# 中央研究院

ACADEMIA SINICA TAIWAN

### ACADEMIA SINICA TAIWAN



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### Message from the President

### **Taking the Lead with Science**

The COVID-19 pandemic in 2020 impacted political and economic situations worldwide, while also transforming the pace of scientific research. Thanks to concerted efforts by scientists across the globe, the process of discovering the virus and developing vaccines took just one year, illustrating the vital contributions science can make in solving unprecedented problems. In the future, humanity will face new challenges, such as irreversible climate change or revolutionary developments brought about by quantum science. With a long road ahead and time running out, modern science must immediately take the lead in tackling critical problems.

Academia Sinica's mission is to pursue breakthroughs in basic research, nurture talent, promote academic exchanges and collaboration throughout the world, and provide suggestions for national policy based on scientific expertise. At present, we are home to a total of 24 research institutes and 8 research centers with almost 1,000 researchers whose expertise spans our three divisions of Mathematics and Physical Sciences, Life Sciences, and Humanities and Social Sciences. We have achieved an outstanding record of performance in biomedicine, basic biology, structural biology, astrophysics, history, Sinology, and the social sciences.

This Introduction is intended to provide readers with an understanding of Academia Sinica's fundamental mission as well as a glimpse of our major research achievements and objectives, including black hole observation, optical physics, cancer research, nanomaterials, synthetic biology, plant and animal evolution, climate change, quantum technology, and Taiwan humanities and social sciences research. In recent years, we have established specialized research centers to



ACADEMIA SINICA



address increasingly complex issues from an interdisciplinary perspective, from emerging infectious diseases and translational medicine, to air quality and climate change.

In addition, Academia Sinica established the Taiwan International Graduate Program to nurture young talent. We are also closely linked to the global scholarly community and actively recruit outstanding individuals to engage in research and exchange. At the same time, we view our mission as helping to spark social progress through innovative research. Thus, we take the initiative in promoting popular science knowledge through new media in order to make complex academic research available to the public, thereby expanding society's depth and breadth of understanding.

As a leading scholarly institution, Academia Sinica will continue to engage in basic research in the spirit of pursuing truth and developing practical applications. With scientific development as our purpose and global sustainability as our priority, we will explore the mysteries of our universe, solve global problems, create new knowledge, and achieve cutting-edge results to contribute to the world and benefit humankind.

Jahi

James C. Liao

### About



Introduction to Academia Sinica video

Founded in 1928, Academia Sinica has earned a reputation for being Taiwan's preeminent academic institution. Our mission is to pursue research excellence, nurture academic talent, and issue policy advisories.

Academia Sinica currently has 24 institutes and 8 research centers in 3 different divisions: Division of Mathematics and Physical Sciences, Division of Life Sciences, and Division of Humanities and Social Sciences. In addition, the Council of Academic Sinica, Central Administrative Office, and Central Academic Advisory Committee have been established to formulate research plans and promote scholarly collaboration at home and abroad, as well as manage academic administration.

There are three central objectives at Academia Sinica: 1) Achieve global peaks of excellence; 2) Fulfill social responsibilities in crucial areas; and 3) Attract and cultivate top talent. We aspire to contribute to society from an academic perspective by targeting key issues and nurturing research talent to achieve excellence.

ABOUT ACADEMIA SINICA

Academicians

### Organization



# At a Glance Statistics



### AS Academicians' International Scholarly Awards

6	Nobel Prizes	E.	2	Balzan Prizes	45	US National Academy of Sciences Members
2	Wolf Prizes		1	Crafoord Prize	43 11	US National Academy of Engineering Members US National Academy of Medicine Members
1	Fields Medal	O	1	Kluge Prize	<b>40</b>	American Academy of Arts and Sciences Members
1	A.M. Turing Awar	rd			13 57	US National Academy of Inventors Fellows World Academy of Sciences for the
	>> 2	76	A	cademicians		Advancement of Science in Developing Countries Members

### Intellectual Property and Technology Transfer



### 1,401 Patents from 44 Countries (Regions)



Technology Transfer Contracts with Domestic and Foreign Companies

## 1,748

Statistics from 1998 to 2020

#### International Collaboration -





### Major International Awards Received by AS Researchers



President James C. Liao received the Samson Prime Minister's Prize for Innovation in Alternative Energy and Smart Mobility for Transportation from Israel



#### 2020

The US National Academy of Sciences honored Nobel Laureate, Academician Yuan-Tseh Lee, for his contributions in the field of human rights



2020

2021

Biological Sciences Section, American Association for the Advancement of Science (AAAS) Member: Academician Pui-Yan Kwok



#### 2020

US National Academy of Inventors Fellow: Distinguished Research Fellow Han-Chung Wu



2020

Breakthrough Prize: Event Horizon Telescope (EHT) Collaboration



### 2019

President James C. Liao was given the Novozymes Award for Excellence in Chemical and Biochemical Engineering



**2019** Academician Wen-Hsiung Lee was awarded the Motoo Kimura Lifetime Contribution Award by the Society for Molecular Biology and



#### 2019

Distinguished Research Fellow Yu-Ju Chen was elected 2021-22 President of the Human Proteome Organization (HUPO)



2019

**Evolution (SMBE)** 

Distinguished Research Fellow Yi-Fang Tsai received the Corresponding Membership Award from the American Society of Plant Biologists (ASPB)



### 2019

Vice President Fu-Tong Liu was elected Fellow of the US National Academy of Inventors

### Intellectual Property and Technology Transfer

Academia Sinica has established the Department of Intellectual Property and Technology Transfer (DIPTT) to promote the application of research and development results. The DIPTT is charged with applying for patents to promote innovative technologies possessing industrial applications and advancements. Through processes of licensing and collaborative research, the DIPTT transforms fundamental results into valuable products to benefit society.

### **Technology Transfer Agreements in 2020**

- Analysis pipeline for multi-omics data
- Anti-EpCAM monoclonal antibodies and methods of use thereof
- Composition and method for modulating fibroblast growth factor receptor 3 activation
- Method of diagnosing and treating Kawasaki disease
- Internal fixation of cells and organisms and uses thereof
- Immunogenic protein carrier containing an antigen presenting cell binding domain and a cysteine-rich domain
- Bidens pilosa and its phytochemicals for use in prevention and treatment of diarrhea

- Anti-coccidial phytogenic formulations
- Methods for full-length amplification of doublestranded linear nucleic acids of unknown sequences
- A panel of anti-coronavirus N protein antibodies for distinguish diverse coronavirus subtypes

### Privacy Amplification Protocols: Security Under Active Quantum Attack

"The current quantum computer has almost a hundred qubits, far lower than any digital device used in everyday life. When a quantum computer can reach thousands of logical qubits, the computing power it possesses will become a serious threat to the existing cryptographic system. To prevent this situation, practical cryptographers have been studying post-quantum cryptography for many years, while theoretical cryptographers have been actively exploring various possibilities of quantum cryptography."

-Kai-Min Chung, Research Fellow, Institute of Information Science

Mith Assumption Computationally - Hand Problem

ublic- key Encryption

Rapid progress in quantum computing may generate considerable benefits for mankind in the future, while also posing both challenges and opportunities for cryptography. Academia Sinica's theoretical quantum cryptography research team aims to explore opportunities in quantum cryptography, as well as countermeasures against relevant challenges.

The team's recent research focused on the security of classic privacy amplification protocols under active quantum attacks. Prior to their work, one unresolved issue was how to obtain a secure privacy amplification protocol when an attacker obtained quantum side information about the weak secrets shared by honest users. The team proposed the first secure privacy amplification protocol in this context, with its main contribution being to construct the first "Quantum-proof Non-malleable Randomness Extractor" based on which they developed a secure protocol. In the future, the team will continue to work on privacy amplification protocols, aiming to further improve their construction and obtain better parameters. Academia Sinica, as Partner of the Event Horizon Telescope (EHT) Collaboration, Captures the First-Ever Image of a Shadow of a Black Hole

"The image of a black hole from the Event Horizon Telescope (EHT) reveals the extreme physics of most efficient matter and energy conversion, with the immediate applications of this frontier science including technological advances in detectors and sensors, big data science, renewable energy sources, and space science. The research leading up to this black hole image was a result of international scholarly exchange as well as close collaboration between academia and industry."

-Academician Paul Ho, Distinguished Research Fellow, Institute of Astronomy and Astrophysics

The first ever direct visual evidence of a supermassive black hole and its shadow was released in April 2019 as part of a joint effort involving the Institute of Astronomy and Astrophysics (ASIAA) and other members of the EHT Collaboration. This black hole image was made based on EHT observation data from 2017 showing a black hole located at the center of the Messier 87 galaxy consisting of 6.5 billion solar masses and 55 million light-years away from Earth. This image not only represents the culmination of decades of observation and theoretical research, but also demonstrates Taiwan's important role in global scientific cooperation. With its very-long-baseline interferometry (VLBI) technology, the EHT synchronizes telescope facilities from around the world and utilizes our planet's rotation to form one huge Earth-sized telescope. Academia Sinica is a partner in the operarions of three of the eight radio telescopes that joined the EHT array in 2017: SMA, ALMA, and JCMT. Before the ASIAA-led Greenland Telescope (GLT) joined the EHT in 2018, team members had already contributed to this first black hole image in terms of technology development, observation, calibration, image processing, data analysis, and theoretical explanations.

### Uncovering the Memory Mechanism In Our Brains–Developing Lightsheet Localization Microscopy for Clarified Tissue

"Observing cells with a microscope allows us to solve the enigmatic biology of organisms. Therefore, by continuously improving optical imaging techniques, we can look forward to resolving unprecedented details of bio-structures, thereby discovering neuron connections in the human brain in order to unveil the mysteries of life."

-Bi-Chang Chen, Associate Research Fellow, Research Center for Applied Sciences

The use of lightsheet localization microscopy for clarified tissue was developed by the Research Center for Applied Sciences. By combining the advantages of localization microscopy and lightsheet microscopy, it proved possible to obtain super-resolved 3D images at sub 100 nm resolution across the cleared brain of a fly.

Visualizing memory formation in brains then becomes feasible by mapping the subcellular distribution of monoamine transporter proteins in the axons of the serotonergic Dorsal Paired Medial (DPM) neurons.

### Taiwan-US Cancer Moonshot Project–The First Proteogenomics Landscape of Non-Smoking Lung Cancer in East Asia

"Over 90% of female lung cancer patients in Taiwan are never-smokers, posing a huge contrast to common perceptions about the association between smoking and developing lung cancer. Our findings have provided new insights into treatments for early stage lung cancer in neversmokers."

#### -Yu-Ju Chen, Distinguished Research Fellow, Institute of Chemistry

In undertaking this research project, AS's Institute of Chemistry collaborated with the Institute of Statistical Science and the Institute of Information Science, as well as scientists from different research institutions such as Dr. Pan-Chyr Yang from National Taiwan University. The research team established the first deep proteogenomics landscape of non-smoking lung cancer in East Asia, and discovered possible pathogenic mechanisms for nonsmoking lung cancer patients. In addition to identifying a novel subtype and allowing high-risk early stage patients to receive earlier close monitoring and therapy, the research team further discovered the correlation between lung cancer and the prevalence of endogenous APOBEC mutagenesis in the human body as well as environmental carcinogenesis.

These research results provided an additional dimension to cancer biology, as this study represents the first collaboration between Taiwan and the US to fight cancer using proteogenomics and precision oncology. An article describing the results of this project was published in the international journal *Cell* (2020).



### Laying the Foundation for Deep Carbon Reduction–Academia Sinica Creates the First "Synthetic Methylotropic Single Strain"

"This research incorporates a mathematical model to identify critical enzymes for gene editing, followed by laboratory evolution, electron microscopic imaging, and multi-omics analysis. An independent result accomplished at Academia Sinica, this research required years of devoted efforts by highly talented members and advanced core facilities."

#### -President James C. Liao

Academia Sinica President James C. Liao and his research team have successfully created the first "synthetic methylotroph" from E. coli by using laboratory evolution. Their research identified key enzymes with a unique metabolic calculation model known as "Ensemble Modeling for Robustness Analysis", and modified E. coli through gene editing. Synthetic methylotrophs can convert methanol into high value chemicals, medicines, and fuels, forming a new carbon cycle that will help with carbon reduction. The research team used electron microscopy, proteomics, and three different gene sequencing techniques to discover the death mechanism of cells, which allowed them to devise a way of creating a "synthetic methylotropic single strain" while avoiding toxicity from methanol. The team's research article announcing this discovery was published in *Cell*, and hailed as "the new benchmark for synthetic biology".



### Identifying the Bridge for Proteins to Cross the Double-Membrane Envelope of Chloroplasts

"I wish to contribute to science and answer basic but key questions to the best of my ability. Take our research on the protein bridges of chloroplasts for example: we spent seven years experimenting before finally discovering unknown things in nature bit by bit. Our understanding of nature is thus pieced together like a jigsaw puzzle."

-Hsou-Min Li, Distinguished Research Fellow, Institute of Molecular Biology

As a result of seven years of unstinting efforts, scientists at the Institute of Molecular Biology identified the bridge that proteins use to cross the double-membrane envelope of chloroplasts, and named it TIC236. Their analyses of TIC236 further discovered that the structure of chloroplast protein import systems evolved from a protein secretion system of Gram-negative bacteria. These research results not only uncovered the missing link between chloroplast outer and inner membrane transport mechanisms, but also provided fundamental insights into the evolution of protein transport systems from bacteria to embryophytes. A research article describing these results was published in the journal *Nature*, and featured in a *News and Views* article.

### Biomedical Nanotechnology– A Powerful Tool for Coronavirus Vaccine Development

"For centuries our immune system has evolved against the threat of nanoparticulate viral pathogens. Nanotechnology thus offers an immense toolset for antiviral vaccine engineering."

-Che-Ming Jack Hu, Associate Research Fellow, Institute of Biomedical Sciences

Coronaviruses such as Middle East Respiratory Syndrome Virus (MERS-CoV) mutate rapidly, so innovative vaccine technologies are needed to combat evolving viral strains. The Institute of Biomedical Sciences has adopted cuttingedge nanotechnology to develop a virus-mimicking coronavirus vaccine. This nanoparticle vaccine can effectively stimulate the immune system in animals, generating durable antibodies to up to 300 days or more, and boosting cellular immunity. In an animal model of lethal coronavirus challenge, the nanoparticle vaccine confers a 100% survival benefit. Academia Sinica's nanoparticle vaccine technology has already received numerous international patents.

### Understanding Personal and Familial Changes from Panel Data Collected over 20 Years

"By looking into long-term panel data, we can provide explanations and solutions to important issues in Taiwan such as wage stagnation, late or no marriage, low fertility, and ageing population."

-Ruoh-Rong Yu, Research Fellow, Research Center for Humanities and Social Sciences



The Panel Study of Family Dynamics (PSFD) is a long-term panel survey conducted by the Center for Survey Research at the Research Center for Humanities and Social Sciences. Data collection for the PSFD was carried out annually between 1999 and 2012, and biennially since 2012. More than 6,000 individuals have taken part in this survey project, with 18 rounds of data collected since the first sample group. Through tracking the same individuals over time, we can better understand how people's attitudes and behavior varied across different time periods, as well as how family structures and interactions between family members changed during their life courses. Data from the Panel Study of Family Dynamics are vital for research on population, family, labor, education, and subjective well-being.

### World Congress of Taiwan Studies: Presenting Taiwan Research to the World

"The World Congress of Taiwan Studies brings scholars from Taiwan and abroad together to share their latest research findings, exchange opinions, and create opportunities for future academic collaboration. We hope to stimulate research in Taiwan Studies worldwide through strengthening international collaboration networks and raising awareness in this discipline."

WCUS THE 3rd WORLD CONGRESS OF TAIWAN STUDIES September 6~8, 2018. ACADEMIA SINICA, Taipei, Taiwan

Since Academia Sinica held the first World Congress of Taiwan Studies (WCTS) in 2012, this event has been organized triennially, in 2015 at SOAS University of London, and in 2018 back at AS.

Sessions covered topics in fields such as literature, history, art, religion, economics, sociology, political science, law, archaeology, environmental change, linguistics, and Austronesian studies. In 2018, a total of 118 scholars -Introduction to the World Congress of Taiwan Studies

took part in the World Congress representing 15 countries, including the United States, Japan, the United Kingdom, and France. AS hopes that Taiwan Studies can exert greater influence in the academic world through this international scholarly platform. In Response to Critical Contemporary Questions: A Collection of Distinguished Books in the Humanities and Social Sciences

> Meticulously written and edited, these humanities and social sciences research results highlight novel perspectives that examine the past, engage with the present, and look to the future. Responding to unanswered questions in contemporary society while exploring solutions to complex problems, this scholarship also seeks to record the unique charm of Taiwan.

-Shou-Chien Shih, Distinguished Research Fellow, Institute of History and Philology; Cyrus C. Y. Chu, Distinguished Research Fellow, Institute of Economics; Hsun Chang, Director, Institute of Ethnology; Thung-Hong Lin, Research Fellow, Institute of Sociology; Carl K.Y. Shaw, Distinguished Research Fellow and Ming-Chang Tsai, Research Fellow, Research Center for Humanities and Social Sciences

Academia Sinica has been steadfastly committed to the indepth exploration and critical analysis of important issues covering various disciplines in the humanities and social sciences, as well as promoting a diverse understanding of human civilization and cultural development from a wide range of scholarly perspectives. Continuing this fine tradition of research, outstanding results have recently been obtained in the fields of linguistics, cultural studies, Indigenous studies, as well as Eastern and Western philosophy. Moreover, in order to address the challenges facing contemporary society, AS strives to explore the most pressing political and economic issues in all policy fields, be they developments in US-China relations, China's participation in global capitalism, or the influence of the European Union on international politics and the legal order. These research results can hopefully provide policymakers with specific suggestions and countermeasures.



### **Cultivate Top Talent**

### **Recruiting Domestic and Foreign Talent**

As Taiwan's leading academic institution for basic research in its three Divisions (Mathematics and Physical Sciences, Life Sciences, Humanities and Social Sciences), Academia Sinica is a uniquely multifaceted scholarly institution. We encourage interdisciplinary collaboration and have close relations with the international scholarly community, with most academic exchanges conducted in English. AS has hosted nearly 400 foreign researchers from 30 countries to date, including India, Malaysia, Japan, and the US, whose scholarship covers fields such as physics, astronomy and astrophysics, chemistry, biomedicine, biochemistry, plant and microbial biology, history, and the social sciences.





### Taiwan International Graduate Program, TIGP

Since 2002, Academia Sinica has collaborated with leading universities to develop a variety of curricula for Ph.D. students in our Taiwan International Graduate Program. In order to cultivate outstanding talent for interdisciplinary research and strengthen academic connections, the curricula covers advanced studies in fields such as mathematical science, applied science, life science, medical science, and agricultural science, as well as the humanities and social sciences, with degrees awarded by participating universities. At present, 577 students from 45 countries have enrolled in TIGP, and 512 students have graduated. TIGP students have published numerous articles in top-ranked international journals, such as *Nature*, *Nature Chemical Biology*, and *Cell*. The remarkable achievements of our students have received recognition from renowned international research institutions, which have recruited our graduates to positions in their respective academic fields.





### **Domestic Programs**

#### **Collaborative Ph.D. Degree Programs with Domestic Universities**

Since 2008, Academia Sinica has launched 9 interdisciplinary Ph.D. programs in collaboration with 12 domestic universities to cultivate talent for advanced research, with degrees awarded by participating universities. Such collaboration between AS and domestic universities is based on their research strengths and resources, and aims to develop innovative and competitive Ph.D. programs that satisfy current demands for national technology, industrial policies, and social development.

At present, 184 students have enrolled in our domestic collaborative Ph.D. programs, and 92 students have graduated. Program seminars are held every year to facilitate exchanges between faculty from Academia Sinica and the 12 participating universities.



#### **Collaborative Humanities Core Courses**

In order to cultivate new scientific talent for interdisciplinary research and set an example for education in basic humanities, Academia Sinica has collaborated with National Yang Ming Chiao Tung University, Taipei Medical University, and National Defense Medical Center to launch the Academia Sinica Humanities Core Courses. The courses offered by this program cover general education in 6 categories, including society and the economy, history and civilization, technology and society, art and culture, philosophy and the mind, and morality and ethical thinking. A total of 3,300 students have enrolled to date, with 72 courses held.

### 理性與感性:科學與人文的二重奏 2019年中研院人文講座成果發表會

中研院與陽明、北醫、國醫 攜手培育新世代跨領域科學人才

理性與感性: #學與人文的二重奏



### Fulfill Social Responsibilities

### **Key Challenges and Emerging Issues**

Academia Sinica pursues cutting-edge results and breakthroughs by engaging in fundamental research, innovative development, and social participation. We recently founded key issue centers to target emerging infectious diseases, human-induced climate change, air quality, marine science, and quantum optoelectronics. Our Grand Challenge Program seeks fundamental breakthroughs in genetic and cell therapy, data science, and quantum technology to promote societal advancement.







In the humanities and social sciences, Academia Sinica will continue its scholarly endeavors in history, culture and language, Eastern and Western philosophy, society and the economy, the law and political systems, etc., while maintaining its commitment to applying basic science to emerging issues and interdisciplinary collaboration.





### National Biotechnology Research Park



The National Biotechnology Research Park is the first biomedical research ecosystem in Taiwan that integrates industry, government, and academia. The Park specializes in the translation and development of new drugs, reagents, and vaccines, while also fulfilling a number of other tasks, including basic research, regulatory consultation, and animal testing.

Academia Sinica established Biomedical Translation Research Center (BioTReC) in 2019, with the aim to promote clinical drug application through basic research. Innovative results have been transformed into new products and technologies based on the development of new drugs, therapeutics, and diagnostic technologies for major diseases. In addition, BioHub Taiwan, as a branch of BioTReC, provides resident companies all-in-one service model with integrated resources. Academia Sinica will continue to support international collaboration, assist biotechnology entrepreneurs and startups in accelerating product development, and facilitate basic research to enhance the growth and value of biotechnology in

### Academia Sinica South Campus

中央研究院育制院區

To maximize research capacity and promote innovative research in Taiwan, Academia Sinica has established the South Campus to utilize the advantages and characteristics of Southern Taiwan. Scholarship at the Campus focuses on a number of research priorities, including agricultural biotechnology and sustainability sciences as well as fields in the humanities and social sciences that are linked to sustainability. The Campus intends to stimulate academic and local development by introducing advanced technologies, including big data analysis and high-end automatic image detection, in order to integrate top R&D talent as well as Southern industries and cultural features.

In light of emerging advances in quantum science and technology, Academia Sinica has established the Taiwan Quantum Research Base as part of the government's technology development strategy. Its top-notch research environment will attract domestic and foreign talent to trigger a clustering effect and create a core community for the study of quantum technology in

## QUANTUM TAIWAN 邁向臺灣量子新世代 記者會



#### **Policy Recommendations**

#### Economic Forecasting and Policy Recommendations

Newsletters on Taiwan's economic outlook are issued on a regular basis by the macroeconomic forecast team at Academia Sinica's Institute of Economics. The team holds press conferences to release its initial forecast for the next year in December and a revised forecast in July, with forecast results published in *Taiwan Economic Forecast and Policy*. These forecasts not only function as reference for the government and scholars, but also exert influence on local industry. To help tackle numerous problematic issues in society today, beginning in 2008 Academia Sinica has selected a number of key topics and proactively provided policy recommendations through white papers produced by panels. Examples include the Deep Decarbonization Policy White Paper published in 2019, and the Taiwan Industrial Reform and Competition Strategy Proposal published in 2017.



### **Promoting Popular Science**

### Research For You, Popular Science Lectures, and Open House

"Research For You" is a popular science platform appealing to a wide audience that introduces research results in mathematics, the natural sciences, and the humanities and social sciences, as well as shedding light on the hardships researchers encounter while doing scholarship. Breakthroughs in popular science are shared with the public through social media platforms, including YouTube, Facebook, and Instagram.

Academia Sinica regularly holds the "Knowledge Feast: Popular Science Lectures in Honor of Late Presidents", inviting AS Academicians and other scholars to share the latest development in their fields. Beginning in 2018, popular science lectures have been held in cities across Taiwan to bring cutting-edge knowledge closer to the general public.

For the past 23 years, Taiwan's largest "Open House" has been held at Academia Sinica featuring hundreds of events organized on an annual basis, including lab tours, poster exhibitions, interactive experiments, and scientific lectures. In 2019, the "Black Hole Exhibition" along with the first image of a black hole ever recorded attracted 210,000 visits. Due to the COVID-19 pandemic, the 2020 Open House invited people to engage in online sessions about this disease, including its causes and development as well as the relationship between the pandemic and a range of social, cultural, political, and economic issues.





### **International Links**

### Enhancing International Collaboration and Exchange

As a national-level basic research center, Academia Sinica stays abreast of the latest research and developments by engaging in exchange and collaboration with leading academic institutions worldwide, as well as sharing cuttingedge scientific knowledge and techniques. In 2020, due to the COVID-19 pandemic, Academia Sinica actively participated in a number of global epidemic prevention cooperative measures, holding video conferences with government agencies and research institutions in Europe, North America, and Asia. In addition to sharing our progress in research on rapid testing and vaccine R&D, we also discussed international cooperative strategies for epidemic prevention.





A total of 663 cooperative agreements have been signed with 547 research institutions in 54 countries (regions) to establish comprehensive academic connections worldwide, including partners such as NASA, the National Institutes of Health, University of Illinois, and the University of California, San Francisco in the US; Kyoto University and Kobe University in Japan; the Indian Institutes of Technology; Mahidol University in Thailand; and Hebrew University in Israel. In the future, Academia Sinica will continue to broaden international links and strengthen scholarly connections to lead efforts in the development of domestic research to enable Taiwan to exert greater influence in its principal fields.



Joining hands with internationally-known research institutions, Academia Sinica speaks out for global scientific issues, with conclusions reached at meetings like the International Science Council (ISC) often serving as a guide for government science policies. In 2018, Academia Sinica President James C. Liao was elected Member of the ISC Governing Board, following in the footsteps of former AS president Yuan-Tseh Lee, who served as President of the International Council of Scientific Unions. The Academia Sinica Lecture and Special Lecture have been established to offer young scholars in Taiwan an opportunity to interact with leading scholars. Distinguished international scholars and Nobel Prize recipients have been invited to give these lectures, including renowned anthropologist Professor Michael Rowlands and Dr. Aaron J. Ciechanover, winner of the Nobel Prize for Chemistry in 2004.



### Participation in Large-Scale International Collaboration Research Projects

Academia Sinica has maintained a close relationship with the global academic community through establishing numerous research bases worldwide, and engaging in collaborative research projects with various internationally-known scientific institutes.



### First Image of Black Hole 史上首張黑洞影像



Of these projects, Academia Sinica has joined the Healthy Longevity Global Grand Challenge, founded by the US National Academy of Medicine in light of accelerating trends in societal aging. Five outstanding research teams from Taiwan have been chosen for stage one of the project in 2020, including the project entitled "Mechanism of gut microbiota-regulated cardiac repair after infarction in aged mice" led by Dr. Patrick Ching-Ho Hsieh, Distinguished Research Fellow at AS' Institute of Biomedical Sciences. We hope that our research teams can join scientists throughout the world in breaking barriers and achieving good health and longevity for mankind.



International Links 34 – 38



### A Worldwide Move



Funded by 8 entities representing nearly 50 countries and territories; over \$30M USD mobilized to date

In addition, Academia Sinica is a longterm member of the C4 Rice Consortium, implementing a Gates Foundation international cooperative project. Our research has currently progressed to phase 4, allowing more effective use of C4 rice to ensure global food supply. Academia Sinica has also joined the Asian Barometer Survey project, exerting academic influence through the exchange of knowledge and global collaboration.



STATE OF DEMOCRACY IN SOUTH ASIA

**REPORT RELEASE** 

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Thursday, 2<sup>nd</sup> Marc

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### Organization

### **Research Units**

#### Division of Mathematics and Physical Sciences

Institute of Mathematics Institute of Physics Institute of Chemistry Institute of Earth Sciences Institute of Information Science Institute of Statistical Science Institute of Atomic and Molecular Sciences Institute of Astronomy and Astrophysics Research Center for Applied Sciences Research Center for Environmental Changes Research Center for Information Technology Innovation

### Division of Humanities and Social Sciences

Institute of History and Philology Institute of Ethnology Institute of Modern History Institute of Economics Institute of European and American Studies Institute of European and American Studies Institute of Sociology Institute of Sociology Institute of Chinese Literature and Philosophy Institute of Chinese Literature and Philosophy Institute of Taiwan History Institute of Taiwan History Institute of Linguistics Institute of Political Science Research Center for Humanities and Social Sciences

### **Division of Life Sciences**

Institute of Plant and Microbial Biology Institute of Cellular and Organismic Biology Institute of Biological Chemistry Institute of Molecular Biology Institute of Biomedical Sciences Agricultural Biotechnology Research Center Genomics Research Center Biodiversity Research Center Biomedical Translation Research Center

### National Biotechnology Research Park



#### **Interdisciplinary Programs**

Center for Sustainability Science Academia Sinica Center for Digital Cultures







### Academia Sinica South Campus

Research Building I Research Building II Administration and Research Building Green House

**Biodiversity Research Museum-**

#### **Research Facilities**

100 Terawatt Laser System

Taiwan Volcano Observatory at Tatun (TVO)

Fiber Bragg Grating Underground Water Pressure Monitoring at Lantai Deep-seated Landslide Site in Taiping Mountain

Academia Sinica, Biotechnology Center in Southern Taiwan

Advanced Optoelectonic Technology and Novel Materials Lab

Long-term Climate Monitoring Research Station at Hehuan Mountain

Marine Research Station, Jiaosi, Yilan

Dongsha Atoll Research Station

Program Promoting Office for NSP-MOST: BEST (Bridging Earth Science and Technology)

South-East Asian Time-Series Study, SEATS

National Synchrotron Radiation Research Center (Crossed Molecular Beam Apparatus and X-ray Mass Spectrometer)

Ecological and Animal Behavior Monitoring Station at the Highland Experimental Farm, NTU

Cape Fuguei Research Station

National Taiwan University Highland Experimental Farm

Kuo-Sheng Reactor Neutrino Laboratory, The Second Nuclear Power Station, Taiwan Power Company

Broadband Array in Taiwan for Seismology (BATS) and The Micro Satellite Communication System of the South China Sea Broadband Seismic Station

Taiwan Real-time WBGT Monitoring Network

Green Island Marine Research Station

Taipei Feitsui Reservoir Ecology and Biogeochemistry Study

Microalgae and Cyanotoxin Monitoring Station at the Feitsui Water Reservoir

Field Station at Yuanyang Lake



#### **Museums and Libraries**

#### **Museums**

Museum of the Institute of History and Philology Biodiversity Research Museum-

Zoological Collections

### Libraries

#### **Division of Mathematics and Physical Sciences**

Institute of Mathematics Library Institute of Earth Science Library

Institute of Atomic and Molecular Science Library Institute of Physics Library Institute of Astronomy and Astrophysics Library Institute of Chemistry Library Institute of Statistical Science Library

Institute of Information Science Library

#### **Division of Life Sciences**

Life Science Library

#### **Division of Humanities and Social Sciences**

Institute of History and Philology Library Institute of Economics Library Institute of Chinese Literature and Philosophy Library Institute of Ethnology Library Institute of European and American Studies Library Joint Humanities and Social Sciences Library Humanities and Social Sciences Research Center Library Kuo Ting-yee Library, Institute of Modern History Center for Asia-Pacific Studies Library

### Administrative Units

#### Secretariat

Department of Academic Affairs and Instrument Service Department of General Affairs Department of Intellectual Property and Technology Transfer Department of Information Technology Services Department of International Affairs Department of Legal Affairs Department of Budget, Accounting and Statistics Department of Personnel Department of Ethics

#### **Public Facilities**

Activity Center Gymnasium Scholars' Guest House Academia Sinica Kindergarten Daycare Center Public Art



Herbarium tory Museum of the Institute of Ethnology Lingnan Fine Arts Museum Hu Shih Memorial Hall











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