南京大學
NANJING UNIVERSITY

A CENTURY-OLD CHINESE UNIVERSITY ASPIRING FOR EXCELLENCE

Founded in 1902, Nanjing University (NJU) is over a century old. It enjoys an excellent reputation in China and abroad. The historical development of the university has been closely connected with the mission of the nation and the needs of society. NJU's vision is to develop into a world-class, research-intensive and internationalized higher-education institution oriented toward high-calibre faculty, top-notch students and cutting-edge research.

Its president is Jun Chen, a professor in geochemistry and an academician of the Chinese Academy of Sciences. Presently, NJU has over 33,205 full-time students, of whom about 14,188 are undergraduate students, 15,667 are master and doctoral students and 3,350 are international students. NJU has three beautiful campuses: Gulou, Xianlin and Pukou. It has 28 schools containing 73 departments and has 8 national key disciplines in the primary disciplinary categories, 13 in secondary categories and 6 in the nurturing list. The university is listed in the first group of high-level universities in the national 211 and 985 projects, which attract strong funding from the Chinese government. As a member of the China Nine League, NJU boasts strong faculty in the humanities, social sciences, natural sciences, medicine and engineering.

Faculty

In its over 100 years' history, NJU has cultivated a great number of prominent and learned figures, and has consequently greatly contributed to the nation's revitalization and development. Many famous scientists and scholars have studied or worked at the university. Among its 2,251 faculty members, 28 are academicians of the Chinese Academy of Sciences, 3 are academicians of the Chinese Academy of Engineering, 1 is a foreign academician of the Chinese Academy of Sciences, 4 are academicians of the World Academy of Sciences, 1 is an academician of the Russian Academy of Sciences and 1 is an academician of the Academy of Science of the Royal Society of Canada. In addition, there are 115 Chair Professors and Distinguished Visiting Professors of the Chang Jiang Scholars Program, 97 winners of the National Distinguished Young Scientists Award, 29 overseas scholars under the National Thousand Talents Plan and 45 awardees of the National Youth Thousand Talents Plan.

Research

NJU is a leading comprehensive university in China as assessed by various national and international rankings. According to Thomson Reuters' Essential Science Indicators, 13 academic disciplines at NJU are ranked in the top 1 per cent worldwide and are ranked top among Chinese universities. In the QS Word University Rankings 2014, NJU has 20 disciplines listed in the global top 200.

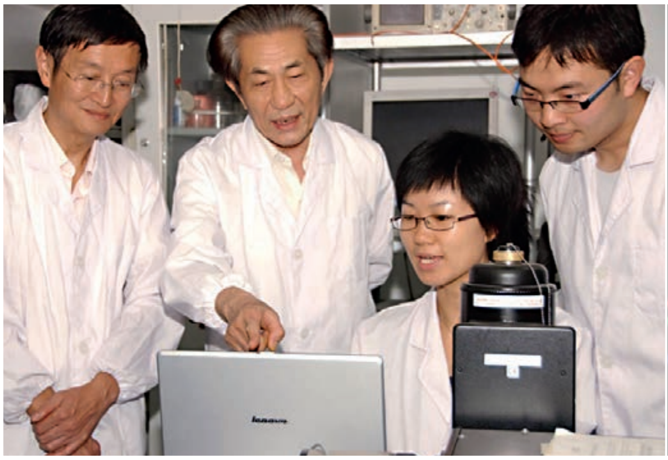
Over the past decade, NJU has acquired more than 800 national, provincial and ministerial awards for research. Since 2000, NJU has won 1 first prize and 18 second prizes in the National Natural Science Awards, 6 second prizes in the National Scientific and Technological Progress Awards and 4 second prizes in the State Technological Awards. In 2006, a project accomplished by NJU physicists led by academician Nai-ben Ming won first prize in the National Natural Science Awards, which is the highest award for natural scientific research in China.

In recent years, NJU has undertaken dozens of state key projects. In addition, NJU ranks top among Chinese universities in terms of the quality and quantity of research papers listed in the Science Citation Index (SCI). The number of SCI publications of NJU was ranked first among Chinese universities for seven years since 1992, and NJU had the highest number of citations of SCI papers for eight years since 1992. In 2013, NJU was ranked fourth among Chinese universities in the Nature Publishing Index. In 2014, NJU was ranked 38th in the Global Nature Index and fourth for China. In 2015, NJU was ranked 7th in the Asia-Pacific Nature Index, and again fourth for China.

In addition to conducting basic scientific research, NJU actively pursues applied scientific and engineering research to promote economic and social development. NJU has established 23 platforms that involve cooperation among government, industry and university, to boost industry–academia interaction and the local economy. These platforms are for areas such as new materials, electronic data, biopharmaceuticals, environment and resources and fine chemicals.

International cooperation

NJU is very active in international cooperation and academic exchanges. It has



established partnership with over 280 institutions of higher learning and research institutes from over 30 different countries. NJU continually pursues opportunities for international cooperation. Such efforts resulted in the establishment of the Center for Chinese and American Studies with Johns Hopkins University, the Sino–German Institute for Law Studies with the University of Göttingen and the Center for Chinese and Japanese Studies with the University of Tokyo. Many world-renowned scholars, including Nobel laureates, are honorary or visiting professors of NJU. In 2011, Aaron Ciechanover, who was awarded the Nobel Prize for chemistry in 2004, accepted an invitation to serve as Director for the Institute of Chemistry and Biomedical Sciences of NJU. In 2013, Jean-Marie Gustave Le Clézio, who was awarded the Nobel Prize for literature in 2008, began to work at NJU as Distinguished Resident Scholar of the Institute of Advanced Studies in Humanities and Social Sciences of NJU.

Research highlights

Physical sciences

A briefing in *Nature* (**389,** 113–117, 1997) assessed the Laboratory of Solid State Microstructures of NJU as "approaching world-class standards in research." Of the numerous achievements at NJU, perhaps the most influential was that by Nai-ben Ming on the dielectric superlattice (DSL). For this work, he and his team members were awarded first prize in the National Natural Science Awards in 2006.

The team investigated the fundamental theory of domain engineering and quasi-phase-matching and applied it in the design, fabrication and application of DSL materials. In recent years, Shi-ning Zhu's group successfully developed and commercialized a series of DSL based solid-state lasers, including mid-infrared tunable lasers, which have important applications in non-invasive medical diagnostics, free-space communication, laser scalpels, spectroscopy and remote sensing. Zhu's team has also done cutting-edge work in the fields of plasmonics and integrated photonic circuits. In particular, Hui Liu and co-workers demonstrated mimicking of gravitational lensing and optical trapping in an optical chip.

Excited by the striking properties and applications of DSLs in nonlinear optics, Zhu and Xu focused on the generation and manipulation of photonic entanglement — a key phenomenon in quantum technologies. The unique properties of DSLs enable the photon flux and achievable wavelength to be increased and also offer a compact way to tailor the polarization, frequency and spatial entanglement.

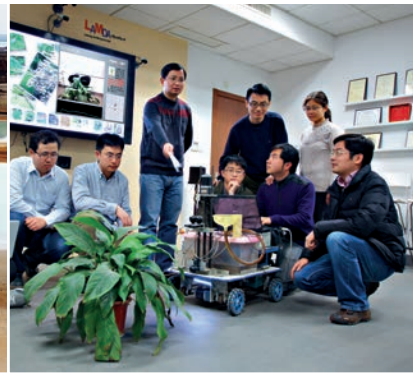
The team fabricated the first lithium niobate (LN) quantum chip that had efficient two-photon sources and manipulated photons using components such as junctions and wavelength-selective filters. This chip is controlled by on-chip electro-optical modulators, resulting in a variety of quantum states. "An LN superlattice may become an ideal platform for realizing fully integrated quantum optics," explains Ping Xu.

Chemistry

Nanomaterials and nanostructures are important in many fields. As one of the earliest nanoscience groups in China, Hong-Yuan Chen and Jing-Juan Xu's group in the State Key Laboratory of Analytical Chemistry for Life Sciences has introduced nanotechnology and biotechnology to the field of electrochemistry and has conducted substantial experimental and theoretical studies in ultramicroelectrodes, electrochemical biosensing, bioelectrochemistry as well as microfluidic chips toward various life-related substances. Their work about the basic study of microelectrodes has been included in the official "Technical Report" by IUPAC in 2000. Interested in a broad range of functionalized nanomaterials and patterned nanostructures, they have exploited the unique electronic, mechanical, electrochemical and interfacial properties of these materials to address critical issues in both fundamental studies and real-world applications toward various life-related substances for more than 20 years. Their accomplishments have been recognized by national-level scientific awards.

Their current research focuses on the in-depth study of the electrochemical and photophysical properties of nanomaterials for the development of innovative bioanalytical techniques based on their photoelectric interconversion processes, i.e., electrochemiluminescent (ECL) and photoelectrochemical (PEC) bioanalysis. They were the first to combine the energy transfer with the ECL of semiconductor nanocrystals system and proposed the dual-potential ECL ratiometric sensing approach as well as the wireless bipolar electrode in bioanalysis. By means of the energy transfer processes between CdS nanocrystals and noble metal nanoparticles in PEC sensing systems, they further realized the bioanalysis with high sensitivity and specificity.



Earth sciences

Atmospheric dust plays an important role in the marine and terrestrial geochemical cycles and impacts the global climate on daily and orbital (10^4–10^5 years) timescales. Asia is the second largest source of dust on Earth; the deserts and sand fields in China dominate Asian dust emission. Studies of dust transport based on dust tracers and satellite imagery clearly show that aeolian dust from Asia is transported globally. In the leeward regions of dust source areas, dust deposition provides an excellent archive for reconstructing the past environmental changes since at least 22 million years ago.

Jun Chen and his team have investigated the origin, transportation and deposition of Asian dust; they used the loess and Red Clay sediments in North China and the aeolian deep-sea sediments in the North Pacific Ocean to reconstruct past environment changes during the late Cenozoic era.

They have focused on three major areas. First, they established the spatial patterns of Nd–Sr isotope ratios, rare Earth element compositions and detrital mineral compositions for the aeolian sediments in the deserts, sand fields, Gobi deserts, loess deposition areas and the Tibetan Plateau. Based on these results, they were able to delineate the source regions of Asian dust and found direct evidence for the close relationship between the isotopic composition of desert deposits and the tectonic settings of the surrounding mountains.

Second, by analysing Nd–Sr isotopes and the geochemistry of detrital monomineral, they found that the direction of short-range transportation of dust in central and eastern Asia is largely determined by the prevailing near-surface wind. Source tracing revealed that the Asian dust has two material sources: the northern margin of the Tibetan Plateau and the Central Asian Orogen. This confirms the importance of mountain processes in the production of silt aeolian particles.

Third, they found that all the sand fields in northern China, an important dust source today, were nearly completely covered by vegetation during the Holocene Optimum, whereas the deserts in northwestern and central northern China were about 5–20 per cent smaller in area at this time. This suggests that the surface conditions of Asian dust source regions changed dramatically during the glacial and interglacial climate variations, and such changes affected regional dust emissions and subsequent feedback to the climate change. Thus, the dust impact should be coupled with the climate system in palaeoclimatic modelling in order to fully understand the forcing mechanism of the past climate changes.

The unique processes of dust deposition and transportation in central and eastern Asia provide a key to understanding the evolution of the Earth's environmental systems during the late Cenozoic. The ambitious research project of Chen and his team focuses on investigating the global dust emission, transportation, deposition and their climatic impact at daily to orbital timescales. They are using high-resolution and high-precision geochemistry and mineralogy techniques to pinpoint dust sources and look for new biogeochemistry proxy indices to better reconstruct past climate and environment changes. Their research will significantly improve our understanding of the behaviour of the Earth's surface environmental systems.

Information sciences

LAMDA, or 'Learning and Mining from Data', is a research team led by Zhi-Hua Zhou, who is an ACM Distinguished Scientist and IEEE Fellow. He is affiliated with the National Key Laboratory for Novel Software Technology of NJU; this laboratory has topped the rankings of the national key laboratories in computer science in China in the past two five-year terms. Zhou's team focuses on research of machine learning and data mining, with the aim of constructing computer programs that can analyse existing data and generalize to future cases.

Zhou and his collaborators developed many innovative techniques that have been applied to various practical tasks including image retrieval, movie annotation, network monitoring, CPU design, medical diagnosis, gene pattern annotation and mobile photograph management. Their innovations have also been incorporated into scientific software such as Matlab and many open-source software systems. Part of their research was awarded second prize in the National Natural Science Awards of China. In that year Zhou also received the Annual IEEE CIS Outstanding Early Career Award, which is awarded to one outstanding researcher under 40 years old.

When Zhou founded LAMDA ten years ago, there were only two faculty members; now the team has grown to 11 faculty and research staff. LAMDA seeks to attract overseas researchers as well as cultivate local talent. Zhou obtained all his degrees at NJU and is an excellent example of home-grown talent.