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Opening Ceremony of High Energy Physics Conference on 27 Nov 2008, 9 AM, Nanyang Executive Centre, NTU
Opening Address by Guest of Honour, SMS Lui Tuck Yew,

Professor Bertil Andersson, Provost, Nanyang Technological University
Professor Tan Eng Chye, Provost, National University of Singapore
Professor K. K. Phua, Director of Institute of Advanced Studies, NTU
Distinguished guests, ladies and gentlemen

Introduction

1. It is my pleasure to be here at this conference on Particle Physics, Astrophysics and Quantum Field Theory: 75 Years since Solvay. To our guests from more than 23 countries, I extend a warm welcome to you.

From Modern Nuclear Physics to High Energy Physics

2. Many of you here would know that the 1933 Solvay conference marks the beginning of modern nuclear physics. At that conference, two eminent Physicists (Cockcroft and Walton) shared their work in using artificially accelerated atomic particles to study atomic nuclei. Both of them were subsequently awarded the Nobel prize for their work. 75 years later, much progress has been made on the development of accelerators. Scientists working at the Large Hadron Collider at the European Centre for Nuclear

Research (CERN) can now accelerate particles up to energies of Terascale (10^{12} electron-Volt). This is a significant step forward in the longstanding attempts to unify the four fundamental forces of nature (Gravitational, Electromagnetic, Weak and Strong forces). At this energy scale, formerly separate fields of cosmology and particle physics become connected thus bridging the sciences of the very large and the very small. Today's conference acknowledges the important work at Large Hadron Collider and, more importantly, it provides the opportunity for physicists and educators to discuss developments and new possibilities in High Energy Physics.

New Knowledge and New Possibilities

3. Physicists have always been curious about the Universe. They wonder about the beginning of the universe and about its fate. Physicists have discovered that the universe is expanding. They are curious to know whether this expansion would continue indefinitely. The answer lies in the understanding of 'dark matter'. In fact, one of the primary motivations for building "super-colliders" such as the Large Hadron Collider is to try to artificially produce 'dark matter' in the laboratory. An understanding of how dark matter is formed and its precise nature will help shed light on the evolution of the universe, and unravel questions on the fate of the universe.

4. History has shown us that what started as man's desire to know and to explore the moon had led scientists to develop new processes and new technologies. These new knowledge and know-how have resulted in many new inventions and discoveries that impact our lives. Take digital imaging which has found a broad array of applications, especially in the field of

medicine. Or something more common like temper foam which originated in the mid 1960s and developed to absorb shock. Today, its use is widespread in diverse areas like prosthetics, modern art, amusement parks and automotives.

5. As scientists develop and build various types of particle accelerators to find out what holds the world together, they invariably create new instruments and tools for materials science, medicine, archaeology and criminology. Likewise, the technical know-how for producing dark matter will lead to many new spin-offs. We look forward to the life-transforming knowledge and possibilities resulting from the work in high energy particle physics.

6. Albert Einstein once said, *"To raise new questions, new possibilities, to regard old problems from a new angle requires a creative imagination and marks the real advances in science.*" New technological breakthrough is the combination of new science and human ingenuity. Technological advancements have resulted in computers with faster speeds and greater memory capacity. But ultimately, it is man's insatiable desire and quest for greater knowledge and deeper understanding that fuels the most significant developments.

Importance of Science for Singapore

7. Renewable Energy Corporation (REC), a leading Norwegian solar energy company, will build a massive $6.3 billion solar plant in Singapore. The ground-breaking ceremony for the complex was on 31 Oct 2008. When

fully developed in 2010, the complex could produce up to 1.5 Giga-Watt (GW), which is about three-quarters of the total output worldwide of 2 GW in 2006. Singapore was chosen from a total of 200 destinations. One key reason why we were chosen was our highly skilled labour force, including our pool of engineers and physicists.

8. Science education has always been a key focus in Singapore's education system, ever since we became independent in 1965. It has contributed significantly to the rapid industrialisation of Singapore, and its tranformation into a competitive economy.

9. When we scan global trends, we note that in developed countries and industrial powers such as Japan, US and Germany, students have become increasingly more attracted to pursue business, finance and humanities related courses and careers. There appears to have been an erosion in the number and quality of people who can take on jobs in science-related industries.

10. Similarly in Singapore, engineers will continue to be in high demand. The Ministry of Manpower has stated that for the past two years, science and engineering related sectors provided the largest number of job vacancies. A strong science education will prepare students to take on such careers and exploit the opportunities available in these fields. A strong science foundation will subsequently also open many career options at the leadership and senior management levels, including non-science related fields.

11. Singapore will continue to invest in Science and Engineering education. This will help us to maintain our comparative advantage as we move into an increasingly technologically-driven future. Teachers play a critical role in inspiring students to want to pursue the learning of science and shaping a life-long interest in science. The Ministry of Education has provided many opportunities for Singapore teachers to learn new ways of teaching science. Each year, about 25 teachers are attached to various universities overseas to be exposed to new teaching approaches. Teachers have gone to University of Washington and returned to implement Physics by Inquiry in their respective schools. Some teachers learnt about teaching Physics by Modelling from Arizona University and others used the teaching kits developed by Cornell University to provide students with hands-on activities to learn Modern Physics.

12. I am heartened that a Physics Education Workshop will be running parallel to this conference tomorrow to enable Physics educators to share and exchange ideas in the teaching of Physics. I commend Professor Lim Hock (Director of Temasek Lab, NUS) and Professor Feng Yuan Ping (Head of Physics Department, NUS) for initiating this workshop. I urge the Universities to strengthen the collaboration with MOE and schools to deepen the students' interest in science and engineering relatred courses and careers.

Conclusion

13. In closing, I would like to congratulate NTU's Institute of Advanced Studies, National University of Singapore, Institute of Physics, Singapore

and Southeast Asia Theoretical Physics Association for organising this conference. With the inauguration of the Large Hadron Collider, we look forward to witnessing a new era of High Energy Physics as physicists around the world continue to work towards uncovering the most fundamental questions about the universe.

14. I wish all participants a fruitful conference. Thank you.