Professor Pan Jianwei

Doctor of Science, *honoris causa*
Citation

In ancient China, Lu Ban, a master craftsman of the Spring and Autumn period, once carved bamboo rods to make a magpie that could fly non-stop for three days, and proudly proclaimed it as an ingenious and magnificent creation. Later, Micius, a great philosopher in the Warring States period, had a different perspective. He believed that it would be more meaningful to carve three inches of wood and transform it into a cart axle capable of carrying a cargo load equivalent to fifty pieces of stone. Upon hearing Lu Ban's boastful remarks about his bamboo magpie, Micius sighed and said: 'Any means that benefit people are truly ingenious, while those that do not are merely clumsy.' In other words, a technology or invention that benefits people is considered ingenious, while that fails to do so is deemed uninspiring. A renowned quantum physicist, Professor Pan Jianwei is not only a pioneer and expert in the field of experimental quantum information but has also effectively applied his theoretical knowledge to benefit our nation and the world at large. This particular skill set of his can be aptly acknowledged as ingenious, and it is not an exaggeration to say so.

Born in Dongyang, a city in Zhejiang province, Professor Pan completed his undergraduate and master's degrees in the Department of Modern Physics at the University of Science and Technology of China (USTC). Following his graduation, he pursued further studies in experimental physics at the University of Innsbruck in Austria, and later continued his studies at the University of Vienna (UV).

After obtaining his PhD, he continued his research at UV as a postdoctoral fellow and senior researcher. In 2001, he returned to China and joined his alma mater as professor in the Department of Modern Physics. Ten years later, he was already elected member of the Chinese Academy of Sciences (CAS). At present, he is the Executive Vice-President of USTC and concurrently Director of CAS Center for Excellence in Quantum Information and Quantum Physics.

Micius conducted the first-ever pinhole imaging experiment in human history and formulated the 'Eight Principles on Optics'. Through this trailblazing experiment, he discovered that light travels in straight lines, thus laying the foundation for modern quantum optics. Fast forward over two thousand years, and Professor Pan has managed to make similar remarkable discoveries in the field of optical science. His research mainly focuses on quantum optics, quantum information, and fundamental issues in quantum mechanics. By employing quantum optical techniques, he has achieved significant breakthroughs in quantum control, showcasing exceptional insights and exquisite techniques. His contributions to experimental research in quantum information have made this field to be one of the most rapidly advancing disciplines in physics in recent years.

After his time in Europe, Professor Pan returned to China and played a pivotal role in establishing a quantum information laboratory at USTC. As early as 2003, while most people were still engrossed in proof of concept demonstrations within the laboratory, he had already conceived the idea of achieving integrated space-to-ground quantum communication network through satellites, outlined the blueprint for global quantum communication, and embarked on a series of pioneering experimental research. On 16 August 2016, the world's first quantum satellite Quantum Experiments at Space Scale (QUESS), named Micius, was launched. Professor Pan once remarked: 'Micius is a great ancient scholar in optics, while the technologies our research team uses for quantum communication and quantum satellite are based on light or photons. Naming this quantum experimental satellite after Micius not only pays due respect to this

prodigious ancient optical scientist but also demonstrates the self-confidence of our country in scientific research.'

Quantum communication, built upon the fundamental principles of quantum physics, possesses a unique advantage in overcoming the inherent security vulnerabilities of conventional encryption techniques. As a result, it stands as the most secure method of communication currently available. This groundbreaking technology represents an ingenious achievement in communication methods and holds immense potential in addressing cybersecurity concerns across various fields, including defence, finance, government affairs, and business. As of today, the greatest challenges faced by scientists remain security with realistic devices, expanding long-distance communication capability, and enabling practical applications of quantum communication. These tasks are onerous, but they are also incredibly intriguing. Through the pioneering experiments conducted by the Micius satellite, Professor Pan has taken a leading role in advancing satellite-based quantum science. This novel and ingenious endeavor has demonstrated the feasibility and reliability of long-distance quantum communication through satellites, and solidifying China's leading position at the forefront of space-level quantum experiments.

The success of the QUESS mission has enabled Professor Pan's team to delicately master the manipulation of photons, propelling progress in the field of photonic quantum information processing. Beginning in 2020, his research team began developing the Jiuzhang photonic quantum computer prototype, named after the ancient Chinese mathematics book *Jiu Zhang Suan Shu* (or *The Nine Chapters on the Mathematical Art*). Since then, the Jiuzhang computer has consistently gone through upgrading, showcasing its quantum computational advantage, surpassing even the most powerful supercomputers when solving specific problems. Professor Pan's research team has undeniably achieved eminence in the realm of quantum computing, intertwining the ingenuity of ancient epochs with the breakthroughs of the modern era, garnering acclaim all over the world.

The Micius satellite and Jiuzhang computer are undoubtedly distinct from the flying magpie by Lu Ban, but their practical applications bear close resemblance to Micius' use of carved wood for a cart axle, all bringing enormous benefit to the country and its people. In today's world, we can harness the ingenious inventions of Professor Pan to transmit safely vast amounts of information at lightning speed. Such astounding and ingenious inventions not only help bolster China's standing in the international scientific sphere, but also bring enormous benefits to humankind.

The innovative research achievements by Professor Pan have had a profound global impact, and have also brought him numerous accolades. His research findings have been repeatedly recognised as "major scientific advancement of the year" by prestigious journals such as *Nature* and *Science*. He has also received multiple international awards, including the Fresnel Prize from the European Physical Society, the International Quantum Communication Award from the International Organization for Quantum Communication, Measurement and Computing, the Newcomb Cleveland Prize from the American Association for the Advancement of Science, the R.W. Wood Prize from the Optical Society of America, and the ZEISS Research Award from the Carl Zeiss AG, Germany. In China, he has been honoured with the National Prize for Natural Science Award (First Class) and the Pioneer Medal of Reform for his innovative work in quantum information research, among other national awards and titles. Currently, Professor Pan serves as Vice-President of China's Jiusan Society, an association set up on 3 September 1945 with the mission to pursue political, economic, and social progress in the nation. He is also a member of the National Committee of the Chinese People's Political Consultative Conference. Through these important roles, Professor Pan continues to make valuable contributions to society and his motherland.

Emerging quantum capabilities,
strengthening the nation.
Ingenious innovative research,
astonishing the world.

Mr Vice-Chancellor, Professor Pan's audacious research has propelled China

to the forefront of quantum information and communication, garnering recognition both nationally and internationally. His unwavering dedication and boundless passion for scientific pursuits have transformed China's role in quantum physics from a mere follower to an extraordinary pioneer, deserving resounding acclaim. Within the scientific community, Professor Pan's remarkable advancements have driven the progress of quantum technologies, benefiting not only the global community but also future generations. In acknowledgment of his innovative scientific research and invaluable contributions to the nation and its people, Mr Vice-Chancellor, I have the pleasure to present to you Professor Pan Jianwei for the award of Doctor of Science, *honoris causa*.