



## SUN SHINES IN SCIENCE

### — Interview with Professor Sun Kwok, new Dean of Science

The Faculty of Science is pleased to welcome the arrival of the new Dean, Professor Sun Kwok, in February this year. In this kick-off issue, Professor Kwok shares with us his passion for science.

#### Discovering excitement in science

Professor Kwok is a renowned astronomer. His theory on the origin of planetary nebulae — spectacular-looking objects formed near the end of a star's life, has become the standard model for the death of stars like our Sun. Surprisingly, Kwok was not a born enthusiast of astronomy.

Kwok graduated from Pui Ching Middle School in 1967, in an era when secondary school students were not exposed to many disciplines beyond the school curriculum. "In my high school, I liked to build radios," said Kwok, "and therefore I chose to do electrical engineering."

It was until one day when Kwok picked up a book called *Frontiers of Astronomy* by Fred Hoyle that unveiled the world of astronomy to him. He was amazed by how physics could be applied to explain the universe. By the time he finished the book, Kwok decided to go into astronomy.

## From the Editor

Dear readers,

In front of you is the first issue of science@HKU, the newsletter of the Faculty of Science, HKU. I hope you will enjoy reading it. This newsletter will be published two times a year. We hope it can serve as a meeting point not just for us to disseminate the latest news and views of the faculty and her members, but also for you — alumni, parents, students and teachers to voice your opinions and to share your latest developments. Letters to the Editor, in English or Chinese, can be sent directly to the Faculty of Science, HKU or to [scinews@hku.hk](mailto:scinews@hku.hk).

Every issue of science@HKU has a theme. This very first issue features an interview with our new Dean, Professor Sun Kwok. He is happy to share with us his passion for science. The newsletter also carries a number of regular columns.

One of them is "Behind the News" in which readers will be guided to explore the science behind news stories.

Electronic copies of science@HKU are available on the web at <http://www.hku.hk/scinews>. Please tell us which format you want to receive your future issues by filling in the reply slip attached. Our next issue will feature the science education reform. Please write to us if you wish to share your thoughts. Last but not least, you may earn a HK\$50 book coupon. Please find out how by reading this issue carefully.

Yours sincerely,  
HF Chau  
Chief Editor

### Communicating with the public

Since then, Kwok embarked on the road of scientific exploration. He spent over two decades in the University of Calgary teaching and doing research. In 1994, Kwok was designated the Canadian Principal Investigator of the **Odin** mission, an international astronomy and aeronomy project. The satellite **Odin** was launched successfully from Svobodny, Siberia on February 20, 2001.

Together with his discovery of a missing link in the final lives of stars (a new class of objects called proto-planetary nebulae) using observations from the Hubble Space Telescope, and that very old stars can produce extremely complex organic compounds from observations with the

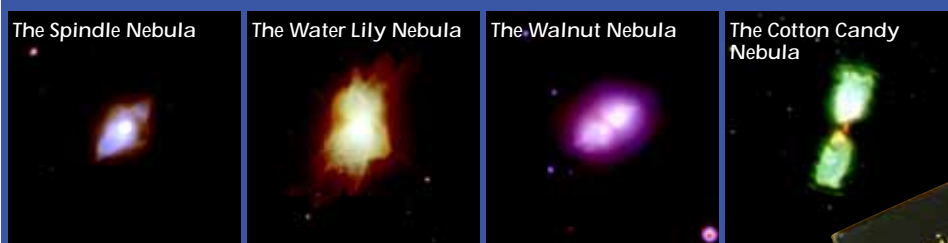
future of the Sun and how stars die. It has become one of the best selling science books.

Hong Kong-born Kwok also serves as an advisor for the Hong Kong Space Museum, and has produced a sky show based on a simplified version of the **Cosmic Butterflies**.

### Trend of science development

While he feels it is important to share the excitement of scientific discussions with the public, Kwok believes there is an even more urgent and vital mission of the scientist. Kwok's vision on the future of science is that it will become more inter-disciplinary where the boundaries of classical fields of science are blurring. Having knowledge

Proto-planetary nebulae discovered by Professor Kwok observed with the Hubble Space Telescope



Infrared Space Telescope, Kwok enjoys a high international standing.

Nevertheless, Kwok is not contented. As a leading scientist, he finds that science is indeed for everyone. Kwok always believes that many aspects in modern science are extremely interesting to the layman.

"Scientists should try their best to find a way to relay the interests of science to the public," he paused and continued in a firm tone, "Personally, I see this as a very important thing to do!"

Therefore, Kwok has written numerous articles for popular science magazines. In this book **Cosmic Butterflies** published in 2001, he featured more than 100 beautiful pictures of planetary nebulae taken through the Hubble Space Telescope. In simple language, the book tells the

Publications by Professor Kwok



of just a single discipline can no longer help to solve many contemporary problems.

An example is astronomy. It used to be a study of applied physics but has now moved to incorporate more knowledge from the fields of chemistry, biology and geology. "Now I am doing a lot of research on organic things; I have to learn from my daughter's biochemistry textbook," said Professor Kwok, "after all, learning is an continuing process."

### Some words to secondary school students

There is a big world out there and there are a lot of things to see! Be adventurous! Don't be afraid to explore, in particular when you are young. Young people have more advantages: you are more daring and more curious, and you are not bounded so much by traditions. This is the best time of your life and you have to take advantage of it!



Observing at the Canada-France-Hawaii Telescope with a student

## CV of Professor Sun Kwok

2006 - current	Dean of Science and Chair Professor of Physics, The University of Hong Kong
2003 - 2005	Director and Distinguished Research Fellow, Institute of Astronomy & Astrophysics, Academia Sinica, Taiwan
1983 - 2005	Professor, Department of Physics & Astronomy, University of Calgary, Canada
1978 - 1983	Research Associate, Herzberg Institute of Astrophysics, Ottawa, Canada
1974	PhD, University of Minnesota, USA
1970	BSc, McMaster University, Canada
1967	Pui Ching Middle School, Hong Kong

But the blurring of boundaries does not end within the realm of science. As society gets more complicated, Kwok expects that solutions to science issues would even cross over to other disciplines. "Such as environmental problems, they are no longer simply basic science or engineering problems but are also engaged in the areas of sociology or government policy."

The world is changing faster than it used to be. Kwok pinpointed there are something universities can do to help the younger generation tackle the situation. He viewed that university should not be a vocational institution. Instead, the current curriculum can be broadened so that students can be exposed to a wider range of subject matters. "By the time they graduate, they are more adaptable to changes."

### Why HKU?

Back to the basic question: Why and what actually brought Kwok back to his birthplace after spending most of his career overseas?

When Kwok visited HKU last October, he was "impressed with the University's determination to achieve a higher level of quality both in research and teaching." He also found it exciting when he heard of the university expansion plans.

But behind these reasons, there is one personal yet important catalyst. "It is an opportunity for me, as someone who was born in Hong Kong, to do something for the society and for the university." In the end, this was the deciding factor that he agreed to take up the deanship.

### Looking ahead

As he is still new to the Faculty, Kwok prefers not to be specific on any new plans at the moment. Yet, he has revealed his management philosophy by stressing that "the most important success of an institution is the people it has." ♦

## Congratulations...

### To our teachers

- **Professor Vivian W W Yam**, Department of Chemistry Second Class Prize, National Natural Science Award 2005



- **Professor David L Phillips**, Department of Chemistry, Croucher Senior Research Fellowship 2006-07
- **Dr Paul S F Yip**, Department of Statistics and Actuarial Science, Silver Innovation Award 2005 awarded by the Asia Wall Street Journal and Singapore Economic Development Board
- Excellence in Teaching and Research 2005 Distinguished Research Achievement Award: **Professor F C Zhang**, Department of Physics Outstanding Researcher Award: **Dr Billy K C Chow**, Department of Zoology Outstanding Young Researcher Award: **Dr H Z Sun**, Department of Chemistry



From left:  
Dr Sun,  
Professor Zhang,  
Dr Chow

### To our students

- Three Chemistry students:  
**Wong Ka Yu** (year 3)  
**Au Ka Man** (year 2)  
**Xue Mingyu** (year 1)  
won the Silver Medal in the 17th Hong Kong Chemistry Olympiad on February 18, 2006 at the City University of Hong Kong
- **Yue-Qing Hu**, PhD student of Actuarial Science, was awarded the 2nd Class Award for his project "The Evaluation of DNA Mixtures in Forensic Science and the Associated Computer Software", with supervisor Professor Wing-Kam Fung at the 9th Nation-wide Challenge Cup Competition at Fudan University, Shanghai in November 2005. ♦



# 崔琦打破神話 與中學生真情對話

文：楊蕙妍

諾貝爾物理學獎得主崔琦教授應香港大學物理系邀請，在去年十二月十二日與來自十四間中學共二十五位鍾情物理的同學見面，分享他的科研抱負和人生體驗。這一次真情對話，崔琦親身親口打破了三大神話：

## 神話一：諾貝爾得獎者都是非常嚴謹、不苟言笑的學者。

同學們與崔琦見面後，一定會對科學家大為改觀。崔琦一身深藍色斜布褲、白襯衣，外罩藍色V領毛衣。坐在學生群中，驟眼來看跟他們別無兩樣。崔琦毫無架子，同學恭敬地站起來提問，他連忙著同學坐下，笑稱無須拘泥。他會認真地回答同學的提問，但同時又會自願自的笑了出來。到了聚會後期，崔教授越坐越低，甚至把膝頭頂在會議桌的邊沿，反映出他平易近人的作風。



## 神話二：科學家總說著令人難以明白的理論。

同學問崔琦如何將意念轉化為具體研究，又怎樣解決研究時遇上的問題，只見崔琦揮動著雙手說：「科研就如游泳踏單車一樣。踏單車，你只教人兩隻腳上落上落是不足夠的。你給他一輛單車，三天就學懂了！物理也是同樣道理。」單靠理論行不通，所以他鼓勵同學要勇於發問和嘗試，強調必須親身經歷才有實際經驗，才能領略到箇中道理。

有同學投訴物理很抽象，崔琦對此說不表贊同。「『物理很抽象』只是一個 myth (神話)。物理是最實際的，你們的手提電話、數碼相機和它的閃光燈，其實就是物理學理論和實驗的成果。」

既然物理不抽象，同學又應怎樣裝備自己投身科研工作呢？崔琦沒有叫同學要唸甚麼學位，卻叫同學們「自己去探索」，因為時下年青人有很多出路，同學「要主動找尋真正的興趣，無須擔心選錯科，因為即使選錯又如何？你們仍有很多機會。」擁有時間和無限精力，確是年輕人的最大本錢。

崔琦教授一九三九年在中國河南出生，十二歲時移居香港。他在香港培正中學畢業後負笈美國，並在一九六七年在芝加哥大學取得物理學博士學位。崔琦後來加入新澤西州貝爾研究所(Bell Laboratories)工作，專門研究固體物理學(Fractional Quantum)。十三年後，他在一九八二年轉到普林斯頓大學電子工程系，任教至今。

憑著在一九八二年與另外兩位科學家發現分數量子霍爾效應(Fractional Quantum Hall Effect)，崔琦在一九九八年獲得諾貝爾物理學獎。崔教授是香港大學物理系的訪問學人，並為去年成立的理論和計算物理中心擔任榮譽總監。

## 神話三：成功人士喜歡與別人分享成功心得和秘訣。

但同學請崔琦說一些勉勵的說話時，崔教授忙不迭「耍手擰頭」，甚至叫同學「不要相信勉勵」，因為他不相信一句話就可以解決所有問題。崔琦認為每個人都有本身的才能和不同的經歷，所以不要盲目相信別人的一套。只要有適當指導，每個人都有發揮潛能的機會，便可達至成功。

不過，崔琦最後還是提醒了同學，做人不一定要做大事。他笑言：「做令自己滿足的事，對社會、又甚至只是同房、同學和親友有好處的事就夠了！人生的價值不是靠金錢，或事事靠別人評價，這樣會很難過下去。」

這次分享，沒有高深的科學名詞滿場飛，卻讓同學明白到：科學家不是超人；科學也不是神話。科學家和你我一樣，都是平常人，也只有一個腦袋。分別，就在乎你怎去踏出第一步，提出第一條問題。 ◆

## Centre established for physics collaboration

by Brenda Yeung

Local physicists now have an opportunity to collaborate with distinguished scientists from around the world in frontier research in physics through the establishment of the Centre of Theoretical and Computational Physics (理論和計算物理中心) in October 2005.

"The Centre serves as a platform for outstanding local scientists and young talented postgraduate students to carry out first rate research through collaborations with international research institutions and distinguished visitor programmes," said Professor Zhang Fu-chun, Director of the Centre and also Head of the Department of Physics, HKU.

The Centre is honoured to have Professor Daniel C Tsui, who received the Nobel Prize in Physics in 1998, as its Honorary Director, and renowned physicist, Fellow of Royal Society (London), Professor T Maurice Rice at ETH-Zurich as Chair of the Centre's International Advisory Committee. Other Committee members come from leading institutions in scientific research, including MIT, Stanford and Caltech.

"We are very grateful to have the support of world-class scientists who are dedicated to enhancing academic excellence and scientific research in Hong Kong" said Professor Zhang.

Currently, the Centre is conducting a number of research projects, including the cutting edge research in theoretical and computational nano-science. Workshops and seminars by members and visiting researchers are held from time to time to stimulate intellectual exchange.

More details of the Centre can be found at <http://www.physics.hku.hk/~ctcp/>. ◆



From left: Professor FC Zhang, Professor Daniel Tsui and Professor Maurice Rice.

# Treating nature as our treasure

by Allen, Wai Lun To (PhD student of the Department of Ecology & Biodiversity)

Born in 1982, I was lucky enough to grow up in a happy family. Not because of the toys, money or candies my parents offered, but because I have a dad who enjoys watching animal documentaries more than live broadcast of horse-racing, and has given me, and my brother, the freedom to keep pets. Tortoises, fishes, birds and insects were often my childhood companions. Since then, I have been fascinated by nature, especially animals.

After years of primary and secondary school study, I managed to get into the Environmental Life Science programme offered by the Department of Ecology & Biodiversity, HKU. This turned out to be one of the best decisions I have ever made.

During the three-year undergraduate study, theories and case studies were what I had expected to learn. However, what I had gained unexpectedly, was the great fun, the useful and enjoyable fieldwork experiences as well as enthusiasm, admiration and awareness of our responsibility to the nature. All these seemed to have consolidated my future studies in this field of knowledge, and luckily I was admitted to postgraduate study after graduation.

The story does not end here... Thanks to my classmates, friends and friendly teaching staff of my department, I gradually

developed a passion for photography a year ago. Butterflies, dragonflies, reptiles, amphibians, birds... Anything, you named it, and I would go and take a picture. Since then, I realize that taking pictures of nature is not only an enjoyment, it also gives me an opportunity to have a closer look at the natural environment which we are dependant on and is so



This photo, taken in late September 2005 at Sai Kung Pier, depicts a whiskered tern (*Chlidonias hybrida*) (鹽浮鷗) (a locally uncommon winter-visiting bird) with wings fully stretched catching a glassfish. It won the Hong Kong Geographic & Wildlife Photo Competition (Student Group), Radio Television Hong Kong.

(Canon 20D, 1/800, F 8.0, ISO 200)

close to us. Once you have a chance to look for wildlife in the so-called "concrete forest" of Hong Kong, I am sure you will be amazed by the high diversity of fauna and flora we have and realise the damage we have brought to nature, for one reason or another, which is in fact our home! Photography not only could document these precious local fauna and flora, but also give hard evidence to show how our nature has changed negatively.

Enjoyment, appreciation and respect can save our natural world. Let's treat our nature as a treasure. ♦

## Secondary School Support Team (SSST)

by Helen Hung

The Secondary School Support Team is established to provide quality support and resources to secondary school teachers and students in the areas of Mathematics, Statistics, Earth Sciences, Physics, Chemistry, Biology and Liberal Studies.

respectively. To view the video of the bird flu lecture, please visit [www.hku.hk/lecture](http://www.hku.hk/lecture).

### Campus and Research Laboratory Visits

More than 100 students and teachers visited the Faculty and research facilities in January and February 2006



Meeting with Professor Tsui



Game and the Mathematical Mind



Earth Sciences teaching lab



Kadoorie biology lab

### Activity Clippings:

Highlights of the SSST activities in 2005 - 2006:

#### Meeting with Nobel Laureate, Professor Daniel Tsui

Please visit <http://www.hku.hk/science/meeting> for video of the meeting.

#### Symposium & Public Lecture

A symposium on the secondary school curriculum and two public lectures on bird flu for secondary teachers and students were held in October and November 2005,

where they had science learning experience outside the classroom.

For more information about our activities, please visit our website at [www.hku.hk/ssst](http://www.hku.hk/ssst) ♦

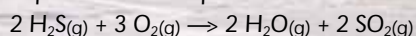


### The story

Recently, an accident happened in a hot spring in northern Japan killing three people. It drew public attention to the safety of hot springs because hot springs in Japan are very popular destinations for tourists from Hong Kong. It was suspected that the release of hydrogen sulphide ( $\text{H}_2\text{S}$ ) from the hot spring was the cause of the accident.

### $\text{SO}_2$ or $\text{H}_2\text{S}$ ?

Some news reports claimed that sulphur dioxide ( $\text{SO}_2$ ) was the killer in this accident. In fact, both  $\text{H}_2\text{S}$  and  $\text{SO}_2$  are commonly found gases in areas that have volcanic activities. When hydrogen sulphide burns in air, sulphur dioxide is produced:



However, hydrogen sulphide is approximately 5 times more toxic than sulphur dioxide.  $\text{H}_2\text{S}$  is a colourless gas that possesses the characteristic "rotten egg" smell (which is the so-called "sulphur smell" — please bear in mind that elemental sulphur is odorless). This odor can be offensive at concentrations as low as 3 to 5 parts per million (ppm). That means our nose is very sensitive to the presence of  $\text{H}_2\text{S}$ . However, upon long-term exposure to low concentration  $\text{H}_2\text{S}$ , the olfactory nerve may be overwhelmed and we may have no warning of exposure. Exposure to a high concentration ( $> 800$  ppm) of  $\text{H}_2\text{S}$  for a short period of time may cause sudden death. The toxicity of  $\text{H}_2\text{S}$  originates from its ability to form a complex with the iron in mitochondrial cytochromes, enzymes responsible for cellular respiration. The effect of arresting aerobic metabolism in cells is similar to cyanide toxicity.

### So, is it safe to visit a hot spring?

Since  $\text{H}_2\text{S}$  is a gas, it can diffuse to the environment quickly without accumulating to a harmful level. Therefore, it should be quite safe to visit a hot spring that has good ventilation.

Despite its toxicity,  $\text{H}_2\text{S}$  is very important to industry. It is used to process mineral ores and in the production of phosphors used in television tubes and computer monitors. Some metallic sulphides are semiconductors and are widely used in the microelectronic industry. ♦

## Do hot springs kill?

by Dr W K Chan, Department of Chemistry



Courtesy of Samson So

## This animal is found on the HKU campus. What is it?

Prize: \$50 book coupon

Deadline: Friday, May 26, 2006

Please email your answer, together with your name and school (for students), to [scinews@hku.hk](mailto:scinews@hku.hk). FIVE winners will be drawn randomly from contestants with the correct answer.

# Chemical Spill in Northeastern China

November 13, 2005

Jilin Province, Northeastern China

by Dr W K Chan, Department of Chemistry



## What happened?

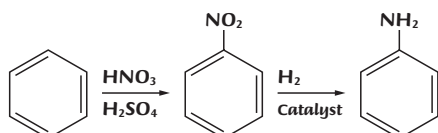
A major industrial accident happened in a chemical plant in Jilin City, Jilin Province. The accident resulted in a very serious spillage of chemicals into the Songhua Jiang. The polluted water in turn affected millions of people living along the river, which ran from China into Russia. The water supply in the City of Harbin, one of the largest cities in Northeastern China, was even suspended for a few days because the river, which is the major fresh water source for the city, was so badly polluted.

## Why fresh water supply had to be suspended?

Both benzene and nitrobenzene were found to be the major pollutants in this incident. Benzene is known to be a carcinogen. The major adverse health effect associated with its exposure is the damage to bone marrow. In turn, the body becomes incapable of properly manufacturing blood cells. Exposure of workers to benzene vapour has been associated with several cases of leukemia. Nitrobenzene is also a harmful chemical which could be hazardous to health. It can be absorbed through skin and cause damage to blood and the central nervous system. It is also toxic to aquatic organisms, and may cause long-term adverse effects on the aquatic environment.

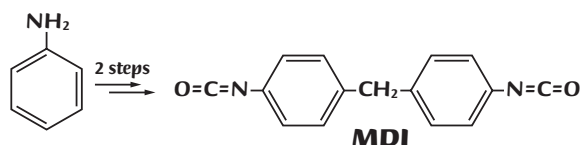
## What are benzene, nitrobenzene and aniline?

Benzene is mainly produced as one of the major products in the petroleum refining process. It is the most important aromatic organic chemical in the industry, because it serves as the starting material for many basic organic chemicals such as styrene, phenol, cyclohexane, and nitrobenzene. By nitration, benzene is converted to nitrobenzene, which is then reduced to aniline by catalytic hydrogenation:



Nitrobenzene mainly serves as an intermediate chemical for the production of aniline. Small amount of nitrobenzene are used for the production of acetaminophen, which is a very common pain-killing drug.

The most important use of aniline is in the manufacturing of p,p'-methylene diphenyl diisocyanate (MDI), a monomer for the production of polyurethane. Polyurethane is a major component in many synthetic elastic fibers for clothing. Aniline is also used in the production of vulcanization accelerators, which are critical to the rubber industry. Other applications include the production of various dyes, pigments, and herbicides.



## How to clear up the pollutants?

You may have noticed that activated carbon was used to clean up the polluted water. Activated carbon is actually elemental carbon with a very large surface area and pore volume. Due to the presence of many small pores on the surface, the molecules are trapped in the highly porous surface of the activated charcoal. The amount of material adsorbed by activated carbon is surprisingly large, which may be as much as the weight of the activated carbon used. It is used in solution purification such as cleanup of cane, beet, or corn sugar solutions. It is also used as the absorbent in military or industrial gas masks because of its ability to absorb certain poisonous gases. In consumer products, it can be found in "smell absorbers" for refrigerator and filtering columns for drinking water. In this incident, tons of activated carbon were dumped into the water purification plant in order to remove the organic pollutants in the drinking water. ♦



## Faculty announcement

### UE Waiver for JUPAS in 2006

The University will introduce new English language courses for students who have special needs. With these new courses, the Faculty of Science now accepts JUPAS applicants with Grade E in Use of English applying for admission to the following physical science programmes in 2006:

Chemistry, Chemistry with Management, Earth Sciences, Mathematics, Physics, Mathematics/Physics, Statistics

Please go to the Faculty website at [www.hku.hk/science](http://www.hku.hk/science) for more details.

### Visit by Distinguished Scholar

Professor T M Rice from ETH-Zurich, appointed as Distinguished Visiting Professor by The University of Hong Kong, visited the Physics Department in December, 2005. Professor Rice is a world leader in condensed matter physics, mainly interested in correlated electron systems and was a theory group leader at the Bell Lab. Professor Rice is a foreign Fellow of Royal Society at UK, member of the US National Academy of Sciences. He is a recipient of Hewlett-Packard Award of European Physical Society and Bardeen Prize for Superconductivity among many honours.



### Recent Events

#### Public Lectures

- December 10, 2005: 「數論初探——一些懸疑未決的難題」 by Dr K M Tsang, Department of Mathematics.



- March 24, 2006: Public Lecture "The greatest catastrophe: mass extinction 250 million years ago" by Professor Paul Wignall, Leeds University, UK.
- April 27, 2006: Public Lecture "Death of Stars and Future of the Sun" by Professor Sun Kwok, Dean, Faculty of Science, HKU.



### Conferences

- December 15-17, 2005: The 5th IASC Asian Conference on Statistical Computing co-organized by Department of Statistics and Actuarial Science, HKU; The Asian Regional Section of the International Association for Statistical Computing; and the Hong Kong Statistical Society.



- December 17, 2005: The 2005 Hong Kong Statistical Conference co-organized by Department of Statistics and Actuarial Science, HKU; and the Hong Kong Statistical Society.

### Seminar

- January 2006: "Mini-course on Introduction to Quantum Many-body Theory" co-organized by Physics Department, HKU; The Hong Kong University of Science & Technology; and the Physical Society of Hong Kong.

### Nature Trip

- February 11, 2006: More than 50 students and teachers from local secondary schools joined the nature trip to Tung



Ping Chau, Mirs Bay, to see its ecological and geological attractions.

### Courses for Secondary School Students

- March to May, 2006: The Department of Physics and Department of Mathematics jointly organize an Enrichment Course to give secondary school students an opportunity to visualize the interwoven relations of mathematics and physics. Details can be found at <http://www.physics.hku.hk/~mathphys>.
- March 18 and April 1, 2006: SuperSaturday — Accelerated Science, an intensive one day integrated science programme for senior secondary school students to gain deeper understanding of various science topics and have hands-on laboratory learning experience. ♦

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