Conferment of the Degree of Doctor of Science, honoris causa
A Citation

Professor Lu Yongxiang, Dr-Ing, DEng (Hon), LLD

Professor Lu Yongxiang is an expert of international renown in the field of fluid power transmission and control. He is currently the President of the Chinese Academy of Sciences, Executive Chairman of the Presidium of the Academy, and a Vice-Chairman of the Standing Committee of the 10th National People's Congress.

A native of Ningpo in Zhejiang, Lu grew up in a scholarly family as the son of two physicians. The early exposure to an academic atmosphere augered well for the exceptional career ahead. While still at school, he was already reading university-level books on dynamics and mathematics, and having completed school with top results he was admitted, at the age of 17, to the Faculty of Engineering at the famous Zhejiang University. He was not merely given to books, but was active in extra-curricular pursuits and a member of the University's soccer team during his five years as a student. He also represented the University in aviation model aeroplane competitions, in which creativity and aerodynamics went hand in hand to produce innovative designs. If a side interest could predict future success, then Professor Lu's brilliant career was already foretold when he was young.

In 1964, Lu Yongxiang graduated from Zhejiang University and stayed on as tutor and then lecturer until 1979. The intervening years witnessed the devastations of the Cultural Revolution, and yet research went uninterrupted for Lu, despite great scarcity of material resources. He published a number of papers during these years, which were to provide the basis and orientation for his future research. In 1979 scholars were allowed to pursue higher studies in Europe and America for the first time, as the country began its policy on opening up and reform. Professor Lu was recommended by the Chinese Academy of Sciences to seek postgraduate training at the Institute of Fluid Power Drives and Controls of the Technical University of Aachen as a Humboldt Fellow. During the two years in Germany, Professor Lu was much impressed by the scientific and technological advancement he saw, and he resolved to commit himself to research. Under the tutelage of Professor Wolfgang Back , Lu achieved remarkable results and secured patents in Europe and the United States for five important inventions in fluid dynamics transmission technology. Meanwhile Professor Backé, deeply impressed, was all encouragement and Professor Lu gained the doctorate in engineering in only two years, compared with the norm in Germany of five; this was a record at the Technical University of Aachen.

Professor Lu returned to China in 1981 and set out to organize a research laboratory for fluid dynamics transmission, which he directed. He was keenly aware of the need for China to nurture and develop her own technological and scientific personnel, and he resolved to do so at his alma mater as a way to contribute to national development. The research laboratory was subsequently re-organised as a research institute. Professor Lu continued to be its director and, apart from becoming one of the nation's major research institutions, the institute has trained

many prominent engineering scholars over the years and their research is now at the leading edge of their respective disciplines.

In 1988 Professor Lu became the President of Zhejiang University, a venerable institution with a long list of illustrious and distinguished personages among its former Presidents, including Zhu Kezhen, Ma Yinchu and Qian Sanjiang. Professor Lu came to the Presidency at the relatively young age of 45, a further testimony to his outstanding capabilities. Professor Lu built upon the foundation laid by his predecessors and sought to lead Zhejiang University along the road of development. First of all, he established over 50 research institutes, and transformed the University from a teaching institution into one with an equal emphasis on research. The standard of research at Zhejiang University rose. Second, he established a fair and systematic procedure for the recruitment of professors, based on the standard of teaching and research as well as quantitative assessments, and enforced the procedure vigorously. This recruitment policy injected a dose of fresh air into academic life at Zhejiang University, and ushered in a practice, based entirely in merit, that was a first in the country. Furthermore, Professor Lu changed the motto of the University from Qiu Shi (To seek that which is Right) to Qiu Shi Chuang Xin (To seek that which is Right and to create the New) in recognition of the need for innovation in the face of rapid change and international competition. Science and technology must meet community needs and constantly renew itself to keep abreast with the times. Such a shift of emphasis brought significant changes: when Professor Lu assumed the Presidency in 1988 there were 170 doctoral candidates, but when he handed over the Presidency in 1995, there were 1,700; the figure now stands at 5,000.

The remarkable achievements and success of Professor Lu in both research and administration had led to his appointment, while still President of Zhejiang University, as a Vice-President of the Chinese Academy of Sciences in 1993, and President from 1997. From then on he has been able to realize his long-cherished aim of bringing prosperity to the country through science and education. When he assumed the Presidency at the Academy, his first task was to read major specialist books on the development of science and technology, and on natural philosophy, so as to equip himself with a thorough understanding of all the scientific disciplines being pursued at the Academy, and the traditions, positioning and characteristics of each. He then proceeded to map out collaboration plans with the universities, placing their collective emphasis on the development of research personnel of a high standard. Since 1997 the Chinese Academy has made great efforts to promote the Knowledge Innovation Programme to meet the development demands of the knowledge-based economy and globalization, so that the nation, as it opens up and reforms, could keep itself in step with the rest of the world. As in Zhejiang University, President Lu gave priority to the building up of an efficient and effective management system. He demanded that research results published by the Academy should stand up to scrutiny by international peers, while practical inventions must meet the tests of the market. His second priority was to build up an enlightened culture for the Academy: preserving the traditional Chinese reverence for age, but at the same time recognizing performance and achievements without regard for seniority; respecting tradition and heritage, but also

encouraging innovations and creativity. With this enlightened policy and President Lu's frank and open style, the Academy has taken on a new look, as its material strength is closely integrated with a refreshed, enlightened spirit to usher in a new era of development.

After a series of streamlining and restructuring, obsolete research functions have been eliminated from the Academy while many new, inter-disciplinary topics have been introduced. And, to complement the national policy on openness and reform, the principle of fair, open and reasonable competition is enshrined in the Academy's policy. Since 1998, the Academy has annually published important reports ("Science Development Report", "High Technology Development Report" and "China's Sustainable Development Report") on the latest scientific developments in both China and the world so as to provide updated information for the Government. To bring recent scientific developments to the public and to help build up an ethics of science, the Academy at the turn of the century organized over a hundred reporting sessions by its Academicians at various cities throughout the country; these talks enhanced popular knowledge on ethical concepts in science.

While directing much of his attention towards the building up of an understanding of science among the general public, President Lu is also concerned with the ethical issues that arise as the result of advancements in science and technology. While science and technology propel human progress, they could also be abused. New ethical issues come up as new technologies are adopted. Cloning, the internet, and genetically modified food all bring immense benefits, but they also pose delicate issues of ethics, which must be treated with the greatest care. In other words, there is still the need to balance and integrate the sciences and the humanities, and such a need is high on the agenda of the learned Professor Lu.

Professor Lu believes that scientists today should not be content with the mere publication of original papers or taking a leadership position in research. Even more important are the dissemination, transfer and application of research results. In 1997, the Chinese Academy of Sciences submitted a report on the theme of "Addressing the age of knowledge-based economy, and building up the national innovation system". This report was highly regarded by the Government, and it was decided that the Academy was to be developed into the national knowledge base, think tank, and talents pool of science and technology over the next ten years. Under the leadership of President Lu, the Academy made incessant efforts to take on new disciplines and push new developments. In order that China might take her rightful place in the international scientific arena, it is necessary for her to learn from advanced nations, and also to contribute to the worldwide scientific community. Since the country opened up and reformed, a considerable number of the Academy's scientists have visited foreign research institutions every year, reciprocated by foreign visiting scientists also in substantial numbers. Academic partners are now found all over the world. The citation of publications in the field of nano science and technology from the Academy now ranks fourth in the world. These are just some of the outstanding successes achieved by the Academy under President Lu's leadership.

Professor Lu is a man with a broad mind and unsurpassed foresight. He takes a practical approach in his work, and refuses to bow to tradition for its own sake. His personal motto consists of three words, "Ideal, Diligence, and Constance". Professor Lu has spent the best part of his life promoting the study of mechanical engineering, in particular fluid power transmission and control, in which his contributions are immense. He has 20 patents to his credit in China, Europe and the United States. He has published over 250 important articles on scientific research and engineering education in China and abroad, as well as five monographs. His principle on force feedback of the measuring rate of two basic parameters, pressure and flow rate, is of pioneering significance. When applied to pilot-operated pressure and flow control components, his discovery has necessitated fundamental changes to the traditional Freeman-Jinken principle on the control of the rate of flow, which has been in use for over a century, and to the Vickers principle on pilot-operated type pressure control, which has also been in application for over 40 years. His innovation has improved remarkably the static and dynamic control performances for large flow rate and high pressure control. The electro-hydraulic proportional control systems developed by Professor Lu have been regarded as some of the major achievements in the field since the 1980s and are held in high esteem all over the world. His theories have been included in textbooks and technical manuals in Germany, Japan, Sweden and many other countries.

Numerous honours and awards have been presented to Professor Lu. In Germany he was awarded the Rudolf-Diesel Gold Medal in 1997, the Alexander von Humboldt Medal in 1998, the Knight Commander's Cross of the Order of Merit of the Federal Republic of Germany in 2000, and the Werner Heisenberg Medal from the Alexander von Humboldt Foundation in 2001. The technical projects developed by Professor Lu have had tremendous impact on national efforts to promote studies in mechanical engineering, and he had been honoured with the National Invention Prize, Second and Third Divisions, in 1988 and 1989, and a special award for superlative achievement from the Guanghua Science Foundation in 1993. Professor Lu was awarded the degree of Doctor of Engineering, honoris causa, by the Hong Kong University of Science and Technology in 1995 and an Honorary Doctorate of Engineering by City University of Hong Kong in 1997, an Honorary Doctorate of Laws by the University of Melbourne, Australia in 2003, and an Honorary Member of Senate , TU Berlin, Germany in 2003.

While at the forefront of scientific and engineering research, Professor Lu has spared no effort in promoting higher education and in serving the country. In 1990 he was elected a Fellow of the Third World Academy of Sciences, and he has been a Member of the Chinese Academy of Sciences since 1991. He was elected a member of the Chinese Academy of Engineering in 1993. Furthermore, he was Vice-President of the China Association for Science and Technology from 1986 to 1996, the Chairman of the Higher Education Consultative Committee of the State Education Commission from 1990 to 1994, and a Delegate to the Sixth and the Tenth National People's Congress. He has been President of the Chinese Academy of Sciences and the Executive Chairman of its Presidium since July 1997. He is currently a Vice-Chairman of the Standing Committee of the National People's Congress, Vice-Chairman of the Academic Degrees Committee of the State Council, Vice-Chairman of the China Overseas Friendship Association,

and President of the Chinese Mechanical Engineering Society. He also holds visiting or honorary professorships at several universities, including Zhejiang University, Tsinghua University and the University of Hong Kong.

Professor Lu's association with the Chinese University dates from 1995, when he gave a keynote speech at the Hong Kong Science Park Symposium hosted by the University. In 1997, in his capacity as President of the Chinese Academy of Sciences, he lent his support to the establishment of the first Joint Laboratory of Geoinformation Science at the Chinese University, a collaborative effort between the Academy and the University, and officiated at its opening. In 1998 he supported the Chinese University in hosting the 107th Xiangshan Scientific Symposium on Telescience and Robotics and, in 2000, under the leadership of Professor Lu, the Academy entered into an agreement for the establishment of the Shanghai-Hong Kong-Anson Research Foundation for The Chinese Academy of Sciences and The Chinese University of Hong Kong in Molecular Biosciences.

Despite his exalted position and busy schedule, Professor Lu has always been supportive of developments in higher education and science and technology in Hong Kong. He made substantial contributions to the education here through his membership on the University Grants Committee from 1996 to 2002. In 1998 and 1999 he was a Member of the Chief Executive's Commission on Innovation and Technology and, since 2000, he has been a Special Adviser to the Advisory Commission on Innovation and Technology of the Hong Kong SAR.

Mr Chairman, in consideration of his outstanding achievements in the study of fluid power transmission and control, and his excellent work in the development of scientific research and higher education in China, may I present Professor Lu Yongxiang for the award of the degree of Doctor of Science, *honoris causa*.