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

Daniel Chee Tsui, BA, PhD, Nobel Laureate in Physics

Daniel Chee Tsui was born in 1939 in Henan, China, arrived in Hong Kong in the early 1950's, and spent his secondary school years at Pui Ching Middle School. In this well-known private school, using mother-tongue as language of instruction, he proved to be a very gifted student, winning scholarships that helped to cover the school fees his family would have found it very hard to pay. After he left Pui Ching, he spent one year in the Hong Kong Government's Special Classes Centre, where he enjoyed the English literature classes on poetry and fiction. In 1958 he continued his studies in the United States. Armed with a brilliant Bachelor of Arts degree in Mathematics from Augustana College, Illinois, he went on to graduate work, gaining a PhD in Physics in 1967 from the University of Chicago, where he became a research associate. After a year, he joined the Solid State Electronics Research Laboratory at Bell Laboratories in Murray Hill, New Jersey, where he worked until 1982, when he joined the Department of Electrical Engineering at Princeton University.

Professor Tsui's research has explored the collective behaviour of electrons in solid state materials, especially those in semiconductors and semiconductor transistors, which are the starting material and the building blocks of our modern-day microelectronics. In an experiment in 1982, he discovered with Professor Horst Störmer that, at low temperatures and in strong magnetic fields, electrons confined to move along the interface between two different semiconductors can form new kinds of quasi-particles with charges that are only fractions of the normal electron charge.

The physics that this discovery has brought forth is known as the fractional quantum Hall effect or FQH effect. It has been a main subject of study by experimental and theoretical physicists ever since. As Wen Xiao-gang of the Massachusetts Institute of Technology wrote in his contribution to a tribute to Professor Tsui, 'There have been few discoveries that can stimulate theoretic studies and experimental explorations for such a long time....We are still far away from a complete understanding of FQH systems....We still cannot see the end of the impact of a discovery that happened seventeen years ago. This is a sign of truly great discovery' (*The Joy of the Search for Knowledge*, 148-154). Professor Tsui's PhD supervisor at Chicago, Professor Stark, goes to the heart of the matter when, looking back at the work of his student, he reflects: 'That special quality that you have is called scientific integrity.' (Op.cit., 105).

I would like also to recall that in his paper for the Third Asia Pacific Physics Conference held in The Chinese University of Hong Kong in June, 1988, Professor Tsui noted that '...it is intuitively obvious that in such an ideally pure system the electrons will correlate their motion

to minimize their Coulomb repulsion energy.' I have no understanding of the science referred to here, but I pick up on the fact that the scientific imagination uses *intuition* as well as complex reasoning processes.

The now famous 1982 experiment was explained a year later by Professor Robert Laughlin's theory that the combination of lower temperature and stronger magnetic field changed the electron gas into a quantum fluid. It was for their amazing work in the FQH effects that Tsui, Störmer, and Laughlin were awarded the Nobel Prize in Physics in 1998. The Nobel citation sums it up as the 'discovery of a new form of quantum fluid with fractionally charged excitations'.

Professor Tsui, a fellow of the American Association for the Advancement of Science, is also a fellow of the American Physical Society, whose Buckley Prize for condensed matter physics he won in 1984. Three years later he was elected to the US National Academy of Sciences. He is also a member of the Academia Sinica in Taipei.

Professor Tsui is also the recipient of the 1998 Benjamin Franklin Medal in Physics. He is the twenty-ninth Nobel laureate associated with Princeton and its eighteenth laureate in Physics or, as another Princeton colleague points out, he can be considered the first electrical engineer ever to win the prize! But Hong Kong can be immensely proud too, because he is also the first Hong Kong schoolboy to do so.

Although at school he scored his highest marks in Physics, Mathematics and History in his final examinations, his marks in Chinese and English were also outstanding, being in the 80% to 90% range. He thus combined proficiency in the Humanities and the Sciences. If he had a good grounding in English as a *global* language, allowing him to live and work in the United States, he rapidly mastered also the *universal* language of science itself. His triumph is a triumph for pushing and growing beyond one's origins to become a citizen of the world and a human explorer of the powerful universal laws that govern life, matter and space time itself.

John Ruskin thought that 'Great nations write their autobiographies in three manuscripts - the book of their deeds, the book of their words, and the book of their art.' From our end of millennium perspective, many of us would add that these are the books which have become books belonging to humanity rather than to nations; and most of us would add a fourth book of humanity, that of science. Professor Tsui has co-authored a striking chapter in that book of amazing changes.

He has not neglected his origins, though, for he has fond memories of Hong Kong and relatives still living here. Nor has he forgotten the university that did not exist here when he was a schoolboy but has now achieved a very solid state full of highly charged excitations: he honoured us some years ago as one of the Plenary Speakers at the Third Asia Pacific

Physics Conference organized by The Chinese University of Hong Kong in June 1988.

And so, because of these things, Mr. Vice-Chancellor, we are here today to pay our homage to an honourable schoolboy, in the truest sense of the word, who was celebrated in student verses at Pui Ching as not only clever but 'Best beloved of the class', who is recognized by colleagues as a true gentleman and scholar in the Confucian sense, and who has become one of the most extraordinary physicists of his century. He is so well liked by those who know him, because he is as modest as he is brilliant, as humorous as he is reserved. I am both privileged and deeply moved to present an honourable man and a great scientist, Professor Daniel Chee Tsui, for the award of the degree of Doctor of Science, *honoris causa*.