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

Zhang Cunhao, BS ChE, MS ChE

Professor Zhang Cunhao, President of the National Natural Science Foundation of China, is a chemist of international renown. His family came from Wudi in Shandong and he was born in Tianjin in 1928. He moved with his family to Chongqing at the age of nine, and was admitted to the Nankai Secondary School at ten. That was the time of the Japanese invasion of China and, in the turmoil of war, the young Zhang moved again from Chongqing to Fujian, and then further to Shaoguan, Hengyang and Guiyang, sometimes covering a hundred miles a day. After a tortuous journey, Professor Zhang entered the Department of Chemical Engineering at the Central University in Chongqing, obtaining his degree in 1947. He then proceeded to enrol in the Department of Chemical Engineering at Nankai University in Tianjin for a master's programme, and in 1948 he went to the United States. He took the Master of Science in Chemical Engineering at the University of Michigan in 1950, returning to China later in that year. Since 1951 he has been engaged in research work at the Dalian Institute of Chemical Physics of the Chinese Academy of Sciences. During these years he has held the position of associate research professor, professor, deputy director and eventually director.

Professor Zhang's research interest encompasses physical chemistry, chemical dynamics, laser chemistry and chemical lasers. During the early fifties he led a research team which worked successfully on the synthesis of liquid fuel from water gas. This produced an efficient catalyst, which, when applied to synthesis of liquid fuels from water gas on a fluidised bed, surpassed achievements made in Britain, the United States, Germany and Japan at the time in terms of effectiveness and product distribution. In the sixties Professor Zhang directed research on rocket propellant and motor combustion with remarkable achievements, and the multilayer combustion theory of solid propellant he propounded earned much praise from the scientific community worldwide well into the eighties. From the 1970's on, Professor Zhang turned his attention to laser chemistry and chemical lasers. In the eighties he placed special emphasis on the chemistry and spectroscopy of molecules in excited states and on short wavelength chemical lasers. Such research initiated studies in double resonance multi-photon electroionisation spectroscopy study, and the device of "ion hole spectroscopy" was developed. The result of this pioneering research project was published in 1986 to great acclaim both in China and abroad. To date, Professor Zhang has received seven Awards from the Chinese Academy of Sciences and four National Science Awards.

Professor Zhang is known all over the academic world for the many breakthroughs he has achieved. During a research career of some 40 years, he has published over 80 papers, of which many were published in leading international journals. His articles "Double Resonance

Spectroscopy and Molecular Dynamics", published in *Science* in 1993, and "Evidence for Quantum Interference in Collision-induced Intramolecular Energy Transfer within CO Singlet-Triplet Mixed States", published in the *Journal of Chemical Physics* in 1995, are particularly influential.

Professor Zhang holds important public offices on top of his research activities. He is the President of the National Natural Science Foundation of China. In 1980 he was elected Academician of the Chinese Academy of Sciences and, in 1981, he became a member of the Chemistry Panel of the Degree Committee under the State Council. Between 1984 to 1994 he was elected first as Standing Member, then as Deputy Director and finally as the Director of the Chemistry Division and a member of the Presidium of the Chinese Academy of Sciences. In 1992 he was made a Fellow of the Third World Academy of Sciences, and in 1993 a Bureau member of the International Union of Pure and Applied Chemistry. Professor Zhang is an adviser to the Presidium of the Chinese Academy of Sciences. He was a standing council member of the Chinese Chemical Society, and has been at various times a part-time professor of Peking University, Nanjing University, Fudan University, the University of Science and Technology of China, and the Zhejiang University. He is on the advisory editorial board of *Chemical Physics Letters* and *Spectrochimica Acta, Pt A*, and sat on the international advisory board of *Faraday Transactions* published under the *Journal of Chemical Studies* in Britain.

By taking up positions of high responsibility in administration, teaching, research and publication, Professor Zhang has shown outstanding talent and exceptional dedication. When asked what it was that contributed to his success as a scientist, Professor Zhang pointed out the following qualities. First, he must not back away from difficulty, for scientific research is teeming with unexpected twists and turns. In order to resolve a problem encountered during the course of research, a scientist must be able to look it in the eye, and deal with it with determination and fortitude. Second, research is often dependent on inspiration, with self-discipline playing a complementary role. As in the case of literature and the arts, in pure science a research worker needs inspiration. However, scientific research is not a wild game of guessing either. Furthermore, it has to be admitted that certain quantitative aspects of scientific research are insipid and dull, and success is available only to those who can pursue their projects to the bitter end with determination and tenacity. Third, the importance of team work can never be over-emphasized: scientific research is best carried out by small groups of like-minded people who can stimulate and encourage one another through difficulties which abound on the way. The fourth factor is the importance of teamwork, in which cooperativeness is the keyword and the commitment to a mutually agreed objective overrides all other considerations. Even relationship between teacher and pupil is to be ignored. Each member of the team should take on difficult jobs himself while reserving credit for others. This is the only way to success.

Professor Zhang is blessed with a generous and liberal mind, and he has come independently to conclusions similar to those of Professor Yau Shing-tung, the famous mathematician, and Professor Daniel Tsui, who won the Nobel Prize for Physics this year. Professor Yau suggests that Chinese scientists should recognise the importance of academic freedom without clinging to traditional individualism, while Professor Tsui describes scientific research as a joyous, challenging, meaningful and rewarding undertaking. Thus these three scientists got to the heart of the matter: scientific research has to be free and totally unfettered.

Professor Zhang firmly believes that real science, should be different from technology. The scientist advocates a ceaseless quest and a pioneering spirit: it is a spiritual yearning for renewal and liberation, and not a pursuit of materialistic ends. To draw a parallel from the Madonnas in the museums in Florence: paintings created before the 14th century are uninteresting portraitures with a dolorous expression and dull eyes. However, Madonnas executed during and after the Renaissance are much more lively and spirited, with eyes that sparkle with life. These changes of course came from an emancipation of the mind and a revitalisation of the intellect. It was the result of a liberated soul, and the effect thus created has never ceased to amaze. What is true for the visual arts is also true for science. In a similar manner, the work of the National Natural Science Foundation of China is heavy but far from dull. Among the very large number of research proposals reviewed by Professor Zhang each year, many open up exciting prospects: as a matter of fact, with assistance and support from all quarters, scientific research in China has made tremendous progress, with major breakthroughs, during the years 1996 to 1998. The National Natural Science Foundation, under Professor Zhang's presidency, has increased its funding five-fold, and is set to play an increasingly significant role in the promotion of scientific research in China.

Professor Zhang is not only a scientist of meticulous thinking and admirable foresight. He is also a scholar learned in the arts and science of both the past and the present. In his leisure he enjoys poetry and music, and writing articles which will benefit the younger generations of students. In April 1998 he published an essay on the importance of the linguistic aspects of scientific and technological treatises. In August of the same year he expressed high hopes for Chinese scientists in the international hall of fame in an article entitled "Now is the time to have a go at the Nobel Prizes". It would appear that Professor Zhang had some foreknowledge of this year's awards, particularly the nomination of Professor Tsui's for the award.

Mr. Chancellor, Professor Zhang Cunhao has distinguished himself in China as well as in the international community of scientists. His achievements in scientific research, his international reputation, and his major contribution to higher education and the encouragement he gives to young scientists are all worthy of our admiration and respect. I therefore present Professor Zhang for the award of the degree of Doctor of Science, *honoris causa*.