Faculty of Science Newsletter
香港大學理學院通訊
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We Promote Science Literacy to Community at Large

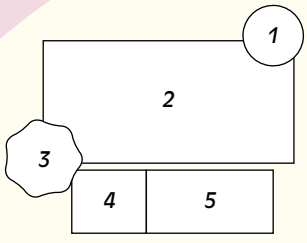
As the forerunner of science education, HKU Faculty of Science is dedicated to promoting science literacy and serving the wider society, with the combined efforts of its Departments. As part of its commitment to community involvement, the Faculty offers an array of education activities to secondary school students, teachers and general public.

Junior Science Institute

Building on the positive feedback of Summer Science Institute (SSI), which had become a centerpiece of local summer science learning activities since 2002, the Faculty has redesigned a series of hands-on workshop under our Science flagship enrichment programme, Junior Science Institute (JSI), offering secondary school students a wider exposure to different science disciplines all year round. Through a variety of inspiring workshops, laboratory exercises, field trips, lectures and other interactive activities, participants are able to embark on a journey of science exploration.

The workshops were well received by the participants. In 2010-2011, JSI benefited 583 senior scientifically-inclined students from 160 secondary schools, and has provided them with science-rich, fun-filled experiences. From their evaluations, about 80% of the students agreed that the programmes they took were well-organized and well-presented; they found the programmes enjoyable and inspiring. They also reflected that the programmes aroused their interest in studying the relevant science subjects in the future.

Hear from our participants for their unique experience:
"This is an excellent experience for secondary school students."
"It can enhance my understanding in astronomy. It also provides me with a precious opportunity in using telescope for star -gazing."
"We can learn something that we can't learn at school."
"It is a golden opportunity for us to explore more about the subject that we are interested in. It also allows us to have a glimpse of university life."



1. *A participant of 'The Magic of Polymers' workshop' was synthesizing polymers.*
2. *The JSI offers science-rich experience to senior secondary school students.*
3. *Students enjoyed star-gazing with telescope at 'Astronomy Workshop'.*
4. *A reptile discovered during the 'Hong Kong Amphibians & Reptiles-Night Safari at Tai Po Kau Nature Reserve' workshop.*
5. *A demonstrator was elaborating the Earth system with the magic globe at the "Discovering the Earth" workshop.*

From The Editor

Dear readers,

Professors and teachers in a modern university can no longer hide themselves in the ivory tower, doing simply research and teaching and with little interaction with the rest of the world. They also have the responsibility of communicating their findings to the public. In this issue of *science@HKU*, we highlight some of the recent outreach events organized by the Science Faculty, as one of the means to promote science literacy to the general public and to the youth in particular. We also include an interview of Professor N Mok, the Edmund and Peggy Tse Professor in Mathematics, in which you will learn not just about his mathematical contributions, but also his interesting life as a mathematician.

Yours sincerely,
Dr H F Chau
Chief Editor

Contents

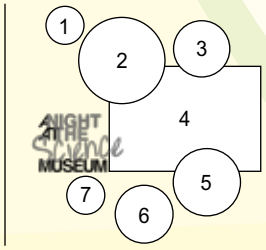
A Night at the Science Museum

The HKU Faculties of Science and Engineering in conjunction with the Hong Kong Science Museum and IBM Hong Kong, co-organized "A Night at the Science Museum" on Nov 11-12 and 18-19, 2011 to celebrate the centenary of HKU, IBM Hong Kong, and also the 20th Anniversary of Science Museum.

For the first time ever, the Science Museum opened its doors at night, from 9pm to 9am, for an extraordinary night of science and technology. There were 60 schools and about 600 students joining the event, participating in the tailor-made programme, including Icebreaker Challenge, which required teams to work together to build a tower from dried spaghetti, string and tape, topped by a single marshmallow. There were 7 hands-on science workshops and 5 engineering workshops offering a taste of hands-on scientific enquiry to the students. Over 70 staff and students were involved in the organization of the 2 overnight camps.

Workshops offered by the Faculty of Science:

- *Forensic Science: Be a Crime Scene Investigator*
- *Games and Mathematical Mind*
- *Glow in the dark science: Biological applications*
- *Glow in the dark science: Geological applications*
- *The Sky at Night*
- *Visualizing Cells*
- *You Scream, I Scream, We All Scream for Ice Cream*

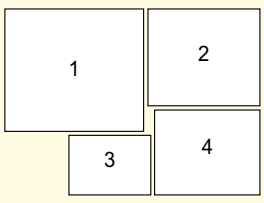


1. *Geological application workshop.*
2. *Participants were excited about the programme ahead.*
3. *You Scream, I Scream, We All Scream for Ice Cream workshop.*
4. *Opening Ceremony of A Night at the Science Museum.*
5. *Ice-breaking Marshmallow Challenge.*
6. *Forensic Science: Be a Crime Scene Investigator workshop.*
7. *Amazing Race in the Science Museum.*

Chemistry Week – Our Life, Our Future

The Year 2011 was declared as the International Year of Chemistry (IYC) by the United Nations Educational, Scientific, and Cultural Organization (UNESCO). To celebrate the achievements of Chemistry and its contributions to the well-being of mankind, the Department of Chemistry organized a week "Chemistry Week – Our Life, Our Future", in collaboration with the General Education Unit, HKU, and with the support from American Chemistry Society (HK Chapter), Chemistry Society, SS, HKUSU, and the Faculty of Science, HKU.

The Chemistry Week, held on October 4 – 13, 2011, comprised a series of programmes, including two dialogue sessions with renowned chemists Professor Vivian Yam and Dr Sarah Liao, as well as interesting chemistry magic shows and workshops, promoting Chemistry to the University community, secondary school students and the public. The Chemistry Week drew over 900 participants, of which 250 of them were students from over 20 local secondary schools. The event also attracted the crew of Euronews, an Europe television broadcasting firm, to film for their programme "Learning World – Chemistry in the Classroom".

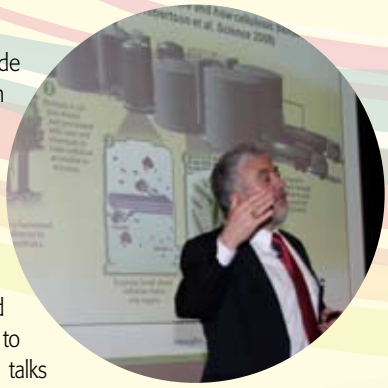


1. *HKU Chemistry Week Opening Ceremony.*
2. *Professor F Ekkehardt Hahn, who has a reputation of being the David Copperfield of Chemistry Magic, demonstrated fundamental concepts of chemistry with exciting performances in the Magic Show.*
3. *Students collecting suspected fingerprints from a glass surface.*
4. *Professor Vivian Yam (second from the left) encouraged the young generations to pursue their dreams in the Dialogue Session.*

Public Lectures and Talk @ My School Programme

A series of diverse Faculty public lectures are delivered to the public throughout the year to explore sciences topics of general interest and concern, thus enhancing their awareness and understanding of different science disciplines and controversial issues. A total of 8 lectures, 3 seminars and 1 dialogue session were organized in 2010-2011. International experts including Nobel Laureate and member of National Academy of Sciences, USA, were invited to talk about current frontier areas of science and subjects of interdisciplinary nature. The lectures and talks were all well received, with over 2,300 audience in total, including university members, secondary school students and the general public.

The Faculty has been organizing talks on a wide range of science issues along with admission talks in secondary schools, increasing the understanding of prospective students on both science disciplines and the Faculty's curriculum. Our Student Ambassadors also help to reach out to scientifically-inclined students and bridge the gap between the Faculty and the community. We have organized 60 talks in 2010-11 and are committed to organize 29 school talks and 13 admission talks in the 2011-12.



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1. *HKU Centenary Distinguished Lecture on protein universe delivered by Professor Kurt Wüthrich, Recipient of the Nobel Prize in Chemistry in 2002.*
2. *Faculty Centenary Lecture on the opportunities and challenges in developing sustainable biofuels from cellulosic plant biomass, delivered by Professor Timothy Donohue of University of Wisconsin-Madison.*

Visit of Campus and Facilities

Secondary school science students visiting the Main Campus

The Faculty welcomes secondary school groups and public to visit our campus and facilities. Laboratory tours, science-rich and fun-filled demonstrations are designed to arouse visitors' interest and appreciation of science. They also have the chance to see our modern research facilities, meet with out Student Ambassadors, visit different science departments and tour around the campus.

Stephen Hui Geological Museum

The Stephen Hui Geological Museum, also one of the highlights of the campus visit, provides an attractive object-based learning facility for visitors of all ages to understand the dynamic nature and evolution of our planet. As the first geological museum and the largest museum gallery on Earth Science related topics in Hong Kong, it enjoys an increasing popularity among a diverse audience. Since the opening of the Museum in 2009, the free admission 2-hour guided museum tours engaged and inspired up to 10,000 participants from primary and secondary schools, elderly centres, societies and general public and recently welcomed an increasing number of overseas groups from Mainland China, Macau, Taiwan, Singapore, Korea, Thailand and USA.

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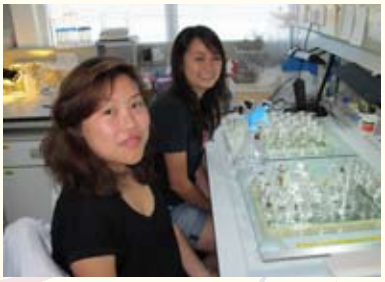
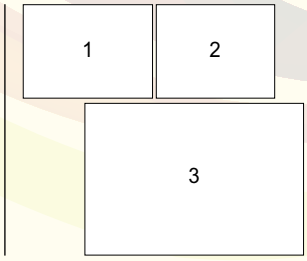
1. *Elderly Centre visiting the Stephen Hui Geological Museum.*
2. *Fu Hong Society visiting the Stephen Hui Geological Museum.*
3. *Object-based learning at the Stephen Hui Geological Museum.*
4. *Primary School visiting the Stephen Hui Geological Museum.*

Swire Institute of Marine Science



Situated in Hong Kong's only Marine Reserve, the Swire Institute of Marine Science (SWIMS), provides an ideal situation for school children, university students and general public to learn more about Hong Kong's marine environment as well as to experience how a modern scientific laboratory functions. School classes come to SWIMS to study marine organisms in their natural environment as part of their curricula, whilst also learning about modern experimental techniques. More importantly, these students also gain an insight into the work being conducted at SWIMS to conserve and protect Hong Kong's rich biodiversity. SWIMS has 350 school students participating its classes on average a year. SWIMS is also very popular for school and undergraduate students from both Hong Kong and overseas, who come for internship programmes and also first-hand research experience.



1. *Sally (up), University of Southampton, UK and Sharon (down), Bristol University, UK as summer helpers in SWIMS.*
2. *West Island School kids visiting the SWIMS.*
3. *The Swire Institute of Marine Science.*

Other science education activities include:

- Hands-on Polymerase Chain Reaction (PCR) training workshop for secondary school teachers and technicians by School of Biological Sciences.

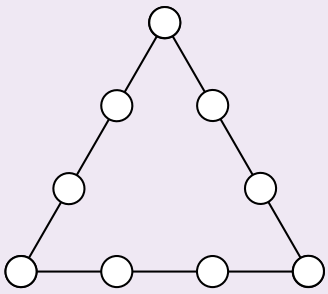
- Training for International Mathematical Olympiads and Chemistry Olympiad for Tertiary Institutions.

- Science Roadshow – "Transit of Venus" astronomical phenomenon activities series, including teachers' trainings, public lectures and observation to be held from April to June, 2012 with the Department of Physics. For details, please visit: http://roadshow.science.hku.hk and http://www.transitofvenus.hk

科學巡禮 SCIENCE ROADSHOW

Brainteaser

Questions



Is it possible to put the numbers 1 to 9 in the circles in the figure so that each side of the triangle adds up to 20? Explain your answer carefully.

Please email your answer together with your name and school (for students), to scinews@hku.hk. FIVE winners will be drawn randomly from the contestants who give the correct answer. Winners will be informed by the Faculty individually.

Prize: *HKU Centenary Stamps – Special Gift Pack*
Deadline: June 30, 2012

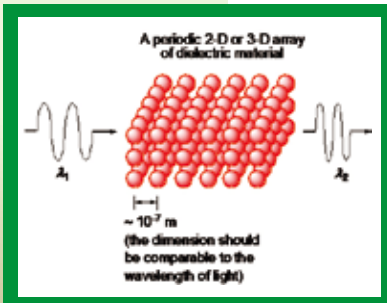
Questions of last issue: The existence of this type of particles was postulated before their discovery. Their properties are very difficult to determine partly because they rarely interact with others. We once believed that they are massless although their precise masses are still not very certain. What are they?

Answers: Neutrinos

Nanotechnology by the Nature

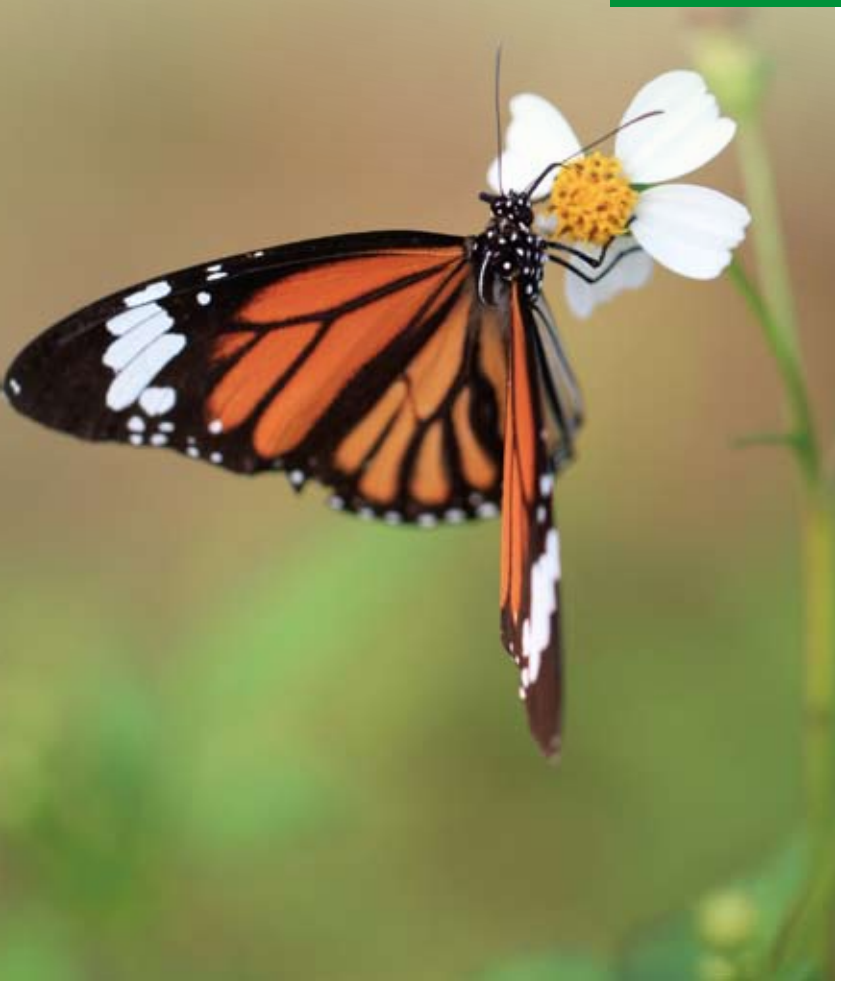
by Professor W K Chan, Department of Chemistry

You have probably noticed that many insects, such as butterflies and beetles, exhibit highly vivid color. Similar phenomenon can also be observed in some minerals such as opals, and the inside surfaces of oyster or abalone shells, which exhibit iridescent color. We have learned that the color of an object is determined by the color of light it absorbs. For example, upon irradiation with white light, if an object absorbs all the blue color components, it will appear as a yellow object (yellow is complementary to blue light). In simple words, the color of light it absorbs is determined by the energy gap (color) between the ground state and excited state of the atoms/molecules involved. This applies to many colorful objects we see in the nature, such as flowers, leaves, dyes etc.



Schematic diagram showing the interaction between electromagnetic wave and photonic crystals and the subsequent frequency change.

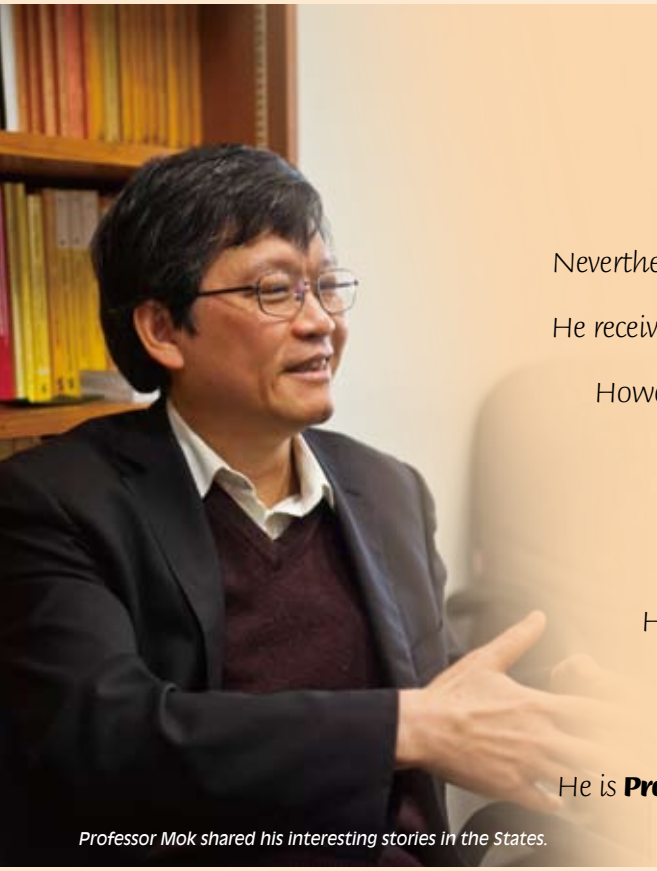
An opal comes in a wide range of vivid colours.



However, the coloring effect exhibited by butterfly wings is not due to the direct absorption of light by the materials. Instead, it is due to the presence of a photonic crystal network on the surface of the wing scales. Photonic crystals refer to an periodic network of structures in the order of nanometer (10^{-9} m) scale. When there is an array of 2-dimensional (or 3-dimensional) nanoparticles, either synthetic or natural (e.g. polystyrene sphere, silica, calcium carbonate), the propagation of light wave in the material will be affected by this network. The motion (and hence its energy) of a photon will subsequently be affected by the periodicity of this nanoparticle/nanocrystal network. As a result, the energy (and hence its color) of light will be changed when it emits from the surface of the photonic crystals.

On the surface of butterfly wing scales, there exists a network of photonic crystals, which is composed of chitin (a biopolymer without any intense color). On the inside surface of abalone shells, there are many thin layers of calcium carbonate, which produce similar effects.

It is of tremendous interest for scientists to mimic the biological world by constructing extensive nanocrystal/nanoparticle networks. The processes and techniques developed in studying these materials in nanometer scale in recent years form the basis of modern nanotechnology. Not only new scientific knowledge can be obtained, but some interesting commercial products are also developed based on nanotechnology. For example, nanocrystal-based pigments that exhibit iridescent or pearlescent coloring effects have been applied in paints or decorative items.



Professor Mok shared his interesting stories in the States.

Mathematics as Life

by Qiu Xiaoyi Janet, year 1, BSc (intended major: Mathematics)

He does not have a bachelor degree.

Nevertheless, he obtained both master and doctor degrees in mathematics.

He received the University Distinguished Research Achievement Award 2011.

However, he regarded this as recognition of research achievements in fundamental sciences rather than of himself.

He is a "self-trained" linguist.

And he can speak more than 8 different languages.

He determined to pursue mathematics since primary school.

And he has been the Director of the Institute of Mathematical Research (IMR) since 1999.

He is **Professor N Mok**, *Edmund and Peggy Tse Professor in Mathematics.*

I am really honored to have this valuable opportunity to carry out an interview with Professor Mok, one of the most organized and rigorous people I have ever known. As a graduate of St. Paul's Co-educational College in 1975, Professor Mok went abroad to further his studies in pure mathematics. Among the universities that he was accepted into, he chose The University of Chicago, of which the rigorous programme in mathematics allowed him to "do graduate mathematics in the first year". However, after one-year exploration, he discovered that his real interest lied in several complex variables, where Yale University could offer him more opportunities in that field. Therefore, he transferred to Yale and then Stanford University to pursue his PhD in Mathematics. In other words, his journey from a high school graduate to a PhD laureate took only 5 years. Despite his exceptional gift, he emphasized that speed is not the most important thing throughout the learning process. For graduate students, it is much more important to be prepared and equipped. "One should take full advantage of the time available during student years to lay groundwork for the long years of research lying ahead," said Professor Mok. After those five years, he embarked on his academic career at Princeton University and Columbia University. When asked why he had such a path of learning and teaching, he responded jokingly, "To some extent I like the east coast better."

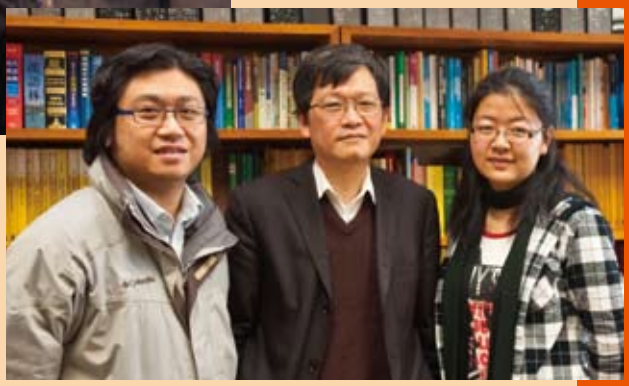
In fact, from Chicago to Yale then to Columbia, Professor Mok was able to get closer and closer to New York City, a center of cultures. While exposed to western culture, he kept abreast of current affairs taking place in Hong Kong and Mainland China, and had close connection with overseas students from Hong Kong and Taiwan. More interestingly, it was during his stay in the States that he mastered Mandarin, which was unfamiliar to him before. With the help of friends and Hanyu Pinyin system, his pronunciation became authentic. "I had to communicate with a lot of people from Taiwan and Mainland China. So I sort of improved along the line," he recalled. "The door was open for me to see the bigger Chinese world." Beside Mandarin, he can speak French fluently as well. He had even taught in French in the Université de Paris (Orsay) from 1989 to 1994 before coming back to Hong Kong and taking up a Chair Professorship at The University of Hong Kong. From his perspective, learning mathematics and languages both require the ability to "recognize patterns in a routine manner and absorb such patterns into a system for the expression of more complicated thoughts". Professor Mok is interested in languages, cultural activities and current affairs at home and abroad, and he is never a bookworm.

In order to learn more about Professor Mok, I attended one of his classes for postgraduate students, and was impressed by his enthusiasm and passion on teaching. With a chalk in his hand and always writing on the board, he was completely absorbed in the world of mathematics, confidently and energetically. He said, "I prefer using blackboard and chalk. In this way my students can see Mathematics in action. They can see the main ideas and key points in the derivation of theorems and mathematical formulae. It can also make the class more interactive." Through these lines, I was touched, not by a professional mathematician, but simply a dedicated teacher.

Professor Mok certainly pays much attention to the training of mathematics students, hoping that they will view mathematics as an undergraduate major from an appropriate perspective – taking Mathematics as major does not necessarily mean that one must choose research as one's career. In fact, this major does equip one with basic mathematical tools to deal with data and patterns, which one would find beneficial to one's future career. Inspirationally he said, "It is sometimes not just the contents of the courses but also the training which you go through that count for your future."

Professor Mok also holds great expectations for the future of mathematics and the new generation. "In a knowledge-based society, some basic knowledge of quantitative skills and an understanding of mathematical notions are equally important for everyone. Without solid background in mathematics, it is difficult to articulate one's description of processes."

Professor Mok (in the middle) being honored at the University Award Presentation Ceremony for Excellence in Teaching and Research 2011 for his outstanding achievements in research excellence.



I (right) had a nice talk with Professor Mok (in the middle) and Mr SL Cheung, Professor Mok's past student from the Faculty.

Distinctions and Achievements of Professor Mok:

- **Presidential Young Investigator Award of the US (1985)**
- **The Croucher Senior Fellowship Award (1998)**
- **Outstanding Researcher Award of The University of Hong Kong (2000)**
- **State Natural Science Award (2nd Class Prize) (2007)**
- **Member of the Fields Medal Committee for the International Congress of Mathematicians (ICM 2010)**
- **The 2009 Bergman Prize of the American Mathematical Society (2011)**
- **Distinguished Research Achievement Award of The University of Hong Kong (2011)**

Throughout the interview and the class, Professor Mok showed me that mathematics does not merely mean a career to him, but also a lifestyle. The way he thinks and the way he talks both impress me with the features of mathematical logic and structures. I am sure, as a mathematics student, that it will be a great pity if I graduate from HKU without ever taking his courses. He also reminds me of what Steve Jobs addressed in his commencement speech at the graduation ceremony of Stanford University -- "the only way to do great work is to love what you do". Yes, it is the passion he has and the contribution he made for his beloved career that keep him going and stimulate him to continue to explore the fabulous world of mathematics.

He is Professor N Mok, a low-profile professor dedicated to his career and a man treating mathematics as life.

Dr Edmund Tse (left) and Professor Mok at the dedication ceremony of Edmund and Peggy Tse Professorship in Mathematics in 2011.

Student Reporter Profile

Qiu Xiaoyi, Janet

Year 1, BSc (intended major: Mathematics)

'As a non-local freshman, I would say coming to HK and HKU is a choice that I will never regret. By participating in a variety of activities here, I am exposed to a relatively open and diverse culture, which allows me to blend into this new environment. Learning science, particularly mathematics, enables me to develop a more critical and scientific way of thinking, and "asking why" has become a habit of mine at my day-by-day encounters. I am sure that my university life will be an unforgettable and fruitful one.'

About IMR

As the Director of IMR, Professor Mok aims at providing a platform where researchers in Mathematics can freely exchange their research ideas, and create an ambiance which facilitates the cross-fertilization between different fields of Mathematics. "I hope the Institute can provide a training ground for researchers in Hong Kong through exposure to new topics of research and interaction with leading researchers in various fields of Mathematics," said Professor Mok. "At the same time, it should also provide a channel for interdisciplinary research on the interface of Mathematics and mathematical sciences, e.g., quantitative finance, information science and mathematical biology."

ACHIEVEMENTS

University Awards for Excellence in Teaching and Research

- **Professor N Mok**, Edmund and Peggy Tse Professor in Mathematics, was granted the University's highest research honour – ***Distinguished Research Achievement Award for 2010-2011***, of which the award is made to outstanding researcher who has achieved international distinction and at the forefront of their chosen field.

- **Dr A P L Tong,** Department of Chemistry, received the ***University Outstanding Teaching Award (OTA)*** of the ***Teaching Excellence Award Scheme (TEAS) 2010-2011*** for her achievements and contributions in teaching excellence and engagement with students and their learning, and curriculum design, renewal and innovation.

- **Professor W Zang** of Department of Mathematics received the ***University Outstanding Researcher Award 2010-2011*** for his exceptional research achievements of international merit.

Professor Zang also shared the ***Research Output Prize 2010-2011*** with Xujin Chen and Zhibin Chen for their efforts on the research paper entitled "*A Unified Approach to Box-Mengerian Hypergraphs*" in *Mathematics of Operations Research* Vol. 35, No. 3 (August 2010), 655-668.

External Awards

- **Professor V W W Yam**, Philip Wong Wilson Wong Professor in Chemistry and Energy, was awarded the ***Ho Leung Ho Lee (HLHL) Prize for Scientific and Technological Progress*** for her contributions in light-emitting materials and innovative ways of capturing solar energy. The HLHL Foundation was established in 1994 to reward excellence in Chinese scholarship in the scientific and medical fields, to encourage respect for knowledge and motivate talented people, and to foment scientific research through the encouragement of scientific and technological workers.

- **Professor T W K Fung**, Department of Statistics and Actuarial Science, was honored the ***Fellow of American Association for the Advancement of Science (AAAS)*** on 18 February 2012 during the AAAS Annual Meeting in Vancouver, British Columbia, for his significant contributions to statistical DNA forensics, robust statistics, professional services, dissemination of statistical knowledge to forensic community, communicating and interpretating of statistics to the public.

Other University Honours

- **Mr Stanley Yu Lun Chu**, Distinguished Science Alumnus 2009; **Mr Patrick Sun Cheong Poon**, Distinguished Science Alumnus 2009; and **Professor Man Keung Siu**, Honorary Professor of Department of Mathematics, were awarded the ***Honorary University Fellowships 2011***, in recognition of their contributions to the University and the community.

LECTURE

Professor V W W Yam (third from the right) and guests at the lecure

- **November 22, 2011:** "The World of Colours - From Fundamental Science to Energy and Materials" by ***Professor* V W W Yam**, Philip Wong Wilson Wong Professor in Chemistry and Energy, Department of Chemistry. This lecture was co-organized by the Faculty of Science and UNESCO Hong Kong Association.

- **November 30, 2011:** Public Lecture by Hung Hing Ying Distinguished Visiting Professor in Science and Technology – "Wonder of Matter" by **Professor Luk Kam-biu**, Professor of Physics, University of California, Berkeley, and Fellow of the American Physical Society.

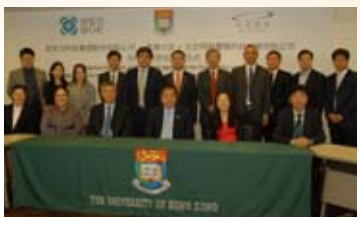
Ms Belinda Hung, Professor Sun Kwok and Professor Luk Kam-biu (from the left)

- **February 17, 2012:** "The Emperor's New Lessons: How and Why Did Emperor Kangxi Learn Western Science and Mathematics?" by **Professor Siu Man Keung**, Honorary Professor of Department of Mathematics and Department of Physics.

Professor Siu

OTHERS

- The University of Hong Kong, BoE Technology Group Co. Ltd., and Beijing Aglaia Technology and Development Co., Ltd., had signed a tripartite framework agreement on the collaboration in Active Matrix Organic Light-Emitting Diode (AMOLED) development in November, 2011, which established a mechanism on the collaboration of Opto-electronics technology, Organic Light-Emitting Diode (OLED) display technology, and facilitated the exchange of knowledge for this cutting edge research. The HKU team is led by **Professor C M Che** of Department of Chemistry.



AMOLED signing ceremony

- The Department of Statistics and Actuarial Science was designated as a Center of Actuarial Excellence by the Society of Actuaries on 15 December 2011. The designation is awarded for a period of five years to schools which demonstrate excellence in actuarial science through meeting strict criteria in quality of curriculum, number and quality of graduates, qualified faculty, strong ties to business, and beneficial research and scholarship.

Center of Actuarial Excellence by the Society of Actuaries

For details: please visit http://www.scifac.hku.hk/

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