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

Steven Chu, AB, PhD, Nobel Laureate in Physics

Let us welcome back once more to the land of his forebears one of the most adventurous of experimental physicists in the world, Professor Steven Chu. His lasers have brought not just light but precisely concentrated light to what once was dark and unknown. Given the nature of his work, enabling us to measure more precisely than before the minuscule universe of atoms, it is no exaggeration to say that he shares something with that visionary poet, Henry Vaughan, excited by the new sciences making headway in the seventeenth century, who wrote:

I saw Eternity the other night

Like a great ring of pure and endless light,

All calm, as it was bright,

And round beneath it, Time in hours, days, years,

Driv'n by the spheres

Like a vast shadow moved; in which the world

And all her train were hurled.

In 1948, Steven Chu was born into an American Chinese family living in St. Louis, Missouri in the United States. After graduating from the University of Rochester in Physics and Mathematics, he went to Berkeley, where, under the supervision of Professor Eugene D. Commins, he gained his PhD in Physics from the University of California at Berkeley in 1976. After two years as a Research Fellow at Berkeley, he joined the Bell Laboratories in New Jersey, later becoming Head of the Quantum Electronics Research Department. In 1987, he moved back into academia as Professor of Physics and Applied Physics at Stanford. Over the next three years he had been a Morris Loeb lecturer at Harvard, been named Theodore and Frances Geballe Professor of Physics and Applied Physics at Stanford, a chair he still holds, been a Special Visitor to the Joint Institute for Laboratory Astrophysics in Colorado, and Visiting Professor at the prestigious Collège de France in Paris. Such things exact a price: he was appointed Chair of the Physics Department at Stanford between 1990 and 1993.

Professor Chu's work brought him the Stoddard Prize for both Physics and Mathematics at Rochester, suggesting his brilliance and potential, a promise fulfilled at home and abroad by his Humboldt Senior Scientist Award, the Broida Prize for Laser Spectroscopy, the King

Faisal International Prize for Science, the Arthur Schawlow Prize for Laser Science of the American Physical Society, the Optical Society of America's William F. Meggers Award for Spectroscopy, his various Fellowships, and his membership of not only the U.S. National Academy of Sciences, but of the Academica Sinica in Taipei and, as a Foreign Academician of the Chinese Academy of Sciences. Such achievements testify to his outstanding work in physics and to the crucial role he plays in the promotion of scientific research in China.

In 1997, he shared the Nobel Prize with William Phillips and Claude Cohen-Tannoudji. Professor Chu showed that the random motion of atoms at high speeds in different directions can be controlled, ordered, and slowed down by strategically positioned lasers. This results in the cooling of the atoms. The laser cooling and trapping of atoms by means of what has been called optical "molasses" is a breakthrough for theoretical physics as well as for experimental techniques and procedures: to bring atoms almost to a standstill facilitates more precise study of them, has led to deeper understanding of the interaction between light and matter, and has enlarged the arena in which theoretical ideas can be tested. Professor Chu's methods have stimulated intense activity among physicists worldwide. The study of the quantum behaviour of dilute atomic vapours at very low temperatures has applications in, for example, the refinement of atomic clocks, developments in atomic lithography, and the development of the first atom laser. The exacting precision of Professor Chu's work is matched by the imaginative inventiveness that distinguishes his experiments and innovative techniques.

Professor Arthur Schawlow, the inventor of lasers and a Nobel Laureate for 1981, points to the wide range of interests in different problems that marks Steven Chu's thinking and to his grasp of theoretical speculation, enabling him to devise the kind of searching experiments that display great virtuosity. The virtuosity is what we might call his style in experimental physics, a style distinguished by a willingness to address a crucial but intransigent problem in a fashion that operates at the edge of what is technologically possible and yet succeeds. Thus he proceeds in those extraordinarily difficult investigations that have made such important contributions to atomic and condensed matter physics, biology, and polymer science. He was the first to obtain high resolution spectra of positronium and muonium. Furthermore, he confirmed De Gennes' model of reptation--the way polymer strands "relax". Yet the man capable of such advanced experimental physics is not too lofty to help a student sweep up the laboratory in order to keep it tidy!

Those who attended Professor Chu's Wei Lun Distinguished Lecture here at The Chinese University of Hong Kong in March 1998 on "Laser Cooling and Trapping of Atoms and Particles" can agree that it was extremely well received, creating a high level of intellectual excitement. His lectures are acclaimed for the wit and clarity he brings to his exposition of creative scientific ideas. He focuses on what turns out to be the centrally important factor.

He influences advanced students and co-workers in ways that earn their sincere gratitude. We are indeed fortunate that he has been able to advise us and to inspire young scientists everywhere with his views on scientific and technological development.

Mr. Chancellor, for his services to the scientific community worldwide, his enthusiastic inspiration of Chinese scientists in particular, and his fruitful liaison with our University, I present Steven Chu, Nobel Laureate, for the award of the degree of Doctor of Science, *honoris causa*.