusing a lot of energy on talent cultivation, he has served as the director of the electrical engineering department alumni association and the director of the culture and education foundation of the electrical engineering department of National Cheng Kung University.

4 QUALITY EDUCATION 8 DECENT WORK AND ECONOMIC GROWTH

Fear of no change, brave all challenges

Chien-**Chung Li**, Honorary Professor, National Central University. After graduating from National Cheng Kung University (NCKU), Mr. Li studied for his master's and doctoral degrees at Michigan State University. After returning to Taiwan, he worked as a professor at National Central University.

As an important leading member of the engineering community in Taiwan, formulated the government procurement law, negotiated and participated in the WTO Agreement on Government Procurement on behalf of Taiwan.

Since 2008, Mr. Li has served as the chairman of CECI Engineering Consultants, Inc. Taiwan and led colleagues to complete the design and supervision of major projects, such as the construction of the National Freeway No.1 Wugu-Yangmei section widening program, and won the PIARC road achievement award – widely recognized by the industry.

4 QUALITY EDUCATION

Sparkling from the Past to the Future

A Leading Role in Industry and Academia Collaboration

Pierre **Chen** is an alumnus of NCKU and the founder and Chairman of Yageo Corporation. He believes there is a strong link between his achievements today and the education he received. NCKU has unlimited potential when it comes to education, and Chen agrees resolutely with NCKU's spirit of "Veritas et Conscientia." Yageo Corporation is Taiwan's leading passive components supplier. It is now seeking sustainable management and taking up social responsibility.

Recently, NCKU and Yageo jointly established a research & development center to create new value in academic and industrial cooperation.

4 QUALITY EDUCATION | 8 DECENT WORK AND ECONOMIC GROWTH | 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

1

2

Dealing with Tough Tasks

"Dealing with tough tasks properly" is how **Feng-Long Chen**, a distinguished alumnus from NCKU Department of Transportation and Communication Management Science, describes his approach. He is the Chairperson of Chailease Finance Co., Ltd. He reacted quickly to industrial changes and started digitalization much earlier than others. He gives back to NCKU by providing five to 10 international internships for NCKU students. Cultivating international human resources is one of NCKU's goals, and Chen's help has further empowered NCKU. He is very thankful for the education and resources he received at NCKU, and encourages the school to make use of its educational resources and develop digital power to help careers and lives.

8 DECENT WORK AND ECONOMIC GROWTH

1. Pierre Chen
2. Feng-Long Chen

Enjoy NCKU while you can

Jason **Chen** ,Chairman and CEO of ACER Group. Jason Chen who has always encouraged junior fellow students to "enjoy NCKU when you can." Jason Chen joined ACER as the chairman and CEO in 2014. He led the dual transformation strategy of ACER and its subsidiaries to a new milestone, helped it march towards the goal of becoming a global "Itrapreneurship" enterprise.

ACER has been committed to sustainable development for many years. It is one of the 100 Most Sustainably Managed Companies in the World selected by the Wall Street Journal and ranked 22nd in the field of innovation, demonstrating the international indicators that have affirmed ACER's sustainable development. It will continue to expand its influence of sustainable actions in the future.

3

4 QUALITY EDUCATION | 8 DECENT WORK AND ECONOMIC GROWTH

4

8 DECENT WORK AND ECONOMIC GROWTH | 16 PEACE, JUSTICE AND STRONG INSTITUTIONS

ESG for Social Responsibility

James **Zheng**, chairperson of Kbro Inc. and NCKU distinguished alumnus, leads the company with practical attitude and skills.

Zheng graduated from NCKU Department of Electrical Engineering, where he was influenced by the great quality of the education and a teaching style that emphasized practical experiences and training. He believes a good enterprise is defined not only by its expansion, but also its efforts to achieve ESG, which refers to contributions towards environmental, social, and corporate governance. He strives to be a good enterprise leader so that he is worthy of the title of distinguished alumnus.

Leading AI Technology

Kneron ,which was founded by National Cheng Kung University Department of Electric Engineering alumnus **Chun Chen Liu**, was named a winner in the Business Intelligence Group's Artificial Intelligence Excellence Awards program. It is a leading company in the field of artificial intelligence (AI). Liu's insistence on pursuing his ideas and his leadership, as well as Kneron's 3D AI technology and lower-power consumption, have made Kneron a top three AI chip company. Liu displays a genuine team spirit, which was cultivated during his time at NCKU, and maintains the practical spirit of NCKU's engineering culture.

5

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

3. Jason Chen
4. James Zheng
5. Chun Chen Liu

The Risin Stars

A Design for Exploring History

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
11 SUSTAINABLE CITIES AND COMMUNITIES

Ching-**Chia Huang**, from NCKU Department of Architecture, won the Asian Contest of Architectural Rookie's Award (ACARA) 2020 with the project "A Wrapped Boulevard."

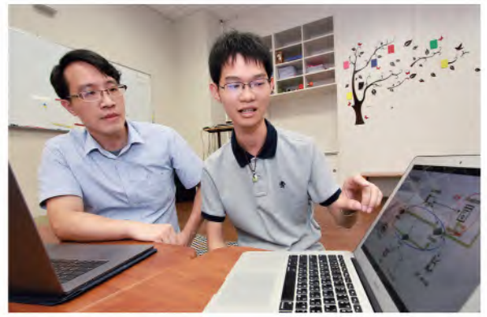
The theme of ACARA 2020 was "Culture, Bridging the Region and History." Huang's idea, which explored the possibility of a trail next to Tainan Art Museum, earned the judges' seal of approval. Tainan Art Museum's white outer appearance has made it a famous tourist attraction. However, there is a striking contrast between its stunning appearance and its surroundings. To link the spaces, "A Wrapped Boulevard" travels through the museum and blends the view in the museum with the view from the outside. Huang believes that being a flâneur is a way to appreciate every element encountered in daily life. She designed "A Wrapped Boulevard" to allow people to take a stroll through the city.

Ching-Chia Huang (left)

NCKU Student Awarded Google PhD Fellowship

4 QUALITY EDUCATION
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
17 PARTNERSHIPS FOR THE GOALS

National Cheng Kung University PhD student **Yun-Zhan Cai** from the Department of Computer Science and Information Engineering was named as a recipient of the Google PhD Fellowship Program in the field of "Systems and Networking." Recipients of this fellowship are offered a one-year fellowship with a monetary award of US$10,000 and matched with a Google Research Mentor. This is the first time that this fellowship has been awarded to a scholar in Taiwan. In his research, titled "Improving Fastness and Safety of SDN for Era of IoT," Cai proposed novel mechanisms to solve computing issues faced by software-defined networking (SDN) applications. His outstanding academic performance earned him recognition from both NCKU and Google. The Google PhD Fellowship Program only considers students who are nominated by their university. their institutes. In the past three years, Cai published one journal paper and nine conference papers and won one best conference paper award.



Yun-Zhan Cai (right)

NCKU iGEM Team Wins for Fifth Consecutive Time

National Cheng Kung University's iGEM student team stood out amongst 256 teams from around the world to win gold for the fifth time. The team used synthetic biology technology to develop "Eye kNOw," contact lenses that can dynamically release drugs in response to changes in intraocular pressure. Along with the intraocular pressure tester "Eye Screen," it provides new therapies for glaucoma patients.

4 QUALITY EDUCATION
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

Welcoming International Scholars and Students

NCKU 90 and Beyond: Striving for Mutual Success Through the Recruitment of International Talents

The "NCKU 90 and Beyond" project was launched on the 90th anniversary of National Cheng Kung University's founding to expand the scope of the University's recruitment of exceptional domestic and international specialists, scholars, and researchers.

The "NCKU 90 and Beyond" project was created by integrating aspects of talent cultivation into the existing subsidy program to expand the University's sphere of recruitment to the international realm, and bring in exceptional educators, researchers, and academic talents to fill postdoctoral research fellow and higher positions.

In addition to offering salaried positions, the project also provides subsidies for relocation, accommodations, transportation expenses, and research expenses.

4 QUALITY EDUCATION | 8 DECENT WORK AND ECONOMIC GROWTH | 17 PARTNERSHIPS FOR THE GOALS

NCKU Launches "Noah's Plan" to Help Students Study

NCKU launched "Noah's Plan," which offers long-term degree programs, short-term courses, and research participation opportunities. It allows students who cannot continue their studies due to the epidemic situation to study in Taiwan. Since the outbreak of COVID-19, NCKU has successfully helped exchange students from Spain and Taiwanese students returning from France and the United States to continue their studies, conduct research, and use the academic resources on NCKU campuses.

"Noah's Plan" provides a number of projects. For Taiwanese students studying overseas, NCKU offers the "Enrollment Project for Taiwanese Students Returning from Overseas Epidemic Areas." The undergraduate quota is 51 across 33 departments, while the master's degree program quota is 59 across 59 departments and the PhD program quota is 12 across nine colleges.

1 NO POVERTY | 10 REDUCED INEQUALITIES | 16 PEACE, JUSTICE AND STRONG INSTITUTIONS

Crossing Boundaries with Impactful Research: NCKU Overseas Hub in Malaysia Hosts Forum Webinar

Despite the COVID-19 pandemic, National Cheng Kung University (NCKU) continues to carry out its plan to foster and strengthen cooperation with overseas partner universities. On Aug. 13, 2020, the NCKU Overseas Hub in Malaysia launched its Facebook page and hosted a forum webinar to discuss various aspects of international research collaboration with representatives from the University of Malaya (UM), the British Council Malaysia, the Collaborative Research in Engineering, Science and Technology Centre (CREST), and the NCKU Alumni Association of Malaysia.

The forum discussed international collaboration; opportunities and challenges in conducting impactful research among Asian countries; and ways to facilitate access to new solutions and build lasting relationships among researchers.

4 QUALITY EDUCATION | 17 PARTNERSHIPS FOR THE GOALS

Industrial-Academic Collaboration to Innovation

National Cheng Kung University Launches Shalun Ecocity Initiatives for Innovation

National Cheng Kung University (NCKU) has launched the Shalun Ecocity Initiatives, under which universities, industries, and the government will join forces in an innovative ecosystem to establish an international emerging technology domain and an ecologically healthy city powered by smart solutions and a circular economy.

As the main initiator, NCKU proposed the Shalun Ecocity Initiatives to promote ecosystem sustainability, societal sustainability, and economic sustainability for the continuity of co-creation and innovation; enhancement of well-being and health; and growth of the digital economy.

NCKU formed the Shalun Ecocity Initiatives to attract domestic and foreign corporations that are developing breakthrough technologies and providing smart solutions. During the first Shalun Ecocity Initiatives meet-up, companies with alumni were consulted and a working group of key industry executives was organized. More workshops will be held to further unite industry and academic resources with local government policy agencies.

8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
11 SUSTAINABLE CITIES AND COMMUNITIES

Yageo-NCKU Joint Research Center Established

National Cheng Kung University and global passive component manufacturer Yageo Group established the "Yageo-NCKU Joint Research Center," the first to have joint research bases between industry and academia. The two bases, NCKU Tainan Campus and Yageo Kaohsiung, were inaugurated through video connections, and link the R&D capabilities of NCKU with the mass production capabilities of Yageo. Together, they will cultivate international-level technology talents, drive local development, and create a new model of industry-academia cooperation.

In the future, the center will deepen research into passive components and cooperate with Yageo to combine industrial mass production capabilities and equipment to cultivate high-level passive component talents. This will allow the research and development of passive components to break through to the next level, and strengthen the international competitiveness of Taiwan's passive component supply chain.

4 QUALITY EDUCATION
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

Humanity and Social Responsibility

Taiwan Studies

The Research Center for Humanities and Social Sciences (CHASS) of NCKU is characterized by social practice-based research and teaching. The goal of the university's Taiwan Studies Program is to focus on social and human sciences SDG issues and carry out explorations of Taiwan's changes and future in a global context. In terms of academic methods, the combination of research, practice, and curation allows academics to engage in dialogue with society, and then respond to another major topic of the Taiwan Studies project, "How to Become a Better Taiwan."

11 SUSTAINABLE CITIES AND COMMUNITIES

NCKU Vice President and CHASS Director **Chung-I Lin** (second from left) and Professor Michel Frizot (second from right) during the international workshop "Henri-Cartier Bresson in China" hosted by CHASS.

Social Care Through USR Projects

NCKU not only practices University Social Responsibility (USR) for higher education cultivation, but also to fulfill the social responsibilities of the university; cultivate students' professional abilities and cross-border domain competence; and encourage all teachers to become engaged academics who are committed to social awareness and social practice.

NCKU is committed to linking university teaching and research with the community. Topics such as "Sustainable Urban and Rural Construction," "Aging Society," "Circular Economy," "Eco-friendly Agriculture," and "Technological Democracy" seek solutions with communities while continuing to explore how to build scientific and technological relationships between universities and society.

10 REDUCED INEQUALITIES | 11 SUSTAINABLE CITIES AND COMMUNITIES | 16 PEACE, JUSTICE AND STRONG INSTITUTIONS

Practicing SDGs

National Sustainable Development Award

16 PEACE, JUSTICE AND STRONG INSTITUTIONS · 17 PARTNERSHIPS FOR THE GOALS

National Cheng Kung University received the 2020 National Sustainable Development Award on Nov. 25, 2020 at an awards ceremony held at the Executive Yuan. NCKU has promoted the localization of sustainable development by achieving the United Nation's 17 Sustainable Development Goals (SDGs). NCKU President **Dr. Huey-Jen Jenny Su** stated that NCKU's vision for sustainable development "NCKU 2030" aims to help NCKU realize its value and incorporate SDGs into its academic development by creating sustainable development solutions and meeting localized social needs.

Top of Taiwan in THE Impact Ranking

3 GOOD HEALTH AND WELL-BEING · 10 REDUCED INEQUALITIES · 17 PARTNERSHIPS FOR THE GOALS

In the Times Higher Education (THE) Impact Rankings 2020, National Cheng Kung University (NCKU) ranked 38th in the world and second in Asia, which were new highs for Taiwanese schools in the world's four major rankings. NCKU was one of the first universities in the country to adopt Sustainable Development Goals (SDGs). NCKU attributed this extraordinary achievement to the school's wide range of applications and participation in international medical and humanity rescue services.

Practicing SDGs Through Improving Drinking Water Quality

6 CLEAN WATER AND SANITATION · 17 PARTNERSHIPS FOR THE GOALS

Water and Sanitation is one of the United Nations' 17 Sustainable Development Goals (SDGs). Professor Tsair-Fuh Lin cooperated with Mapúa University in the Philippines to establish the Taiwan-Philippines Joint Water Quality Research and Innovation Center for cyanobacteria and metabolites sampling, water quality monitoring, and personnel training. Lin built a database to ensure better data visibility for all parties, especially water professionals in the Philippines. This later became a prototype for NCKU's SDG hub. The Office for Sustainability Knowledge & Practices was officially inaugurated in early 2021 and can potentially boost Taiwan's international exposure in the field of SDG research.

Marine Biology and Cetacean Research Center Preserves Blue Whale's Skeleton

NCKU's Marine Biology and Cetacean Research Center (MBCRC) is carrying out an unprecedented mission in Taiwan by cleaning the bones and removing the rotten meat from the carcass of a blue whale, the largest animal in the world, that became stranded on Taitung's seashore in 2020. It will be a significant contribution to global whale research when the skeleton specimen is completed. **Professor Hao-Ven Wang**, Director of MBCRC, pointed out this specimen will raise awareness about issues critical to SDG 14, Life Below Water.

14 LIFE BELOW WATER · 16 PEACE, JUSTICE AND STRONG INSTITUTIONS

NCKU Profile

In 2020, the total number of students exceeded 21,700 (21,773). In terms of NCKU's performance in industry-academia collaboration, there are more than 2,600 projects per year, with funding from this collaboration exceeding NT$5 billion, showing NCKU's strengths and advantages in this field. As for internationalization, the number of international students increasing every year. At present, our 2,035 international students account for 9.3 percent of the student body.

Faculty

1,336	Full-time faculty members
734	Part-time faculty members
25.1%	Percentage of full-time female faculty members
33.7%	Percentage of papers involving international cooperation
34.7%	Percentage of papers published in the world's top 10% journals
3.0%	Percentage of papers published in the world's top 1% journals

Students

21,773	Students
52.5%	Percentage of undergraduate students
47.5%	Percentage of graduate students
37.2%	Percentage of female students
231	Student clubs
15.18	Student-faculty ratio
2,048	Financial aid students
1,499	Students with on-campus, part-time jobs
1,980	Tuition waiver students

Internationalization

2,035	International students
711	International scholar visits
297	International partner universities
428	International agreements
408	NCKU students studying abroad
70%	Departments and institutes sending students abroad