IAS Welcomes Nobel Laureates and Renowned Physicists at the Murray Gell-Mann’s Conference

Raffles Girls’ Secondary School students gain some science knowledge at the Physics Education Workshop, part of the Gell-Mann’s Conference.

Physics Nobel Laureates Murray Gell-Mann (1969, pictured right) and Gerard ’t Hooft (1999) at the lectures in which other prominent scientists extol on Gell-Mann’s achievements.
The Conference in Honour of Murray Gell-Mann’s 80th Birthday was no ordinary conference. Held from 24 to 26 February 2010 at the idyllic and beautiful premises of the Nanyang Executive Centre, NTU, the conference was graced by four Nobel Laureates and several renowned scientists across the globe who celebrated Professor Murray Gell-Mann’s 80th birthday and his contributions to fundamental sciences.

The Conference, chaired by Professor Harald Fritzsch and co-chaired by Professor Phua Kok Khoo, attracted 249 participants from 33 countries, including the United States, Australia, Britain, China, France, Germany, India, Israel, Indonesia, Malaysia and Singapore. The four Nobel Laureates present at the conference were: Professor Yang Chen Ning (Physics, 1957), Professor Kenneth Geddes Wilson (Physics, 1982) Professor Gerard’t Hooft (Physics, 1999) and Professor Murray Gell-Mann (Physics, 1969). Professor Harald Fritzsch and Professor George Zweig both shared a light-hearted account of their encounters with Professor Gell-Mann, with their lectures titled “Murray Gell-Mann – A Scientific Biography” and “Memories of Murray and the Quark Model” respectively.

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A festival of lectures themed “Quantum Mechanics, Elementary Particles, Quantum Cosmology and Complexity” celebrates Gell-Mann’s revolutionary contributions to physics.
Another highlight of the conference took place on the second day when all the participants were treated to a sumptuous banquet dinner at the Regent Hotel. The Guest of Honour, Mr Lim Chuan Poh (Chairman, Agency for Science, Technology and Research), paid tribute to Prof Gell-Mann for his efforts in deepening our understanding of the laws of Nature. Prof Kenneth Young (CUHK, Hong Kong), who was also Prof Gell-Mann’s student, spoke affectionately about his former PhD mentor.

In celebration of Professor Gell-Mann’s birthday, students from Hwa Chong Institution put up a fine display of Wushu performance, an elegant fan dance and a captivating fusion of Eastern-Western music. The exotic music ensemble by the Institution’s Chinese Orchestra, highly commended by Professor Chang Ngee Pong (City University of New York), culminated in a “Happy Birthday” song. Everyone sang, clapped and cheered for Professor Gell-Mann who was visibly moved; he told us that he was very touched by the gesture of the audience at the Banquet.

The last day of the conference ended with parallel sessions on Particle Physics, Quantum Mechanics and Complexity. In addition, more than 80 teachers attended a Physics Education workshop which was held in conjunction with the conference. Most of the teachers who attended the workshop thoroughly enjoyed the captivating talks and hands-on activities at the workshop.

The parallel sessions on Quantum Mechanics and Complexity began with two invited talks by Professor Kerson Huang from Massachusetts Institute of Technology (MIT) and Dr Gunnar Pruessner from the Department of Mathematics, Imperial College London. Professor Huang presented the idea of Conditioned Self-Avoiding Walk (CSAW) as a model of protein folding. Dr Pruessner gave an overview on the current development of Self-Organized Criticality (SOC). The special talks were followed by talks from researchers from Australia, Japan, the Netherlands, Indonesia, France, Russia, Brunei, Turkey and Singapore. The topics presented were wide-ranging, spanning from quantum entanglement to the complexity theory of business, social and biophysical systems.

Dr Phil Chan
IAS Associate Fellow
IAS Invites 5 Nobel Laureates to Engage Brilliant Minds at the 2nd International Science Youth Forum @ Singapore 2010

The Forum provided a high-profile platform for the students and educators to engage in intellectual dialogues with the Nobel Laureates and eminent scientists.

The Institute of Advanced Studies (IAS), NTU organized the 2nd International Science Youth Forum (ISYF) from 18 to 22 January 2010 at the Hwa Chong Institution.

IAS invited five Nobel Laureates, namely Professor Jerome I. Friedman (Physics, 1990), Professor David J. Gross (Physics, 2004), Professor Leland H. Hartwell (Physiology or Medicine, 2001), Professor Douglas D. Osheroff (Physics, 1996) and Sir Richard J. Roberts (Physiology or Medicine, 1993), and Emeritus Professor David Phillips (President-elect of the Royal Society of Chemistry, UK) to the Forum.

The ISYF 2010 brought together 93 outstanding science students and 29 science educators from 26 secondary schools and junior colleges in Brunei Darussalam, China, Hong Kong SAR, Indonesia, Japan, Malaysia, the Philippines, South Korea, Taiwan, Thailand, Vietnam, and Singapore. The Forum provided a high-profile platform for the students and educators to engage in intellectual dialogues with the Nobel Laureates and eminent scientists, thus generating greater awareness about the importance of broad-based knowledge, deep passion, and a global mindset in the pursuit of scientific excellence.
International Conference on Sparse Representation of Multiscale Data and Images (14 – 17 December 2009)

The International Conference on “Sparse Representation of Multiscale Data and Images” was held at Nanyang Executive Centre, NTU, from 14 to 17 December 2009. This conference was hosted jointly by the Institute of Advanced Studies (IAS) and the School of Physical and Mathematical Sciences (SPMS, NTU). Professor Tom Hou (Caltech, USA) and Professor Xue-Cheng Tai (NTU) co-chaired this conference, which brought together experts in images, vision and scientific computing to exchange ideas and identify new research areas.

In recent years, there has been an explosive growth in the development of new efficient algorithms to represent multiscale signals, images and general data by exploiting the sparsity of these signals or images. At the same time, there emerges another exciting area called adaptive data analysis. Renowned speakers including Bjorn Engquist, Tom Hou, Alfred M. Bruckstein, Ron Kimmel, Norden E. Huang, Raymond Chan, Chen Zhiming, Patrick Flandrin, Christoph Schnoerr and Fadil Santosa from USA, Europe and Asia shared their recent works with the participants at the conference. Given that information technology and media innovation are important research areas of NTU, the local community had a great time interacting with these leading international experts.

The conference also provided a forum for intellectual interaction with academic experts, and generated a greater awareness about the importance of reliable knowledge, a global mindset, diverse interests and deep passion in the pursuit of scientific excellence. An attractive feature of this interdisciplinary conference was the deep integration achieved within the topic during this short four-day workshop.

A Visit to the Division of Mathematical Sciences

Many students and research staff of the Division of Mathematical Sciences, School of Physical and Mathematical Sciences (SPMS) attended the conference. Apart from the formal event, some of the participants visited the Division of Mathematical Science and joined the field trip to places like Marina Barrage and Chinese Heritage Centre.

Prof Tai Xue-Cheng, Associate Professor, SPMS, NTU
In recent years, there has been an increasing trend of Chinese herbal medicine research being conducted in research institutions, universities and hospitals in Singapore. Therefore the Institute of Advanced Studies (IAS) had organized a two-day conference on the recent developments in Chinese herbal medicine, which serves as a platform for local and overseas scientists to share and exchange their ideas and findings. The conference was held at the Nanyang Executive Centre, NTU, on 25 and 26 January 2010. It was jointly organized by the Consortium for Globalization of Chinese Medicine (CGCM), a non-profit global organization with the mission of advancing the field of Chinese herbal medicine to benefit humankind.

The main session of the conference was further divided into four consecutive sub-sections, namely Policy/ Challenges; Clinical Studies; Biological Activities/ Mechanism; and Approach/ Biological Activities/ Mechanism. The conference covered a wide range of topics such as reviews of the problems encountered by NIH in approving research funding, characterization of botanical products and research design, constraints and development of herbal medicine in the region, debate over the scientific nature of Chinese medicine, and approaches to the globalization of Chinese herbs. Recent clinical trials and study of the biological effect/ mechanism of various herbs were also described and reviewed. The conference had included both Western and traditional views on the sciences of Chinese medicine. Through discussion and exchange of views, it was hoped that the gap between Chinese herbal medicine and Western medicine would be narrowed.

There were about 50 poster presentations featured at the conference, providing young graduate students and prospective researchers with a platform to showcase their latest findings and receive comments from celebrated senior scientists, TCM practitioners and professors.

“The conference was excellent and it was an honour to participate.”
— Professor Joseph M. Betz, National Institutes of Health, USA

“I was very happy to meet a lot of colleagues and to have an opportunity in sharing ideas with each other. I think the Symposium was one of the excellent meetings to know the state-of-the art on Chinese Medicine.”
— Professor Yeong Shik Kim, Seoul National University, Korea
Dr Henry Lee – “Unveil Crime Mysteries” (6 October 2009)

Dr Henry Lee, Chief Emeritus for Scientific Services for the State of Connecticut and one of the world’s foremost forensic scientists, delivered a public lecture titled “Unveil Crime Mysteries” on 6 October 2009 at the Hwa Chong Institution, High School Auditorium. Dr Lee shared with the audience his interesting experience in crime investigations, his life in Taiwan and the USA, and the current trend in forensic science.

The lecture, jointly organized by the Institute of Advanced Studies, Tan Kah Kee Foundation and Tan Kah Kee International Society, was well attended by close to 550 participants.

Professor Kerson Huang – “The Roots of Chinese Civilisation” (中国文明的根源) 9 January 2010 (Lecture in Mandarin) and 6 February 2010 (Lecture in English)

Professor Kerson Huang, Professor Emeritus at MIT and also IAS Senior Fellow and Nanyang Professor, delivered a public lecture titled “The Roots of Chinese Civilisation” on 9 January 2010 (in Mandarin) and 6 February 2010 (in English) at the Singapore Management University, Ngee Ann Kongsi Auditorium and Hwa Chong Institution High School Auditorium respectively. Professor Huang’s talk on his inspiring experiences of Chinese Civilization had attracted more than 600 participants for both sessions. The lectures were jointly organized by the Institute of Advanced Studies, Tan Kah Kee Foundation and Tan Kah Kee International Society.
Professor C N Yang – “Reflections on Returning to My Roots: Six Years after moving to Tsinghua (归根反思)” (4 March 2010)

Prof C N Yang (left) gave deeper insights as Prof Phua Kok-Khoo fielded questions from the 1600-strong audience.

The Lianhe Zaobao news article on Professor C N Yang’s talk — 4 March 2010 at 6.30pm, at Nanyang Auditorium, NTU

Professor C N Yang’s Special Lecture for Students

Professor C N Yang – “An Interesting Parlor Game and Its Meaning” (27 February 2010)

P rofessor C N Yang gave a talk to NTU and NUS students at the Lee Kong Chian Lecture Theatre, NTU on 27 February 2010. He illustrated Dirac’s game with simple algebra and then went on to talk about the mathematics of knot theory, including the introduction of Alexander polynomial and Jones polynomial. He showed how these mathematics were connected to the study of many-body interactions phenomena in physics and others. Dr Su Guaning, NTU President, chaired the lecture which was well attended by close to 900 students.

NTU President Dr Su Guaning (right) and Prof C N Yang during the Q&A session.
Named in honour of Professor C N Yang, one of the greatest scientists of our era, the C N Yang Scholars Programme is one of the premier undergraduate programmes at Nanyang Technological University for science and engineering students. To many of the students under the programme, Professor C N Yang is a model scientist par excellence. It was therefore a great honour for many of them when they were given the chance to interact with Professor Yang at a special dialogue session for students.

During the dialogue session, many students were keen to find out Professor Yang’s perspectives and opinions regarding the future directions of physics, mathematics and engineering research. They also wanted to know how they could do better in research as students and how they should cultivate their interest in science and engineering. Concerning the latter question, Professor Yang remarked that they should first honestly find out their own interest.

He mentioned poignantly that when he was young, his father asked an interesting mathematics problem regarding the number of rabbits and chickens given that there are ten heads and thirty legs. After he found out how to solve the problem, he was extremely fascinated by the intrinsic beauty in the solution. Years later, he posed the same question to his children. Although they learned the solution quickly, they did not seem to be enthralled by the beauty of the question. His children had to be reminded about the solution repeatedly. None of his children subsequently became physicists or mathematicians. Their interests were obviously not in science. However they still did well in other career paths.

Professor Emmanuel Tsesmelis from CERN delivered a wonderful speech to the NTU students on “CERN and its Particle Physics Programme” at the School of Physical and Mathematical Sciences on 11 January 2010. He discussed about CERN Laboratory’s primary aims and the basic ingredients of the LHC programme – the superconducting accelerator, the high-precision particle detectors and the high-performance computing.

Professor Amnon Aharony and Professor Ora Entin-Wohlman from Ben Gurion University, Israel delivered a talk on “Writing and Reading Spin Information on Mobile Electronic Qubits” and “New Clues in the Mystery of Persistent Currents” respectively at the School of Physical and Mathematical Sciences on 11 February 2010. Professor Amnon Aharony discussed about mobile electrons, which moved through mesoscopic quantum networks (made of quantum wires or of arrays of quantum dots). Professor Ora Entin-Wohlman talked about her findings on the superconducting transition of measured persistent currents in copper and gold.
Driven by curiosity, IAS Senior Fellow, Professor Kerson Huang is inspired to share new discoveries in science and literature.

The Physicist-Poet

by Jean Qingwen Loo

Wake! For the Sun, who scatter’d into flight
The Stars before him from the Field of Night,
Drives Night along with them from Heav’n, and
strikes The Sultan’s turret with a Shaft of Light.
— Rubaiyat, Verse 1

Most people would probably regard physics and Chinese literature as parallel fields with little in common, but for Professor Kerson Huang, a leading authority in physics who has authored two translations of classic literary works, it is readily apparent what unifies them. “For me, it is quite natural to see what they have in common — their sense of beauty,” he explains.

SEEKING THE TRUTH
Professor Huang’s life has been dedicated to explicating and sharing the truths of science and literature. The Chinese-American physicist-poet holds the post of Professor of Physics Emeritus at the Massachusetts Institute of Technology (MIT), where he has been a faculty member since 1957. In November 2009, he accepted an appointment as Nanyang Professor for two years, and is currently a visiting professor at NTU’s Institute of Advanced Studies (IAS).

Over the course of his five-month sojourn at IAS, Professor Huang’s engagements have included advising a number of projects related to biophysics, high energy physics and statistical mechanics; discussing the establishment of a new Centre for the History of Science; and speaking at the International Science Youth Forum 2010. Earlier this year, he also delivered an IAS Public Lecture on “The Roots of Chinese Civilisation” in both English and Chinese.

“I’m enjoying my time here,” he says. “It’s interesting to be in a country that is developing a culture of pure research, which will be very important in the long run.”

AN EARLY LOVE OF SCIENCE
Professor Huang was born in Nanning, China, in 1928. As a child, he did not take an easy path to discovering his passion for learning: growing up in Manila, the Philippines, during the Japanese Occupation, he was unable to go to school,
and so turned to studying physics at home with the guidance of a tutor.

“Physics is absorbing and beautiful because in one equation, it can explain to us how the whole universe works,” he says. “An equation may be simple in its statement, but complicated enough to describe the way of the world, when we study its details.”

Following the end of the war, Professor Huang enrolled in MIT and dove headlong into the challenges of higher academia. After completing his PhD at MIT in 1953, he joined the Institute for Advanced Study at Princeton University before returning to his alma mater in 1957 as a member of its Department of Physics.

Much of Professor Huang's teaching and research career has been devoted to high-energy theory and statistical mechanics, subjects he has explored in a series of textbooks that have become foundational texts in the field. "The nature of physics is beautiful," he recalls of his years as an educator, "and what I've always tried to do is to present its truths to students in an exciting way."

THE PROBLEM OF FOLDS

In 1999, Professor Huang retired from teaching and has since chosen to devote himself to the complexities of biophysics. He is currently working on a long-term project with a team that includes Dr Chew Lock Yue from NTU’s School of Physical & Mathematical Sciences and researchers from the Centre for Applied Mathematics at Beijing's Tsinghua University.

This collaboration began in 2006 and takes a novel approach to the study of protein folding, regarded as one of the most intriguing questions in biophysics. A protein is a sequence of molecules or amino acids; when it is put into water, this sequence will fold into a specific shape that allows it to fit with other molecules, so as to perform certain biological functions.

The team is employing a novel computer-driven model known as Conditioned Self-Avoiding Walk (CSAW) in its investigations. "What we are trying to understand via CSAW is how a protein folds into a shape, what determines that shape, and whether we can engineer it," he explains. "We hope this statistical approach will lead to a better understanding of protein folding, and so open the door to more refined applications in drug design."

THE WRITTEN WORD

Besides science, Professor Huang's other consuming passion has been for the written word. An avid reader of literature, he has penned his own verses since he was a youth. As a postgraduate student at MIT, Professor Huang adapted Edward FitzGerald's Rubaiyat of Omar Khayyam into qijue (七绝), a classical Chinese verse form with four lines of seven characters each.

Written originally in Persian, Rubaiyat is a selection of 1,000 poems that was translated by FitzGerald into English in 1859. "This work is made up of very beautiful verses with imagery and phraseology in the best Victorian tradition," explains Professor Huang. "I loved FitzGerald's translation very much, and so it was natural for me to want to translate it into Chinese."

Published in 1953, Professor Huang's adaptation is known for its elegance and emotion. In 1986, the book, long out of print, was republished in Taiwan, and has since won over a new generation of admirers.

DRIVEN BY CURIOSITY

In 1984, Professor Huang embarked on another feat of literary translation. With the help of his wife, Rosemary, he rendered the I Ching (易经) into English. Known as the Book of Changes, it dates to the third century BC and comprises a divination system based on traditional philosophy and literature. Having first read the book as a youth, Professor Huang was eager to make its merits more readily available.

And this is precisely what he has been busy doing at NTU - sharing his knowledge and ideas with others. From discussions of scientific theory with colleagues to meeting students on the university’s premier CN Yang Scholars Programme, Professor Huang has been making the most of his time on campus, always with keenness and curiosity.

In words that might apply equally to his love of science and literature, he explains: "Our sense of curiosity is driven by the challenges we are exposed to... There are interesting elements in every question, and if we can find the answer, important implications may arise from our discovery."

Come, fill the Cup, and in the Fire of Spring
Your winter-garment of Repentance fling:
The Bird of Time has but a little way
To flutter - and the Bird is on the Wing.
— Rubaiyat, Verse 7

春火珠紅酒里天，
心中块垒碎尊前。
白驹此去无多路，
岁月无情已着鞭。

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