

# NCKU

2022 | Annual Report



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歷久如一

藏行顯光·成就共好



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# NCKU

2022 | Annual Report



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# FOREWORD

by the PRESIDENT

校長的話

高等教育之要務在以知識與人才解決未來的問題，  
成大人將以正直、善良與知識，成為同炬的光，  
承擔領航世代的挑戰，躍升屬於自己獨一無二的精彩。

The core mission of higher education is addressing future challenges with knowledge and talent. Equipped with integrity, kindness, and knowledge, NCKUers earnestly face the challenges of leading future generations as they forge their own unique path.

*President*  
*National Cheng Kung University (NCKU)*  
*Meng-Ru Shen*

沈孟儒

# About NCKU

1931

Establishment of Tainan  
Technical College

1946

Upgraded to Taiwan Provincial  
College of Engineering

1956

Taiwan Provincial Cheng Kung  
University

1971

National Cheng Kung  
University

1988

National Cheng Kung University  
Hospital commenced operation

2001

Pursuit of Academic Excellence  
70th anniversary

2006

Stepping toward Top  
University

2011

Top Taiwan University  
80th anniversary

2021

Distinguished Asia-Pacific  
University 90th anniversary

2031

Global University of The Future – 100th anniversary

## *Our Vision*

National Cheng Kung University (NCKU) is renowned for its rigorous academic standards, strong research capabilities, internationalized learning environment, interdisciplinary innovation, creative vision, and remarkable achievements in cooperation with industry partners. With humanistic regard and pragmatism, NCKU's academic prowess addresses challenges and exerts a positive societal influence, making valuable contributions to not only Taiwan but also the global community. Through its indomitable spirit, NCKU aims to inspire its home city of Tainan, make the nation proud, elicit respect from partner institutions, and foster outstanding citizens, thereby solidifying its position as a pivotal global university.

## *Our Education*

Consistent with its motto—the pursuit of truth through exhaustive reasoning—NCKU features an academic climate that promotes excellence in the pursuit of knowledge and truth. Since its establishment, NCKU has undergone continuous transformation and growth. The university comprises a main campus with seven adjacent zones, along with other campuses such as An-Nan, Kuei-Jen, and Dou-Liu. Today NCKU has nine colleges—Engineering, Management, Liberal Arts, Sciences, Medicine, Social Sciences, Electrical Engineering and Computer Science, Planning and Design, and Bioscience and Biotechnology—in addition to affiliated hospitals. NCKU is dedicated to nurturing globally competitive talents, supporting the nation's continued economic, social, and cultural advancement.

## *Our Impact*

Higher education is crucial for societal progress and innovation; NCKU, renowned for its extensive and globally significant research achievements, also values social responsibility. NCKU drives industry ecosystem growth, supports policy development, champions green energy for sustainability, and leverages its expertise in disease prevention, disaster response, and food safety to benefit society. NCKU aims to amplify its influence and serve as a forward-thinking global influence in Tainan, Taiwan, and the world.



# NCKU at a Glance

## Student



Students #22,825  
Undergraduate students 52.6%  
Graduate students 47.4%  
Female students 37.2%  
Student clubs # 238  
Student-faculty ratio 16  
Financial aid students #12,762

## Internationalization



International students #2,044  
International academic collaboration #141  
International partner universities #385

## Faculty



Full-time faculty #1,335  
Part-time faculty #795  
Female full-time faculty members 25.5%  
Papers involve international cooperation 25.7%  
Papers are published in the world's top 10% journals 32.6%  
Papers are published in the world's top 1% journals 3.0%  
Papers are published in IF>15 and Rank<5 #37

## Industry-Academia Collaboration



Collaboration Project #3,525  
Research income (NTD) 7.7 billion

# Pursuing Excellence



## Global Ranking

#33 THE Impact Rankings  
#5 SDG9  
#8 SDG7  
#33 SDG6  
#55 SDG17

## Regional Ranking

#41 QS Asia University  
#110 THE Asia University

## National Ranking

#1 Most Favored Graduate (Global Views Monthly)  
#2 Best University Social Responsibility (CommonWealth Magazine)  
#5 Most Favored Graduate (1111 Job Bank)  
#5 Best Global Universities in Taiwan (U.S. News)

## Subject Ranking

#171 QS Engineering & Technology  
#102 U.S. News Biotechnology and Applied Microbiology  
#114 U.S. News Energy and Fuels  
#144 U.S. News Chemical Engineering

# NCKU's 91<sup>st</sup> Anniversary



NCKU celebrated its 91st anniversary under the banner "United around One Torch, Standing Firm through Time as One," symbolizing a unified effort of faculty and students to continually move forward. The anniversary's main visual, themed "90 Plus," extended the design narrative of the 90th-anniversary's "Achieve Securely, Prosper Mutually." The addition symbol "+" represented a guiding star, perfectly echoing the theme of the 91st anniversary. President Huey-Jen Su reflected that 2022 heralded the beginning of NCKU's journey toward its centennial, expressing hope that all members of NCKU can unite in resilience and determination. NCKU also aspires to create a better future for the world, underpinned by values of inclusiveness, compassion, and rational humanism.

## Alumni Night

NCKU celebrated its 91st-anniversary with the Alumni Night event, which was themed "Returning to Nineteen, Recalling Youth." At the event, over 1300 alumni and faculty converging around 132 elegantly arranged tables in Zhongzheng Hall. President Su extended heartfelt gratitude to the alumni for their unwavering support, which has propelled NCKU to new heights and to become a symbol of hope for Taiwan and the world. She pledged to witness NCKU's journey towards its centennial milestone. The incoming President Meng-Ru Shen also praised President Su's leadership, referring to her as an exemplary president. He vowed to uphold the legacy of excellence at NCKU during his tenure and to lead the university towards its centennial celebration. From its humble beginnings, NCKU has triumphed over challenges to become a pivotal institution in Taiwan's and the global higher education landscape. Embracing change and innovation amid continuous waves of transformation, the university remains committed to social responsibility, striving for collective betterment.





### Orchid Exhibition

NCKU celebrated its 91st anniversary with a special Orchid Exhibition. This exhibition not only filled the air with the fragrance of autumn orchids but also featured orchids with graduated dyed patterns. These patterns—in the form of the NCKU emblem, the Taiwanese flag, ink painting motifs, and various other designs—added a blend of eye-catching elegance and delicacy. The orchids, with vivid and customizable colors achieved through innovative nanospray dyeing technology, offered a refreshing and unique visual experience.

Since 2001, the NCKU Orchid Research Center has been hosting the Orchid Exhibition as part of the anniversary celebrations, a tradition spanning more than two decades. This exhibition has garnered international recognition in academic circles, and the center has sustained a productive collaboration with industry partners. These ongoing endeavors reflect NCKU's preparation for commitment to innovation and collaboration, fully embodying the spirit of "United around One Torch, Stand Firm through Time as One" for the anniversary celebration.

### Entrepreneur Forum



NCKU hosted a distinguished panel at the Entrepreneur Forum. The panel featured renowned international missile and rocket technology expert, Yu-Ben Su, Chairman of TRANSCOM; Quan-Sheng Zhang, a leading manufacturer of high-frequency microwave power amplifiers; and Wan-Jun Ma, General Manager of the Aerospace Industrial Development Corporation. They each delivered a keynote speech exploring the burgeoning prospects of space technology and the defense industry. Distinguished Professor Yau-Hwang Kuo from NCKU's Computer Science and Information Engineering Department served as the moderator and host and highlighted the critical role of risk response with his statement "Security can protect sustainability,

and resilience can realize sustainability." This message aimed to inspire a collective response. NCKU Vice President Fong-Chin Su stated that the greatness of a university lies in its outstanding alumni shining around the world and expressed hope that the forum would foster a new form of communication and joint visioning between alumni and the university.



### Engaging Innovation through Sports and Tradition

NCKU launched the English Creative Performance Parade during its 91st-anniversary sports event, a groundbreaking initiative that redefines innovative campus activities. This initiative not only infused the campus with creative vitality but also fostered a natural English-learning environment, enriching the academic experience and society through practical engagement in sports. Moreover, the torch relay, an integral part of the event, symbolized the enduring bond between NCKU's alumni and its present student body—a testament to the enduring transfer of knowledge and tradition. The unwavering dedication and sportsmanship displayed by the athletes resonated deeply with the core values of unity and passion that define the NCKU community. These moments of collective enthusiasm and teamwork greatly contributed to the lively and celebratory atmosphere of NCKU's 91st-anniversary festivities.





# Highlights of the Year

## NCKU's Presidential Transition: Towards Academic Brilliance

NCKU recently celebrated a significant transition at its inauguration ceremony for the incoming and outgoing presidents. The newly appointed president, Meng-Ru Shen, stepped into the role as the 18th president and succeeded Huey-Jen Su. He emphasized his commitment to leading NCKU's faculty and students toward the establishment of a global academic brand and propelling NCKU to the forefront of universities in Taiwan. President Shen presented his vision, encapsulated in the guiding principle of "Soaring Brilliance, Moving Towards a Century," which includes strategies to enhance education, foster industry-academia collaboration, amplify research, expand the university's international influence, enhance faculty and student well-being, and lay the groundwork for humanistic education. Distinguished guests included the Vice Minister of Education, Meng-Chi Liu; Mayor of Tainan City, Wei-Che Huang; and Director of the Han Pediatric Clinic, Liang-Cheng Han; these attendees commended President Su for her contributions during her tenure. They also expressed their expectations and appreciation for President Shen's new role. Together, they shared a collective hope that the students and faculty of NCKU will embrace the approaching centenary with a legacy of splendid accomplishments.





## NSTC Rockets: NCKU's Milestone in Space Technology Advancements

The National Science and Technology Council's (NSTC's) Syuhai Short-Term Research Rocket Range recently achieved a significant milestone, successfully launching two rockets developed by NCKU. These rockets, weighing 1,500 kilograms and 300 kilograms, respectively, showcase the team's technical prowess. The NCKU team not only overcame various technical challenges but also verified critical propulsion and detachment technologies, culminating in the successful testing of a high-energy cosmic ray detector. Over the past three years, the team has independently designed and manufactured key components and payload instruments, a testament to their dedication and skill. The NSTC is keenly focused on bolstering Taiwan's active involvement in the space industry, aiming to enhance technological prowess and nurture talent. Looking ahead, their strategy includes strengthening supervision of the National Space Organization; fostering collaboration between academia, industry, and research; and propelling Taiwan to the forefront of space technology, particularly in emerging space fields.



## Taiwan's Shipbuilding Vision: NCKU's Landmark Towing Tank Expansion

A groundbreaking ceremony was recently held for the "High-Performance National Ship Trials Basin," a collaborative project involving NCKU, the National Shipbuilding Development Center, and Taiwan International Shipbuilding Corporation. This landmark event—attended by President Ing-Wen Tsai, Tainan City Mayor Wei-Che Huang, and other prominent figures from the government and academia—marked a significant milestone in Taiwan's domestic shipbuilding capabilities. President Tsai highlighted the ceremony's crucial role in bolstering Taiwan's maritime endeavors and expressed gratitude to NCKU, Taiwan International Shipbuilding Corporation, and the National Shipbuilding Development Center for their efforts. She expressed keen anticipation for timely completion of the project, which will enhance the competitiveness of Taiwan's shipbuilding industry. The extension of the towing tank from 165 meters to 285 meters will enhance ship trials, improve testing efficiency, and bolster research in both military and civilian ship model experiments, leading to cost savings and stronger protection of technological innovation. Over the next 30 years, NCKU's towing tank is set to play a pivotal role in advancing naval research and testing, thus significantly contributing to Taiwan's defense self-reliance.





## SATU Forum: Uniting Leaders for Sustainable Goals



The International SATU Presidents' Forum at NCKU brought together leaders from various countries to discuss global collaboration and sustainable development. The President of the Polish Academy of Sciences, Professor Duszyński, detailed his support for Ukrainian scholars and proposed the establishment of a virtual organization for international cooperation. The Vice President of Tsukuba University in Japan, Motozono, expressed a commitment to fostering friendly relationships and supporting social development. Hsiao-Wen Wang, the Executive Secretary of SATU and Director of International Affairs at NCKU, showcased the notable achievement in facilitating collaboration among over 800 researchers and announced the addition of three new member institutions to SATU. The 2023 exchange theme is the creation of a more unified higher education system and promotion of tenacity activities, including research conferences and transnational projects. In a significant move, representatives signed a declaration to champion sustainable development, emphasizing their collective commitment to sustainability.



## Tang Laureate's Lecture: Sustainability in Focus



Professor Jeffrey David Sachs, the esteemed 5th Tang Prize laureate in the "Sustainable Development" category, recently gave a video lecture at NCKU. This lecture was attended by Academia Sinica Academician Zhao-Han Liu, NCKU President Huey-Jen Su, Dean Tian-Zhi Chen of the College of Management at National Central University, and Professor Chi-Yuan Liang of National Central University. Professor Sachs outlined four key pillars for shaping a sustainable future: eradicating poverty, establishing a just and equitable society, achieving environmental sustainability, and preserving global peace. He further delved into Taiwan's initiatives in climate-friendly urban planning and water management, stressing the critical need for energy security and strengthening the resilience of energy systems. During the comprehensive panel discussion, the participants explored concrete strategies for realizing a sustainable future with a strong emphasis on the pivotal role of international cooperation and peace. The discussion also encompassed themes such as public health, global politics, and energy security, underscoring the necessity of promoting respect and open communication.

## Semiconductor Education Alliance: NCKU-Purdue MOU Signing



NCKU and Purdue University in the United States recently held a signing ceremony for a collaborative memorandum of understanding. The aim of the collaboration is to cultivate the advanced technology talent required by the global semiconductor industry through scholar and student exchange, cooperation in research and teaching, and industry-academia partnerships. Boasting over 50 years of close cooperation, NCKU and Purdue University have engaged in numerous initiatives, including delegations, personnel exchanges, cross-border educational programs, and dual-degree programs. The signing of this memorandum of understanding strengthens the collaboration between NCKU and Purdue University and signifies a renewed commitment

to deepening exchange and an increasing focus on semiconductor education and research. Together, the institutions are committed to nurturing top-tier technology talent, driving industrial development, and fostering innovation.



## NCKU's Dental Innovation: Leading Simulation Training Center



NCKU's Dentistry Department's Digital Simulation Teaching Center is the only national teaching and training center in Taiwan that focuses on dental material production. Equipped with state-of-the-art dental and implant simulation systems, X-ray machines, and 3D printing technology, the center integrates these resources into its practical courses, aiming to deliver a comprehensive education and research experience while nurturing the next generation of dental professionals. To foster the growth of digital dentistry, NCKU's Dentistry Department collaborates extensively with domestic medical material manufacturers. A key part of their mission is to actively train doctoral students from Southeast Asia to enhance international exchange and to promote

the global advancement of dental health care. Beyond offering top-tier clinical services, the Digital Simulation Teaching Center plays a pivotal role in fostering cross-generational and interdisciplinary collaboration, positioning itself as a force for innovation in the field.

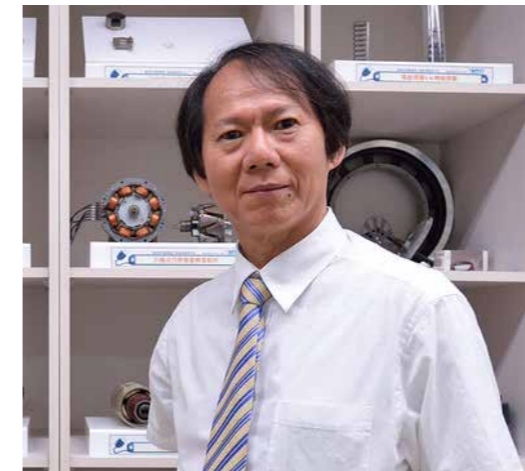


## Pioneering Health Innovation and Impact



NCKU has distinguished itself as the first university in Taiwan to be granted a license under the "Medical Devices Management Act," a testament to its crucial role in smart health care and epidemic prevention. NCKU is committed to nurturing talent, offering specialized technical training and certification programs. Additionally, the university actively promotes research collaborations with industry partners, significantly advancing smart health care and biotechnology. In partnership with NCKU Hospital, the university embraces its social responsibilities and mission, focusing on education, research, service, and ensuring the health of the Taiwanese population. Over the years, NCKU has been a steadfast supporter of national public policies, contributing

to the enhancement of health care and the transformation of industry. Its deep engagement in the biotechnology and medical sectors has not only improved the technological capabilities of the biomedical industry but also underscored the significance and contributions of a top-tier university in addressing critical societal and global issues.



## Innovation Awardees: NCKU's Leaders in Technology Advancement



Chair Professor Mi-Ching Tsai of the Department of Mechanical Engineering at NCKU and NCKU alumnus Chairman Miin Wu of Macronix International Co., Ltd. were honored with the prestigious 5th Presidential Innovation Award, which recognized their outstanding contributions in their respective fields and their profound impact on both the nation and society. Professor Tsai, a leading figure in motor design and drive technology, established the NCKU Motor Research Center and pioneered the application of 3D magnetic materials in motor manufacturing. He introduced the forward-thinking "Spin-in industry-academia collaboration model," actively promoting collaboration between academia and industry. Chairman Wu, the founder of Macronix International, has been at the forefront of transforming it into a global leader in nonvolatile memory, excelling in IC design, production, packaging, testing, and marketing. Adhering to a "practicality" principle in business, Wu has not only successfully created new models but also actively nurtured technological talent, driving Taiwan's high-tech industry to move beyond original equipment manufacturing.



# NSTC

## Outstanding Research Award

The Outstanding Research Award of the National Science and Technology Council (NSTC) was initiated to recognize outstanding research achievements in the field of science and technology, thereby honoring individuals engaged in long-term basic or applied research. Through this award, the NSTC aims to raise research standards, enhance the nation's international academic status, foster development, demonstrate the value of research, and enhance scientific capabilities.



**Andrea Mei-Ying Wu / 吳玫瑛**

Professor | Department of Taiwanese Literature



Professor Wu's research expertise is children's literature, young adult literature, transnational literature and cultural studies, visual narrative, archival research, and gender studies. From 2013 to 2017, she served as a board member of the International Research Society for Children's Literature and received the 2014–2015 Fulbright Senior Scholar Research Grant; currently, she is the director of the Chinese Language Center at NCKU. Professor Wu is the first humanities professor at NCKU to be honored with the NSTC Outstanding Research Award.

**Kung-Chien Wu / 吳恭儉**

Professor | Department of Mathematics



Professor Wu specializes in the field of partial differential equations, and his teaching at NCKU primarily focuses on mathematical theories related to gas dynamics equations, including the fundamental properties of the Boltzmann collision operator and transport equations. In 2017, he received the NSTC's Ta-You Wu Memorial Award.



**Meng-Ru Shen / 沈孟儒**

Distinguished Professor and President of NCKU |  
Department of Pharmacology



Professor Shen, a renowned pharmacologist in Taiwan, currently serves as the 18th President of NCKU and works as an obstetrician and gynecologist at NCKU Hospital. He has dedicated himself to research in molecular and cell biology, as well as the development of neuropharmacology, with notable contributions in genomic medicine. Some of the honors received by Professor Shen include the Professor Chen-Yuan Li Outstanding Research Award from the Taiwan Pharmacological Society, the Outstanding Research Award from the NSTC, and the 2020 Special Contribution Award for Epidemic Prevention from the National Federation of the Taiwan Physician.



**Tse-Ming Chen / 陳則銘**

Distinguished Professor & Director of QFort |  
Department of Physics



Professor Chen has over 20 years of experience in low-temperature condensed matter physics research, with expertise in the design, nanofabrication, and electrical transport measurements of quantum devices and nanoarchitectures based on diverse materials such as semiconductors, superconductors, two-dimensional materials, topological materials, and complex oxides. His diverse research interests include mesoscopic physics, quantum electronics, and spintronics, in addition to the engineering of quantum systems. He has received the K. T. Li Honorary Scholar Award and is a two-time recipient of the NSTC's Outstanding Research Award (2019).

**Chih-Ping Wu / 吳致平**

Distinguished Professor |  
Department of Civil Engineering



Professor Wu's research expertise includes the finite element method, meshless methods, energy principles, perturbation methods, and three-dimensional elastic/piezoelectric mechanics. His research primarily focuses on theoretical analysis, numerical simulations, and optimization design of the three-dimensional mechanical behavior of plate-shell structures fabricated with macro-, micro-, and nanointelligent materials. In terms of academic recognition, Professor Wu was ranked in the top 2% of global scientists in the 2020 and 2022 Lifetime Scientific Impact Rankings and is a two-time recipient of the NSTC's Outstanding Research Award.



# NSTC

## Ta-You Wu Memorial Award

The NSTC's Ta-You Wu Memorial Award is the highest honor for young scholars in academia. The award was established to cultivate young researchers, award grants, and encourage talented academics to devote themselves to research and pursue academic excellence in the long term.



### Yi-Ting Wang / 王奕婷

Associate Professor | Department of Political Science



Associate Professor Wang's research primarily focuses on various aspects of democratic transition and maintenance. She explores the reasons why political parties adopt certain accountability strategies to garner voter support, in addition to exploring the impacts of such strategies. In recent years, she has also analyzed the characteristics of authoritarian rule by considering military trials during Taiwan's authoritarian era and documents regarding dissenters. In 2019, Associate Professor Wang received the Young Scholar Research Achievement Award from Academia Sinica for her groundbreaking research entitled "Clientelism and Party Politics," which garnered high praise from the review panel.

### Jan-Chi Yang / 楊展其

Professor | Department of Physics



Professor Yang specializes in the development of novel complex oxides and analysis of their properties, with his research extending to the application of these quantum materials in nanoelectronics and spin devices. In his current research, strongly correlated material systems (e.g. multiferroic materials, ferroelectric materials, and superconductors) serve as the foundation for constructing heterogeneous structures by using laser molecular beam epitaxy, with the aim of elucidating the physical properties of these materials and developing novel functionalities. In 2022, Professor Yang was honored with both the Ta-You Wu Memorial Award and the K. T. Li Researcher Award.

### Chung-Wei Kung / 龔仲偉

Associate Professor | Department of Chemical Engineering



Associate Professor Gong's research focuses on the design and synthesis of metal-organic frameworks and related porous composite materials. Exploring the correlation between porous material structure and fundamental electrochemical properties, he applies these materials to areas such as clean energy, electrochemical storage, and environmental sensing. His research has been featured on the cover page of the journal *Physical Chemistry Chemical Physics*, validating its importance and drawing worldwide attention. In recent years, he has received various prestigious awards, including the Ta-You Wu Memorial Award and the Yushan Young Scholar Award from the Ministry of Education.

### Pai-Sheng Chen / 陳百昇

Assistant Professor | Department of Medical Laboratory Science and Biotechnology



Assistant Professor Chen specializes in cancer research, focusing on the functional genomics of microRNAs, cancer metastasis, drug resistance, and precision medicine. His research is dedicated to using RNA as a diagnostic and therapeutic target or tool in cancer, in addition to understanding the regulation of RNA processing and its impact on cancer. His research papers have received awards from both the American and Taiwanese Cancer Research Societies, and he was granted the NSTC's 2030 Next-Generation Young Scholar Award as part of the Outstanding Young Scholar Research Project.

# Yushan

## Program Scholars

The Yushan Program endeavors to help Taiwanese higher education institutions attract top global talent. By providing competitive salaries and benefits, the program aims to facilitate the integration of foreign expertise into Taiwan's academic landscape, thereby boosting the international influence of higher education in the country.



**Weng Kee Wong / 王永琪**

Visiting Professor |  
Department of Statistics



Professor Wang is a faculty member in the Department of Biostatistics at UCLA. He was honored as an Elected Fellow by the American Statistical Association and an Elected Member by the International Statistical Institute in 2007; he was also named an Elected Fellow of both the International Society of Mathematical Statistics in 2011 and the American Association for the Advancement of Science in 2012. Professor Wang's research into the optimization of clinical trial and nonlinear model designs has made major contributions in theoretical and applied statistics journals, including in the pharmaceutical sciences.



**Wen-Tai Liu / 劉文泰**

Visiting Distinguished Chair Professor |  
Department of Biomedical Engineering



Professor Liu, a distinguished professor in the Department of Bioengineering at UCLA, has been honored as a fellow of the American Institute for Medical and Biological Engineering (AIMBE) and the Institute of Electrical and Electronics Engineers (IEEE). Renowned as the "Father of the Electronic Eye," he pioneers research in electroneurological bionics. His research focuses on integrating medical physiology and engineering to address contemporary health-care challenges, including the development of biomedical electronic systems to regulate the activity of the central, autonomic, and spinal cord nervous systems, thereby enhancing patient quality of life.

**John Alexander McGrath**

Visiting Chair Professor |  
Department of Dermatology



Professor McGrath is a professor of dermatology at King's College London and the Director of the St John's Institute of Dermatology. He is an honorary consultant dermatologist at Guy's and St Thomas' Hospital and serves as the chief scientist for rare skin diseases at the National Institute for Health Research (NIHR) and the 100,000 Genome Project. Professor McGrath pioneers genetic skin disease treatment through human cell experiments and gene therapy for blistering diseases. He is particularly active in translational research, involving the use of genes, cells, proteins, and small molecules to treat genetic skin diseases.





**Takashi Gojobori / 五條堀孝**

Visiting Distinguished Chair Professor |  
Department of Life Science



Professor Takashi is the Deputy Director of the National Institute of Genetics (NIG) in Japan, a Vatican Academy of Sciences member, and a collaborator with Emperor Akihito; he also advises Prince Fumihito Akishino, the second in line to the Japanese throne. A renowned evolutionary biologist, Professor Takashi is internationally recognized for his work in molecular evolution and genetics; he has also served as the editor of influential journals and has published 550+ articles. His diverse research involves topics such as comparative genomics in sensory neurons and marine metagenomics, with a focus on unraveling the evolutionary origins of neural networks and applying this knowledge to synthetic biology for bioenergy development.



**Fuh-Gwo Yuan / 袁福國**

Visiting Professor |  
Department of Engineering Science



Professor Yuan is an outstanding faculty member in the Department of Mechanical and Aerospace Engineering at North Carolina State University (NC State); he also collaborates with NASA Langley Research Center. Over his distinguished career, he has conducted ground-breaking research in structural health monitoring, digital twins, big data analysis, and artificial intelligence. In 2023, Professor Yuan received the Lifetime Achievement Award from the International Society for Optics and Photonics, the SHM Hans-Juergen Schmidt Award from the 14th International Workshop on Structural Health Monitoring, and the highest honor from the College of Engineering at North Carolina State University.

**Chein-I Chang / 張建禕**

Visiting Chair Professor |  
Department of Electrical Engineering



Professor Chang is a tenured professor in the Department of Electrical Engineering at the University of Maryland, Baltimore County. His research focuses on hyperspectral imaging, remote sensing image processing, automatic target recognition, and medical imaging. A pioneer in hyperspectral remote sensing, he has published nearly 200 SCI papers and authored 4 English monographs and 4 edited volumes. Professor Chang holds various prestigious honors, including Life Fellow of IEEE, Fellow of IEEE, Fellow of SPIE, and Founding Fellow of AAIA.



**Paul-Antoine Moreau / 默亮湍**

Assistant Professor | Department of Physics



Dr. Moreau received his PhD from the FEMTO-ST Institute in 2015, after which he continued his quantum imaging research at the University of Bristol and the University of Glasgow. In 2021, he joined NCKU as an assistant professor and a member of the Center for Quantum Frontiers of Research and Technology (QFort). His research focuses on quantum optics and imaging, with the aim of developing innovative quantum metrology techniques and information schemes leveraging high-dimensional images. Dr. Moreau was awarded the Leverhulme Trust Early Career Fellowship in 2018 in the United Kingdom and the Lord Kelvin Adam Smith Leadership Fellowship in Scotland.





# Highly Cited

## Researchers

Clarivate Analytics annually releases the global “Highly Cited Researchers” list, recognizing top scientific talents with significant impacts in their field. Selected scholars are those who over the past decade consistently published highly-cited papers, ranking in the top 1% in their disciplines and publication years on the Web of Science.

### Wei-Hsin Chen / 陳維新

Distinguished Professor |  
Department of Aeronautics and Astronautics



Professor Chen, a specially appointed professor, has been included in the Highly Cited Researchers list for 7 consecutive years since 2016, the first Taiwanese researcher to achieve this feat. Leading the NCKU Green Energy and Fuel Lab, Professor Chen has been actively involved in green energy for nearly 30 years. His expertise includes biomass energy, hydrogen energy, clean energy, wind power, thermoelectric power generation, carbon capture and utilization, energy system analysis (optimization, evolutionary computation, and machine learning), and atmospheric aerosol science. With approximately 580 published papers, Professor Chen has an H-index of 80 on the Web of Science.



### Wen-Chien Ko / 柯文謙

Distinguished Professor | Department of Medicine



Professor Ko, a medical professor at NCKU’s College of Medicine, is an infectious disease physician keenly involved in international antimicrobial resistance surveillance programs, clinical infectious disease research, and multicenter clinical trials. He mainly works on the pathogenesis, clinical manifestations, antimicrobial resistance, and antimicrobial therapy of major human bacterial pathogens, including *Klebsiella pneumoniae*, *Aeromonas species*, and *Clostridioides difficile*. Professor Ko has authored over 500 articles in academic journals covering infectious diseases, clinical microbiology, antimicrobial therapy, and AIDS medicine, and he has an H-index of 61 on the Web of Science.



### Tay-Rong Chang / 張泰榕

Professor | Department of Physics



Professor Chang conducts theoretical research on topological materials and their properties; he has featured on Clarivate’s Highly Cited Researchers list for 4 consecutive years and received the prestigious K. T. Li Honorary Scholar Award in 2023. His research, receiving high praise from his peers, involves predicting novel topological materials and achieving the Hall effect with zero magnetic field in two-dimensional topological insulators. A recipient of a grant from the NSTC’s Columbus Program and the Taiwan Physical Society’s 2021 Outstanding Young Physicist Award, Professor Chang has an H-index of 54 with approximately 150 published papers on the Web of Science.



### Chung-Ying Lin / 林宗瑩

Associate Professor |  
Institute of Allied Health Sciences



Professor Lin’s research on mental health, quality of life, and behavioral addictions has made valuable contributions to the development of the psychology and sociology fields. Professor Lin currently serves not only as the co-Editor-in-Chief of the *Asian Journal of Social Health and Behavior* but also as associate editor for journals such as *Health Psychology and Behavioral Medicine*; he is also on the editorial boards of other esteemed journals. Professor Lin, who ranked among the top 2% of global scientists in 2022, earned Most Cited Paper awards in journals such as *Health Expectations*, *Brain and Behavior*, and the *Australian Journal on Aging*. With approximately 350 published papers, his H-index is 50.



# K. T. Li Technology and Literature Lectureships Award

The K. T. Li Technology and Literature Lectureships Award, established and funded by Delta Electronics founder Mr. Bruce Cheng, is in its 21st year. The award recognizes those driving progress in the fields of science, technology, and humanities in Taiwan, thereby promoting the fusion of technological development and cultural enhancement.

## Shu-Lan Hsieh / 謝淑蘭

Chair Professor |  
Department of Psychology



Professor Hsieh's research examines the relationship between the brain and behavior, with a focus on the neural basis of higher-level cognitive control. Combining behavior, EEG waves, and neuroimaging, Professor Hsieh explores clinically relevant topics such as the effects of sleep deprivation on error monitoring and emotion regulation as well as the links between brain resilience, depression, and Alzheimer disease. Her research findings were featured on the cover of the 32nd issue (July) of the international journal *Cerebral Cortex* and were honored with the Outstanding Research Award from the NSTC in 2020.

## Po-Wu Gean / 簡伯武

Chair Professor |  
Department of Pharmacology



Professor Gean conducts research into central nervous system disorders, focusing on preventive and treatment strategies. He specializes in treating adolescent violent behavior and exploring the regulation of neurotrophic factors in the hippocampus of older people with dementia. Collaborating with China Medical University, he investigated the efficacy of anticancer drugs against gliomas. Professor Gean's research supports the development of novel treatments for preventing societal violence, improving memory in senior citizens, treating posttraumatic stress disorder, and combating malignant gliomas. His research has made substantial contributions to the prevention and treatment of central nervous system disorders.

## Tse-Ming Chen / 陳則銘

Distinguished Professor &  
Director of QFort | Department of Physics



Professor Chen has over 20 years of experience in low-temperature condensed matter physics research, with expertise in the design, nanofabrication, and electrical transport measurements of quantum devices and nanoarchitectures based on diverse materials such as semiconductors, superconductors, two-dimensional materials, topological materials, and complex oxides. His diverse research interests include mesoscopic physics, quantum electronics, and spintronics, in addition to the engineering of quantum systems. He is a two-time recipient of the NSTC's Outstanding Research Award (2019).

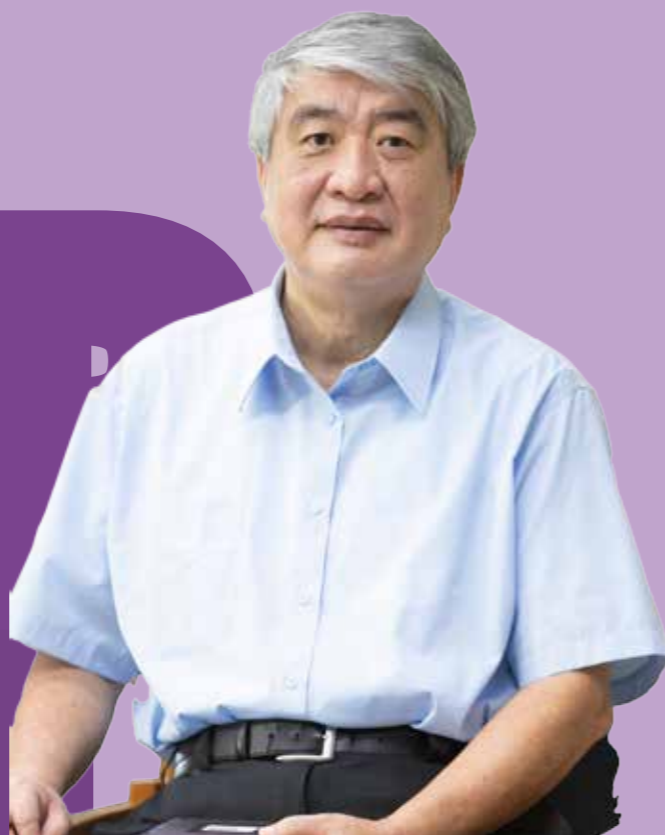


## Tzong-Yueh Chen / 陳宗嶽

Distinguished Professor |  
Department of Biotechnology  
and Bioindustry Sciences



Professor Chen is the director of the NCKU Agricultural Biotechnology Research Center and holds positions as Executive Director of the Taiwan Society of Marine Biotechnology and Executive Director of the Taiwan Aquaculture Seed Association. With extensive expertise in areas such as fish genomics, fish molecular immunology, and microfluidic molecular detection technology, his research has significantly influenced the sustainability of aquaculture as well as the quality of products used in the industry. In recognition of his contributions, Professor Chen has received awards such as the Outstanding Research Award from the NSTC and the Future Breakthrough Award.



# K. T. Li Researcher Award

## Jan-Chi Yang / 楊展其

Professor | Department of Physics



Professor Yang specializes in the development of novel complex oxides and analysis of their properties, with his research extending to the application of these quantum materials in nanoelectronics and spin devices. In his current research, strongly correlated material systems (e.g. multiferroic materials, ferroelectric materials, and superconductors) serve as the foundation for constructing heterogeneous structures by using laser molecular beam epitaxy, with the aim of elucidating the physical properties of these materials and developing novel functionalities. In 2022, Professor Yang was honored with both the Ta-You Wu Memorial Award and the K. T. Li Researcher Award.

## Tay-Rong Chang / 張泰榕

Professor | Department of Physics



Professor Chang conducts theoretical research on topological materials and their properties, and he was included in Clarivate's Highly Cited Researchers list for 4 consecutive years. His research, which has earned high praise from his peers, involves predicting novel topological materials and achieving the Hall effect with zero magnetic field in two-dimensional topological insulators. A recipient of a grant from the NSTC's Columbus Program and the Taiwan Physical Society's 2021 Outstanding Young Physicist Award, Professor Chang has an H-index of 54 with approximately 150 published papers on the Web of Science.

## Cheng-Te Li / 李政德

Professor |  
Department of Computer Science  
and Information Engineering



Professor Li focuses on developing artificial intelligence technology that can assist global customs agencies in detecting false import declarations. He employs advanced graph machine learning methods to combat societal moral decay; such methods can be used to detect fake news or online bullying as well as to conduct fact-checking, thereby reducing the risk for social media users. He received the 9th Young Scholar Creative Award from the Outstanding Talent Foundation and a 3-year grant from the NSTC's Columbus Program. He hopes to leverage his expertise in artificial intelligence to support the development of more trustworthy and secure intelligent services in the future.

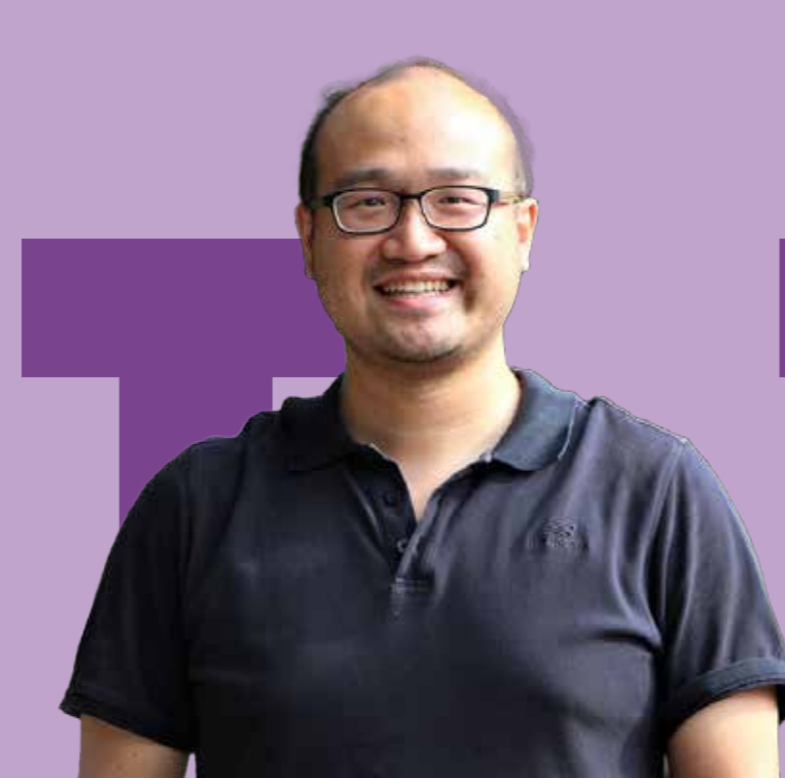
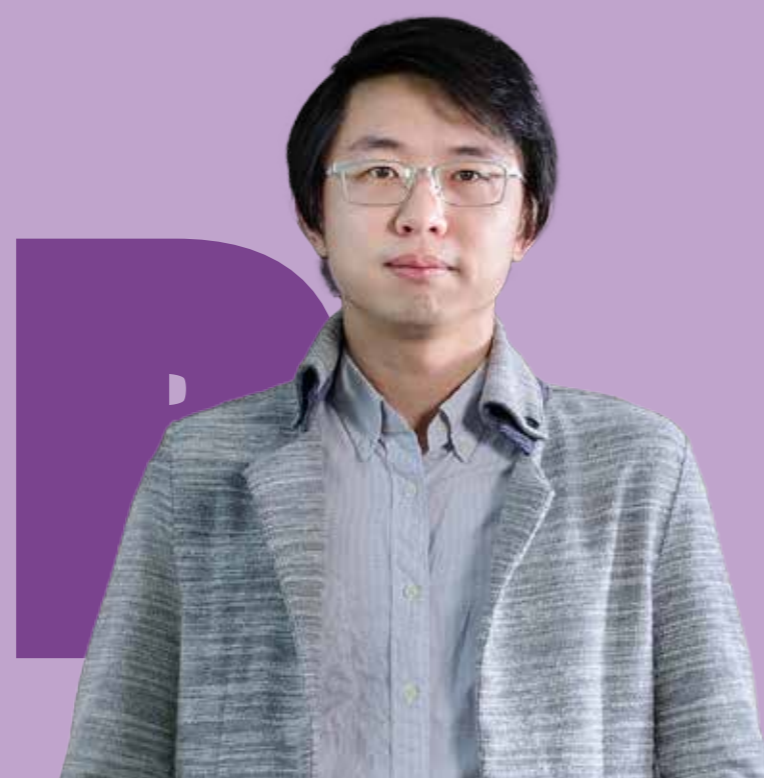
# K. T. Li Gold Medal Award

## Min-Fu Hsieh / 謝旻甫

Distinguished Professor |  
Department of Electrical Engineering



Professor Hsieh specializes in electric machine design, drives, control, and applications, focusing on electric vehicle propulsion. As a recognition of his fruitful collaboration with industry partners, he has received the Excellent Industry-Academia Collaboration Achievement Award from NCKU for 5 consecutive years since 2019. In terms of global recognition, he is listed among the top 2% of scientists by Stanford University for both his career (1960–2022) and individual years (2021 and 2022). Professor Hsieh also holds crucial positions as the International Relation Coordinator and Technical Committee Member for the IEEE Magnetics Society. Furthermore, he serves as co-Chair and Guest Chief Editor for IEEE publications, and he has held editorial and associate editorial roles for related journals for over a decade.



# Distinguished Academic

## OIE Award: Aquatic Health Contributions



The Chairman of the Council of Agriculture, Ji-Zhong Chen, honored NCKU Chair Professor Chu-Fang Lo with the Office International des Épizooties (OIE) Outstanding Contribution Award. This prestigious award recognizes Professor Lo's exceptional contributions to improving the health and safety of aquatic animals. She serves as a renowned expert in the OIE Reference Laboratories, particularly advancing research of white spot syndrome (WSS) and acute hepatopancreatic necrosis syndrome (AHPNS). Professor Lo has played a pivotal role in developing the OIE's aquatic animal health standards and has worked tirelessly to combat major shrimp diseases such as WSS and AHPNS. Her research has not only benefited domestic industry but also played a crucial role in advancing global efforts to prevent and treat shrimp diseases.



## Pioneer in Disease Mechanisms



Chair Professor Shaw-Jenq Tsai from the Department of Physiology at NCKU has made significant contributions to the research of endometriosis, cancer pathogenesis, and molecular mechanisms of disease progression. His influential work has not only earned him international acclaim but also led to his receiving the prestigious 2020 Fuller W. Bazer SSR International Scientist Award. Recently, Professor Tsai was further recognized with the 65th Ministry of Education Academic Award. His groundbreaking research focuses on unraveling the molecular mechanisms in endometriosis and cancer drug resistance. A key aspect of his work is autonomous hormone synthesis in ectopic tissues, and his findings are reshaping the understanding of hormonal pathogenesis in endometriosis and paving the way for innovative treatments beyond hormone therapy.

## AI-Driven Embryo Selection: Breakthrough in Fertility Science



Professor Hsiao-Fang Sun, the Director of NCKU's Center for Genomic Medicine and Chair of the Institute of Molecular Medicine, has dedicated over 30 years of research to genomic technology, culminating in recent landmark achievements. Her research team developed the Intelligent cOmputing Noble Embryo (icONE) system, which received the 18th National Innovation Award. This groundbreaking system leverages big data to create an AI model that assists physicians in selecting high-quality embryos for implantation, boasting an impressive 92% accuracy in predicting the success rate. Such innovation improves the effectiveness of in vitro fertilization, providing invaluable support to those facing infertility while also addressing broader concerns about declining birth rates.



## Unveiling Lung Cancer Molecular Insights



Professor Yi-Ching Wang, Chair Professor at NCKU's Pharmacology Department, has been honored with the Distinguished Talent Lecture Award from the Foundation for the Advancement of Outstanding Scholarship, a testament to her extensive research on the molecular mechanisms of lung cancer in Taiwan. Her pioneering work, which includes a comprehensive database of patients with lung cancer and lung cancer cell lines, has contributed significantly to our understanding of the roles of various genes in cancer formation. Through innovative biological techniques, Professor Wang has uncovered new pathways involving abnormal transcription factors and vesicular transport systems in cancer development. Her research has practical implications for lung cancer diagnosis, treatment, and drug development.



# Research and Development

## I • College of Science

### Game-Changing Quantum Memory Evaluation



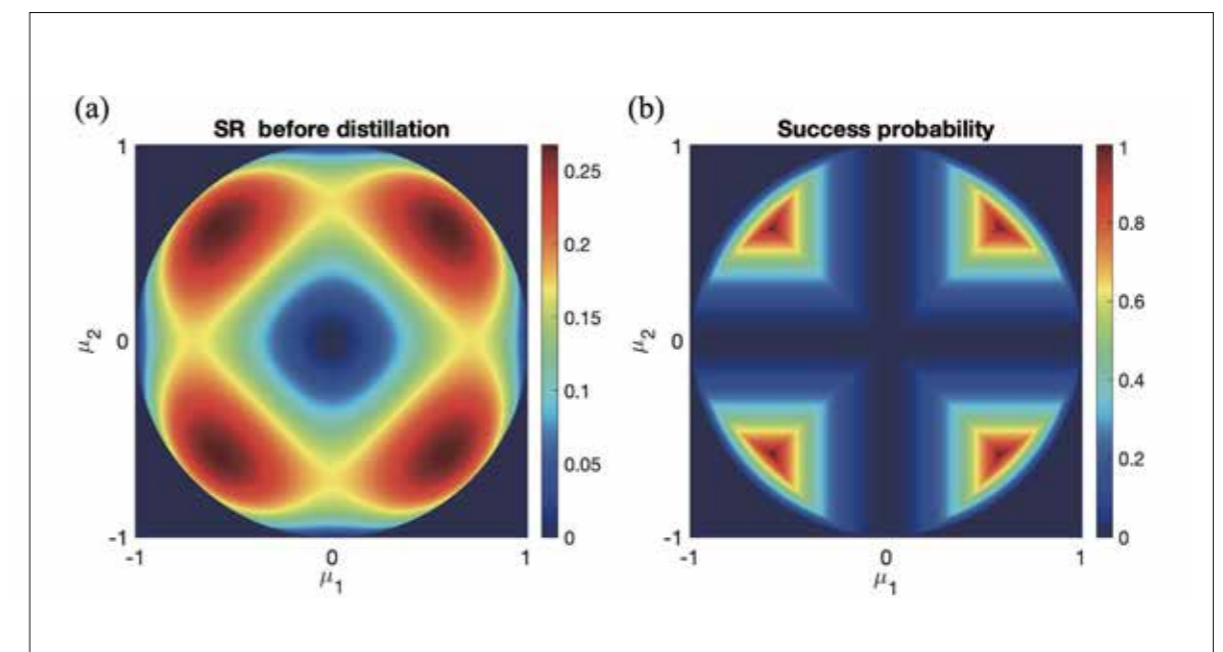
Director Yueh-Nan Chen and Postdoctoral Researcher Huan-Yu Gu from the NCKU Center for Quantum Frontiers of Research and Technology (QFort) collaborated with an international team to propose a novel method for evaluating the efficiency of quantum memory in quantum networks. In their research, they proposed a new approach for evaluating reliable quantum memory, thereby reinforcing Taiwan's pivotal role in quantum component development. Their research results received recognition in the international quantum field journal PRX Quantum. Their approach involved the violation of macrorealism to streamline the resources required for quantum memory testing, thus expanding its applications within quantum networks. Dr. Gu emphasized the crucial role of quantum memory in realizing quantum networks. This four-year research endeavor involved collaboration with international teams from Austria, Japan, and Nagoya University.



### Advancing Encryption with Controllability Theory



Under the supervision of Professor Chen and Dr. Gu from the Department of Physics, a research team unveiled a key theory pertaining to quantum controllability. By categorizing quantum resources, they provided novel insights into the advancement of quantum encryption communication technology. Their work, titled "Complete Classification of Quantum Controllability and Its Relation to Measurement Incompatibility," was published in the prestigious international journal *Nature Communications*. Professor Chen emphasized the importance of quantum entanglement in quantum mechanics, which forms the foundation of quantum communication. The research findings contribute to information security and have potential applications in defense resource security isolation, which can provide secure transmission channels. Dr. Gu dedicated over 3 years to developing the aforementioned theory and collaborated with various international teams from Austria, Spain, and other countries to lay the groundwork for the future commercialization of quantum communication technology.



## Revolutionizing Materials: Epitaxial Control Breakthrough



Professors Yi-Chun Chen and Tse-Ming Chen collaborated with a research team led by Associate Professor Jan-Chi Yang from NCKU QFort to propose a method for controlling the lateral epitaxial twist structure of materials. Their research advances the design and manipulation of the electronic structure and crystal geometry of quantum materials, opening up new avenues for controlling the manufacture of epitaxial thin films. Their results were published in *Nature Communications* and granted a Taiwanese patent, with a pending US patent review. By developing suspended thin films, the team developed an effective approach for controlling lateral epitaxial material growth,

thus enabling the manipulation of long-range crystal arrangements in thin films and regulating their quantum properties and physical characteristics. The team's research findings were also featured in international journals such as *Nature Materials*, *Nano Letters*, and *Advanced Materials*.



## Breakthrough: Electric Control of Kondo Effect



Assistant Research Professor Luke Smith, a participant in the "NCKU 90 and Beyond" cultivation program of NCKU, authored a paper in the renowned international journal *Physical Review Letters*. Launched in 2019, the "NCKU 90 and Beyond" cultivation program aims to attract exceptional doctoral-level scholars from diverse fields abroad to engage in teaching or research activities at NCKU. The research focuses on achieving all-electric control of the Kondo effect within the fields of physics and mathematics. Both Professor Smith and the

NCKU research team proposed a method for this all-electric control by utilizing experimental data related to spin-orbit interactions. Their work enhances the understanding of spin-electron interaction devices and quantum computers, offering insights into future applications and validating the feasibility of all-electric Kondo effect control.



## II • College of Electrical Engineering and Computer Science

### Tech-Infused Athletics: Innovation in Sports Events



In 2021, NCKU hosted the National Intercollegiate Games, which incorporated various technological elements for the first time. They formed an interdisciplinary execution team consisting of scholars, students, and engineers, who showcased drone races with 5G smart technology to provide an immersive spectator experience. They also collaborated with multiple Taiwanese technology companies to introduce 5G dedicated network applications for smart sports technology and enhance the overall game experience. Using AI and 5G networks, they live streamed and analyzed sports such as badminton, table tennis, and swimming, enabling the real-time transmission and multiangle 3D replay of the athletes' outstanding

performances. To showcase the exciting possibilities of sports events, NCKU seamlessly integrated 5G technology and live-streaming experiences, and their academic achievements were published in the *IEEE Systems Journal*.



### MedCheX: AI's Global Impact in COVID-19 Prediction



The "MedCheX: AI-Assisted Chest X-ray Interpretation System," created by Professor Jung-Hsien Chiang's team from NCKU's Department of Computer Science and Information Engineering, has been recognized as one of the top 10 global AI solutions by the UNESCO International Research Center on Artificial Intelligence. This achievement marks the only Asian team to receive such recognition. MedCheX uses AI to swiftly predict the risk of COVID-19, thus offering valuable assistance to regions with limited medical resources. The system is currently in use in 61 countries, providing various medical benefits worldwide. It is offered for free to both ensure equitable access to medical resources and aid in alleviating the health-care challenges posed

by COVID-19. Professor Chiang also collaborated with the National Health Insurance Administration to develop an AI model for detecting lung cancer lesions.



## III • College of Bioscience and Biotechnology

### Novel COVID-19 Protein Microchips



Assistant Professor Guan-Da Syu from the Department of Life Sciences of NCKU led a team to develop two novel protein microchips for COVID-19 detection. These microchips include a High-Throughput COVID-19 Variant Protein Microchip, which efficiently detects neutralizing antibodies against variant viruses, and a protein microchip designed for analyzing the immune responses of patients. The team's research outcomes have been published in *Biosensors and Bioelectronics* and *Analytical Chemistry*. The High-Throughput COVID-19 Variant Protein Microchip requires only a single drop of blood to simultaneously analyze both neutralizing efficacy and antibody concentration against COVID-19 variants. This highly efficient technique, certified with a Taiwanese patent and currently under review for a US patent, prioritizes personnel safety and can potentially be applied across various domains to benefit a wider population.



### Agritech Pioneers Earn Three-Star Award



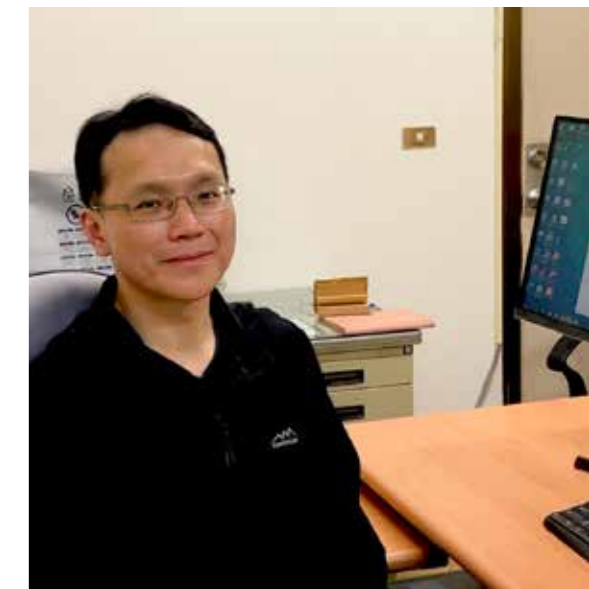
Under the supervision of NCKU Distinguished Professor Tzen-Yuh Chiang, the USR team has played a pivotal role in fostering collaboration among farmers, businesses, and local communities, contributing to the advancement of primary agricultural industries. Their impactful endeavors recently earned them the prestigious USR Sustainable Innovation three-star award from the independent food media outlet *foodNEXT* in the Food Innovation Awards category. Over a span of 6 years, Professor Chiang's team utilized microbial biotechnology to catalyze the transformation of agriculture. By bridging the gap between farmers and local resources, they successfully revitalized previously barren lands in the northwestern Tainan region, transitioning them from primary agricultural production sites to secondary processing sites and ultimately elevating them to a strategic industry of national importance at the sixth level. This three-star award is a testament to their noteworthy contributions in pioneering industry innovation.

## IV • College of Engineering

### Active Fluid Dynamics: Insights into Micromixing Unveiled



Assistant Professor Chih-Che Chueh from the Department of Aerospace Engineering of NCKU, in collaboration with Professor Kun-Da Wu from Worcester Polytechnic Institute in the United States, led a research team to study active fluid dynamics and obtained valuable insights into micromixing in active fluids. The team's research findings have been published in *Nature Communications*. Micromixing in active fluids has practical industrial applications but still requires further academic exploration and development. In their study, the team employed ultraviolet-activated adenosine triphosphate to clarify the mechanisms involved in micromixing in active fluids. Their research not only clarified the intricate connections in the activities of active fluids but also provided additional insights regarding applications in medical and biological engineering that can enhance production efficiency. Professor Chueh encourages his students to actively participate in international research to foster their thinking and communication skills.



### High-Entropy Alloy Catalyst: Advancing Water-Splitting Tech



Professor Jyh-Ming Ting and doctoral student Siang-Yun Li, both from the Department of Materials Science and Engineering of NCKU, have developed a high-entropy alloy thin-film catalyst for hydrogen and oxygen production in water-splitting reactions. Their research findings were published in *Small*. Fabricated from high-entropy materials and a combination of metals through a sputtering deposition process, this catalyst offers high repeatability and stability. The primary application of this catalyst is in hydrogen production based on water splitting, potentially advancing hydrogen energy technology. Furthermore, the team is also engaged in the challenging research of dual-function electrocatalysts, and they plan to collaborate with industrial partners to promote applications related to green hydrogen. They are committed to exploring new frontiers in high-entropy alloys within the context of global zero-carbon initiatives.





### Enhancing Lithium-Sulfur Batteries: Novel Composite Materials



Assistant Professor Sheng-Heng Chung and his team from the Department of Materials Science of NCKU have successfully developed metal-sulfur composite materials through the application of electrodeposition technology. They created nickel-sulfur composite energy storage materials with high sulfur content, enhancing the performance of lithium-sulfur batteries by enhancing their conductivity, sulfur adsorption, and electrocatalytic properties. This technology not only meets energy density standards required for commercial lithium-ion battery cathodes but also provides the required areal capacity for electric vehicle batteries. Their innovative approach and impressive data results earned the approval of judges, leading to them being featured on the cover of *Batteries & Supercaps*. They have been granted a Taiwanese patent for their core technology and are currently awaiting patent approval in the United States and China.

### Advancing Energy Storage: Metal-Organic Framework Insights



Assistant Professor Chung-Wei Kung and his team from the Department of Chemical Engineering of NCKU conducted fundamental research on the electron and ion transport behavior of metal-organic frameworks in energy storage. Their research holds significant value for the application of new nanomaterials in batteries and supercapacitors as well as for material design strategies. The recognition of their research by the field's leading journal, *Physical Chemistry Chemical Physics*, is evidenced by the research being featured on the inside front cover of the journal's May 2022 issue (Volume 24, Issue 17). Professor Gong

used an image of a Taiwanese salt field for the cover design, thereby using his research to showcase Taiwan on the international stage.



### Revolutionizing Lubrication: Eco-Friendly Plant-Based Tech



Chair Professor Yeau-Ren Jeng's team from the Department of Biomedical Engineering of NCKU has collaborated with China Steel Corporation to develop a self-repairing plant-based lubricant technology. Based on the use of plant oils, this technology allows for the creation of a lubricant with low friction and high wear resistance. This innovation has been featured as the cover story in *Applied Materials Today*, and it holds the potential to replace highly polluting mineral and synthetic oils currently available on the market. Professor Jeng is dedicated to finding alternatives to mineral oils and has been engaged in related research for decades. Plant oils are prone to oxidation, and the industry has faced challenges in adopting them because of concerns about their environmental effects. Therefore, Professor Cheng's team developed a completely natural and high-performance plant-based lubricant. They are also currently in discussions with medical material companies to develop nontoxic, food-grade, and medical-grade lubricants.



### Gold for Smart Rectal Exam Device at UAiTED 2022



NCKU students competed in the 2022 UAiTED Innovation Competition held in Taipei. Aimed at inspiring student teams to propose innovative solutions to challenges pertaining to the United Nations' Sustainable Development Goals, this competition attracted teams from 16 top universities in Malaysia, Hong Kong, Singapore, and Taiwan. Subsequently, a cross disciplinary SGF Team led by an NCKU biomedical engineering student clinched the gold medal with the Smart Rectal Examination Device. With early detection being crucial for the treatment of rectal cancer, this innovative device can increase the willingness of patients to undergo rectal examinations in clinical settings. The device can transform health-care practices by ensuring patient privacy and increasing the early detection rate of rectal cancer. This achievement is a testament to the fact that NCKU students have not only achieved excellent results in technology development but also proposed practical solutions for addressing health-care challenges in international competitions.







## NCKU's Sub Team Triumph at European Race



Using their Taiwan-made human-powered submarine “sat-bak-hi,” the NCKU HPS team participated for the first time in the European International Submarine Races held in Portsmouth, England. Despite facing multiple challenges, including a motor failure and a confirmed case of COVID-19 among the team members, the brave team remained resilient. They successfully passed both land and water tests, setting the record as the first Asian team to compete in the event. Because

of their exceptional submarine design, they earned the Best Newcomer Award. However, because the driver had COVID-19, they were unable to participate in the final race, missing the opportunity to compete against other teams. Nevertheless, the team members deeply appreciated the opportunity to compete in the event and emphasized that the true value of the race lied in the journey itself. They also identified directions for future improvements.

## Artful Luminescent Plants Illuminate Awards and Art Therapy



The Artful Luminescent Plants project, created by an NCKU team, successfully integrates technology, environmental protection, and art. The project has been honored with three major awards, including the 2022 Muse Design Award in New York, the United States, and the 2022 Future Technology Award from the National Science and Technology Council (NSTC). The team comprised members from the NSTC’s Research Program on Intelligent Biomimetic Materials and Mgi Design Platform project, including Professor Yen-Hsun Su and Professor Jen-Sue Chen from the Department of Materials Science and Engineering, Professor Jih-Jen Wu from the Department of Chemical Engineering, and several researchers from Academia Sinica. The team used plant vein absorption technology and oxide semiconductors for multi coloration to enable plants to emit light. Furthermore, the

team collaborated with Professor Wei-Chien Ma from NCKU’s Institute of Art Studies to integrate luminescent plants with technological media typically used in exhibitions. This collaboration fosters the development of art therapy and creative activities to effectively incorporate plants and art into everyday life.



## V • College of Medicine



## Optimizing Bipolar Disorder Treatment



Associate Professor Edward Lai from the College of Medicine at NCKU and his research team successfully used big data to simulate clinical trials and identify the optimal therapeutic blood concentrations of certain medications for patients with bipolar disorder. Their research findings were published in the renowned medical journal *eClinicalMedicine*. In their study, they revealed that, during the maintenance phase of treatment for bipolar disorder, the optimal therapeutic blood concentration for valproic acid as a medication should be maintained between 50 and 74 µg/mL. This research was conducted by simulating clinical trials with real-world data and was combined with systematic reviews and integrated analyses to ensure comprehensive and reliable results. Overall, Professor Lai emphasizes the importance of real-world research in enhancing health-care environments and overall health. He encourages medical professionals and researchers to transform clinical data into valuable information in order to collectively improve the settings of global health care.

## VI • College of Planning and Design



### Cheers to 90 Years: NCKU's Award-Winning Liquor Design

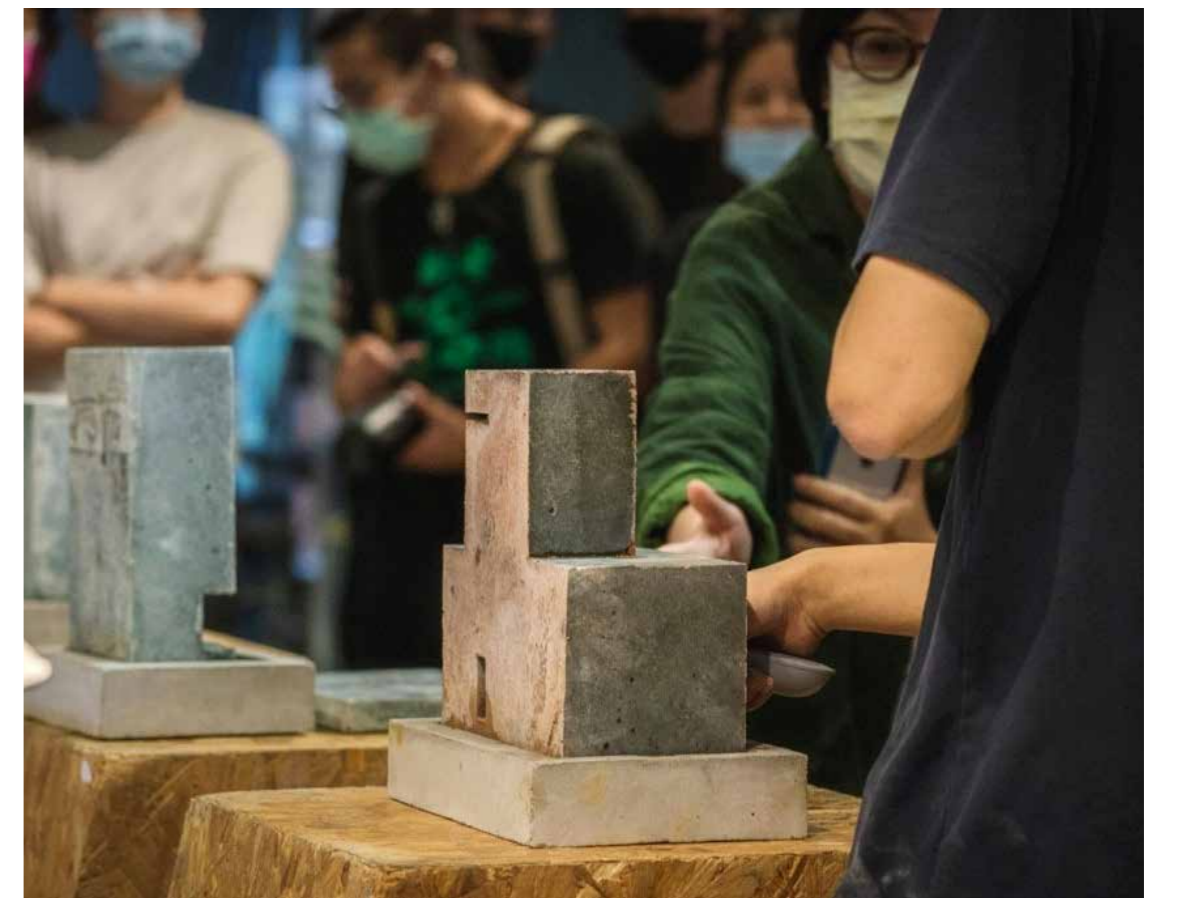


NCKU celebrated its 90th anniversary with a special edition of Kaoliang liquor, featuring an award-winning packaging design. This innovative design, developed in collaboration with the NCKU Art Center, the Department of Industrial Design, and dedicated alumni, garnered prestigious accolades such as the 2022 USA International Design Excellence Awards (IDEA Finalist) and the Taiwan Golden Point Design Award. This packaging design was a collaborative effort involving various alumni, including Sheng-Yao You, Design Director at 22STUDIO, and Designer Wei-Zhe Lin. The design is rooted in the principles of the circular economy, prioritizing sustainability and innovation in material selection. For Jian-Shiuh Chen, Dean of NCKU's College of Planning and Design, this project is more than just a commemorative design; it is a holistic endeavor aimed at fostering co-creation and establishing a framework for promoting small donations through the university's social responsibility initiative, known as the Design-Driven Donation System for USR.

### Transform Power Station into Innovative Bathhouse



Hung-Ming Tseng, an architecture student at NCKU, received the Gold Award in the Architectural Landscape Evaluation and Exhibition by the Taitung County Government for his outstanding graduation project titled "Metaphorical Ground: Repurposing Geothermal Power Stations into Public Bathhouses in Jinlun, Taitung." Tseng's innovative concept revolves around transforming the operational geothermal power station in Jinlun, Taitung, into a public bathhouse. His design seamlessly integrates local materials, considers environmental factors, and utilizes the unique geothermal characteristics of the area. It also involves self-made low-carbon recyclable materials. Tseng's project offers a fresh approach to sustainable land development, fostering emotional connections through architecture. Tseng expressed his gratitude to NCKU for providing the space and resources necessary for creative exploration. In the future, Tseng plans to dedicate himself to design, and he envisions contributing to more sustainable and emotionally resonant solutions for Taiwan's environment.



## VII • Cross-College Collaboration

### NCKU Triumphs: 5 Awards in Cutting-Edge Tech Innovations



NCKU shone at the 22nd Macronix Golden Silicon Awards—Semiconductor Design and Application Contest, with five projects making it to the finals and securing multiple Silver Awards and a Newcomer Award in the application category. NCKU teams developed a Portable Wireless Urine Test System that patients with kidney disease can use at home for self-monitoring purposes, earning them a Silver Award. They also won a Silver Award for creating a Noncontact AI Pathology Interactive Platform with Ultrasound Haptic Feedback, which enhances precision during surgeries and can be used in medical teaching. Additionally, they earned Bronze Awards for designing and submitting a Multisegment Light Reconnaissance Vehicle, a Lead-Free Piezoelectric MEMS Three-Axis Accelerometer Chip System for Unmanned Vehicle Security Monitoring, and a Low-Power, Multilayered Hardware Security IoT Microprocessor System. These achievements underscore NCKU's key research contributions in the areas of smart health care, IoT, artificial intelligence, and robotics, reflecting the university's support for high-tech research.



### MerSe Team Wins 7th Gold in Space Innovation

The NCKU MerSe team achieved a remarkable feat, winning a gold medal in the annual International Genetically Engineered Machine Competition in Paris, France. This marks the seventh gold medal for NCKU. The team's research focused on addressing the effects of radiation from space on living organisms. They engineered *E.coli* bacteria capable of producing selenium-containing melanin, which exhibits radiation resistance and generates sleep-aiding gamma-aminobutyric acid. In the resource-limited environment of outer space, the diversity of synthetic selenium applications made possible through MerSe extends to pharmaceuticals, nutritional supplements, food, and even fuel. The team's achievement not only provides new solutions for space travel but also serves as a beneficial development tool for space biomanufacturing.

### OralUp App Transforms Healthcare with AI

The OralUp Praise APP is the result of a cross disciplinary collaboration among the Nursing Department at NCKUH and the Departments of Nursing and of Medical Engineering at NCKU, and it was awarded the Silver Medal in the 6th National Medical Engineering Creative Competition in 2022. The application employs artificial intelligence to detect facial expressions and support oral muscle training for middle-aged and older patients through augmented reality games. The team's achievement was the result of comprehensive efforts to identify genuine needs pertaining to clinical experiments and achieve breakthroughs in artificial intelligence and augmented reality technology. The team received financial support from NCKU's Precision Health

Education Center for Medical Device Innovation and Commercialization. This funding played a pivotal role in the successful development of the team's innovative application for assisting middle-aged and older individuals with oral muscle weakness.



# Sustainable Achievement

## VIII • Memorandum of Understanding



### NCKU and Delta Electronics: Bridging Talent Across Borders



NCKU and Delta Electronics (Thailand) Public Company Limited have signed a memorandum of understanding to strengthen their collaboration for the NCKU Butterfly Program. This initiative provides students with more internship opportunities and scholarships and expands the criteria for various scholarships. The program is open to Southeast Asian students studying at NCKU. Additionally, it guarantees accommodation and meals for selected interns during their internships. This collaboration aims to encourage students to actively participate in and explore various career paths, thereby bridging the gap between Taiwanese academia and Thai industries. NCKU has deepened its collaboration with international enterprises, providing support for cultivating future leaders. In addition to investing significant efforts into enrollment, talent development, and matchmaking, the university has signed memorandums of understanding with numerous companies over the years, providing students with diverse learning and internship opportunities. This sustained industry-academia collaboration has yielded fruitful outcomes in nurturing global talent.

## I • Awards

### Sustainable Innovations Shine at PwC Awards



NCKU garnered recognition at the 6th PwC Sustainability Impact Awards held in 2022. NCKU's Sustainable Fishery Electricity project won the Bronze Award in the Social Innovation category, and its Exploring Tainan and Companion 2026 projects were also recognized. The Sustainable Fishery Electricity project combines solar power generation with aquaculture to promote ecofriendly fisheries with green and sustainable operations. The Exploring Tainan team engaged students from local communities in Tainan to broaden their understanding of the region and to promote local care and a global perspective. The Companion 2026 initiative focused on developing microcommunities that connect universities with

the community, specifically assisting older adults in achieving life autonomy and establishing a new model of intergenerational interaction. NCKU excelled at the awards, showcasing not only the achievements of its individual colleges but also demonstrating its commitment to social responsibility and sustainable development.



### Triple Gold at Taiwan Sustainable Awards



Three outstanding NCKU teams participated in the 2022 Taiwan Sustainable Action Awards, and they were each recognized in separate categories. The Companion 2026 team was awarded the Gold Medal in the SDG 3: Good Health and Well-being category for their success in developing microcommunities that connect the university with the local community and that address the challenges associated with Taiwan's transition into a super-aged society. The Collaborative Regional Learning Circle for Marginal Lands team won the Gold Medal in the SDG 11: Sustainable Cities and Communities category for aiding remote villages with economic development. The Tainan Yongkang Resilient Community team was recognized with the SDG 11: Sustainable Cities and Communities award for their work in helping a community to enhance its disaster resilience. Through their expertise, these teams exemplify the university's commitment to social responsibility, making significant contributions to sustainable development.



## II • Net Zero Emissions

### Pioneering Green Building with Top Certification



NCKU's Magic School of Green Technologies has received recognition as a nearly zero carbon emissions building. It is one of the first two buildings in Taiwan to achieve the highest level of recognition for green buildings at the First Zero Carbon Building Certification and Green Building Mark Awards ceremony held by the Ministry of the Interior, which is advocating for net-zero carbon emission buildings and encouraging the private sector to implement practices related to such buildings. The ceremony honored the achievements of not only leading green building companies but also architectural firms, experts, and scholars. Notably, the Magic School of Green Technologies attained the highest of seven certification levels for green buildings (Level 1+). This accomplishment not only highlights NCKU's progress toward the goal of buildings with net-zero carbon emissions by 2050 but also its dedication to sustainable building practices.



### NCKU and China Steel's Carbon-Neutral Collaboration



NCKU and Taiwan's China Steel Corporation have signed a Memorandum of Understanding (MOU) to officially establish the CSC-NCKU Negative Carbon Technology Hydrogen Metallurgy Joint Research Center. This partnership marks the beginning of the transformation of Taiwan's steel industry to align with global trends, with the aim of achieving net-zero carbon emissions and incorporating the European Union's carbon border adjustment mechanism. Through industry-academia collaboration, talent development, and technological research and development, this partnership aims to guide the local steel industry on a progressive path toward the goal of achieving net-zero carbon emissions by 2050. It will also drive the local steel industry to engage in high-value and fine steel production and green energy development, thereby ushering in a new stage of development for the industry.



## III • Green Campus

### Innovating Sustainability on Campus



NCKU has deployed 11 Smart Campus Signage Systems across its Kuang-Fu, Sheng-Li, and Cheng-Kung campuses. These systems combine digital technology and creative designs to provide an accessible and user-friendly experience within a sustainable campus environment. These signs use energy-efficient electronic paper technology to present information in various languages in real time; incorporate data from IoT sensors to measure air quality, temperature, and humidity; and disseminate campus and student activity information. This collaboration represents the first implementation of color electronic paper technology in outdoor signage systems in Taiwan. The electronic paper used in these systems is energy-efficient, waterproof, dustproof, and suitable for outdoor applications, providing high visibility even in bright daylight. The Smart Campus project, a joint effort of NCKU, Darwin Precision, and E Ink, highlights Taiwan's capabilities in the integration of software and hardware and the development of innovative applications pertaining to diverse display technologies. This initiative introduces new possibilities for the development of smart campuses.



## IV • Circular Economy

### Waste Not, Want Not: Sustainable Packaging



Associate Professor Hsin-Tien Lin from the Department of Environmental Engineering of NCKU and her research team have found that reducing the plastic packaging used for fruits and vegetables sold in supermarkets can significantly reduce waste. From the perspective of engineering science, plastic waste reduction solutions are required to address the challenges associated with the use and sourcing of plastic materials and the strategies for reducing plastic use. Through a systematic and macroscopic scientific approach, retailers can quickly analyze the potential for reducing their packaging waste and carbon footprint. Professor Lin's team conducted a scientific investigation and analysis of plastic waste reduction in Taiwan's retail industry. On the basis of their research findings, they provided recommendations for reducing packaging use in supermarkets across Taiwan, emphasizing that fruits and vegetables can be sold without excessive packaging. These recommendations provide both environmental and commercial benefits and have gained widespread attention. Professor Lin's research not only helps businesses to reduce packaging waste but also provides scientific support for environmental sustainability.



## V • Social Responsibility

### KUAP App: AI-Powered Rapid COVID-19 Test Verification



In accordance with government regulations, a positive COVID-19 rapid antigen test result, confirmed by a health-care professional, is considered equivalent to a diagnosis. To identify COVID-19, NCKU developed KUAP, an app equipped with a rapid test digital verification feature. This AI-driven feature enables on-campus personnel to upload images of rapid antigen test results for automatic interpretation, and it rapidly issues digital certificates for positive results. Members of the general public can register and link their official accounts with the Tainan Caring Cloud to upload images of their rapid antigen test kits, which are then automatically evaluated by AI. If a risk of AI misjudgment is suspected, an expert review process is initiated, involving

trained professionals who can provide a second opinion to mitigate the risk of false positives. This technology facilitates rapid and reliable screening for the public, thus exemplifying the active engagement of NCKU in the fight against COVID-19.



### Sustainable Agriculture for a Better Future



According to NCKU's USR Program Leader and Professor Tzen-Yuh Chiang from the Department of Life Sciences, extreme weather conditions have a major effect on agriculture, and the excessive use of nitrogen fertilizers can reduce the resilience of crops to extreme weather events. To address this problem, Professor Chiang cultivated microbiological strains suitable for field use. These strains were diluted to obtain liquid fertilizers, which can serve as an alternative to traditional fertilizers and pesticides and can reduce production costs. This environmentally friendly agricultural approach not only promotes healthy crop growth but also enhances the quality of agricultural products and reduces reliance on chemical pesticides. Professor Chiang actively encourages the younger generation to engage in sustainable farming practices, which

improve growing conditions, increase the value of agricultural products, and aid in the revival of rural communities. This green agricultural approach can provide opportunities for the younger generation to return to rural areas and participate in agriculture, thus contributing to the sustainable development of the agricultural industry.



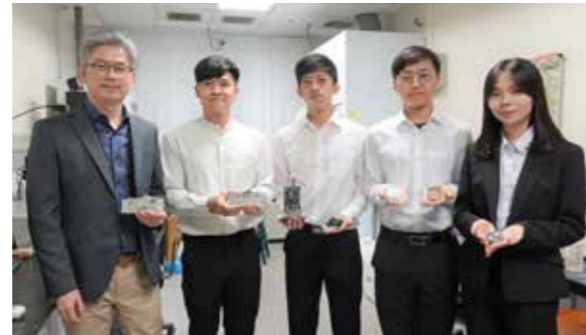
## VI • Sustainable Energy

### Breakthrough in Solid-State Battery Technology



NCKU's Distinguished Professor Fei-Yi Hung from the Department of Materials Science and Engineering and his research team developed a full solid-state iron-ion battery through a unique iron-ion oxidation–reduction mechanism. They increased the stability of the solid-state electrolyte by using a special nonwoven fabric. Given its compact, stable, and cost-effective design, this battery is capable of withstanding over 300 charge–discharge cycles, which makes it suitable for harsh environments and indicates its promising development potential, especially in applications such as electric vehicles, energy storage, and the military sector. Because solid-state iron-ion batteries are resistant to corrosion, their energy capacity can be increased by controlling the

charge and discharge of the iron ions. Compared with traditional lithium-ion batteries, this battery offers enhanced safety, does not contain harmful substances, can be easily recycled, and does not pose a risk of explosion, thus indicating its major competitive advantage.



### Cement Boosts Lithium-Sulfur Battery Performance



NCKU's Distinguished Professor Chung-Chan Hung from the Department of Civil Engineering and Assistant Professor Sheng-Heng Chung from the Department of Materials Science, along with their interdisciplinary research team, successfully improved lithium–sulfur batteries by using cement materials. This research was published in the specialized ceramic field journal *Ceramics International*. These lithium–sulfur batteries have attracted attention because of their ultrahigh capacitance and energy density, but they faced certain challenges in commercialization owing to stability problems. According to the research team, adding cement to lithium–sulfur batteries can enhance their performance. The presence of silicon and oxygen elements in cement is

expected to improve the stability of lithium–sulfur batteries. The team developed high-loading batteries for commercial applications, showcasing their high cycling stability and self-discharge resistance. This interdisciplinary collaboration provided valuable insights into the stability of lithium–sulfur batteries.



## VII • Biodiversity

### First Marine Conservation Center in Southern Taiwan



The Naying Marine Conservation Education Center, the first regional marine conservation education center in Southern Taiwan, was officially established at NCKU's Annan Campus. Representatives from various sectors gathered to witness this major milestone in marine conservation education. The center aims to showcase information regarding cetacean animals, biological specimens, and past rescue efforts and provide the audience with new knowledge and practical learning opportunities. It also aims to assume both academic and social responsibilities and promote the conservation of cetacean animals and all marine life. On World Whale Day, Taiwan's largest remaining sperm whale skeleton was exhibited to the public. This specimen played a central role in the globally recognized 2004 sperm whale explosion incident, which drew widespread attention from scientists and media worldwide. Enabling public viewing symbolizes the aspiration of NCKU to become a world-renowned hub for cetacean conservation.



## VIII • Industrial Innovation



### NCKU Drives Southern Taiwan's Semiconductor Hub Initiative



NCKU announced an initiative to collaborate with the governments of Tainan and Kaohsiung, along with partner institutions, to establish a semiconductor and sustainable manufacturing research base in Southern Taiwan. This initiative aims to accelerate the cultivation of high-level semiconductor talent and build a globally valued semiconductor industry cluster through the collaboration of industry, government, and academia. Regarded as one of the world's most advanced semiconductor manufacturing bases, the Southern Taiwan Science Park is expected to serve as a training ground for NCKU's Semiconductor College. Currently, NCKU collaborates with 10 schools to establish semiconductor colleges and offers five degree programs, including semiconductor IC design, manufacturing, packaging testing, and key materials, to support master's and doctoral degree courses. In the future, NCKU plans to connect with other science parks in Shalun, Tainan, and Qiaotou to promote the sustainable development of the next-generation semiconductor industry and transform Southern Taiwan into a key development hub for the semiconductor industry.



# Outstanding Alumni



### Yu-Pen Su / 蘇玉本

1970, Bachelor, Mechanical Engineering  
Consultant, Missile and Rocket Systems Research Division  
National Chung-Shan Institute of Science and Technology



Yu-Pen Su has been at the forefront of basic research, technological innovation, and engineering practice, making pioneering contributions in each area. The rocket missile system that he spearheaded is renowned globally for its leading-edge technology and performance. In recognition of his exceptional work, Yu-Pen Su was appointed as an Academician in the 33rd Engineering Science Group of the Academia Sinica in July 2022.

### Koug-Chaug Wang / 王國肇

1970, Bachelor, Electrical Engineering  
Chairman & CEO, Genesys Logic, Inc.



Koug-Chaug Wang was a trailblazer in Asia's IC industry, founding Syntek Semiconductor Ltd., the first IC design company in the region. His vision introduced a groundbreaking division of labor model to Taiwan's IC sector. In just six and a half years, it evolved into an international IC design company. He not only promoted IC design but also played a key role in educating clients and growing Taiwan's talent pool. Furthermore, he was instrumental in advocating for government regulations that support investments in the IC design industry.





**Luh-Maan Chang / 張陸滿**

1971, Bachelor, Civil Engineering  
Professor Emeritus of Purdue University of USA  
Endowed Chair for High-Tech Fab Engineering,  
Engineering College, Taiwan University



Luh-Maan Chang played a pivotal role in designing and constructing Taiwan's first Integrated Circuit (IC) Demonstration Factory, marking a significant milestone in the country's technological advancement. His commitment extends beyond construction to cultivating top talent at semiconductor plant facilities. In 2021, he co-established the Taiwan High-Tech Plant Facility Association, which is the first-of-its-kind committee within Semiconductor Equipment and Materials International (SEMI) to focus on plant facility technology. Through this initiative, Chang aims to enhance Taiwan's competitiveness in the global semiconductor plant industry.

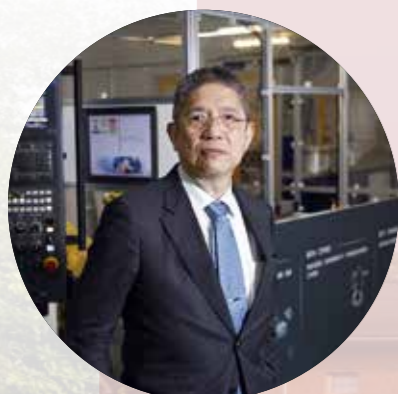


**Fu-Hua Chu / 朱復華**

1976, Bachelor, Chemistry  
Chairman, Polytronics Technology Corp.



Fu-Hua Chu founded Polytronics Technology Corp. in Hsinchu Science Park, and this marked Asia's first foray into polymeric positive temperature coefficient (PPTC) devices. Achieving rapid growth, the company went public in 2003 and, in the same year, became the world's second-largest PPTC supplier. Recently, Polytronics has expanded its reach into the metaverse supply chain and pioneered applications for lithium batteries in electric vehicles.



**Jui-Hsiung Yen / 嚴瑞雄**

1978, Bachelor, Mechanical Engineering  
Chairman, Tongtai Machine & Tool Co., Ltd.



Jui-Hsiung Yen, in his tenure as the Chairman of the Precision Machinery Research & Development Center, provided valuable insights into the industry's labor shortage and was a key proponent of advancing technologies. During the challenging times of the 2020 pandemic, as the Honorary Chairman of the Machine Tool & Accessory Builders' Association, Yen spearheaded the MIT Mask Equipment Supply Chain National Team, which made Taiwan the world's second-largest mask producer.



**Feng-Huei Lin / 林峯輝**

1980, Bachelor, Earth Sciences  
Director, Institute of Biomedical Engineering and  
Nanomedicine, National Health Research Institutes



Feng-Huei Lin currently holds the position of Lifetime Distinguished Professor at the National Health Research Institutes and the Institute of Biomedical Engineering at National Taiwan University. With more than 30 years of experience in education and research, he has pioneered innovative medical devices and treatments. His work, including numerous renowned publications, has gained global recognition. Additionally, Lin has excelled in securing patents and advancing technology transfer for vital biomedical materials.



**Chao-Hsin Lin / 林鈞信**

1980, Bachelor, Environmental Engineering  
Technical Fellow, The Boeing Company



Chao-Hsin Lin is an adjunct professor, serves as an academic committee advisor at various universities, and is the editor-in-chief of *Building and Environment*. His prolific academic career includes authoring over 180 academic papers and holding 17 U.S. and 5 Chinese patents. In February 2022, he was elected to the U.S. National Academy of Engineering for his remarkable contributions to aerospace environmental control systems, which play a crucial role in ensuring the safety and well-being of air passengers and crew.



**Kwo-Tsai Wang / 王國材**

1981, Bachelor, Transportation and Communication  
Management Science  
Minister, Ministry of Transportation and Communications



Kwo-Tsai Wang has served as the Director of Kaohsiung City Government's Transportation Bureau, Chairman of the EasyCard Corporation, and Political Deputy Minister of the Ministry of Transportation. His leadership has been pivotal in advancing Taiwan's transportation sector, spearheading key initiatives such as the successful launch of the Taoyuan Airport MRT and support of Uber's legal operation. As the Minister of Transportation since 2021, Wang's ongoing efforts continue to shape and enhance Taiwan's transportation sector.





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