

ENGINEERING A GREENER WORLD

SPOTLIGHT ON THE ENVIRONMENT

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Much innovative research and development is being carried out by members of the School of Engineering to support sustainable development.

Among such pioneering projects, Prof Tianshou Zhao, of the Mechanical Engineering Department, and his research team have developed a passively operated Direct Methanol Fuel Cell (DMFC). This type of fuel cell is becoming competitive to replace conventional batteries in portable electronic devices. The power density can be as high as 35 mW/cm² - the best performance reported among cells of a similar type.

Prof Kei May Lau, of the Electronic and Computer Engineering Department, is well-known for her research on compound semiconductor materials and devices with high-frequency, high speed and photonic device applications. Her research is currently focused on light-emitting diode (LED) lighting systems. Such systems represent one of the greatest on-going revolutions of the 21st century, making this environmentally friendly lighting source more popular and lowering production costs.

Prof Zhao and Prof Lau have both received Croucher Fellowships in recognition of their contributions, as this issue of *In Focus* reports along with other articles on our environment-related work and events.

The School is also much engaged with preparations for the four-year undergraduate degree to be introduced in 2012 as part of Hong Kong's education reforms. This is perhaps the most important change in Hong Kong's tertiary education in our lifetime. Prof Edmund Ko notes in his second article on engineering education for the 21st century, learning outcomes will have a leading role to play in planning the curriculum for the new degree.

Wishing you all cleaner, greener times ahead.

Prof Philip Chan
Dean of Engineering

Faculty Members

- **Prof Alexis Kai Hon Lau**
Associate Professor, Civil Engineering
PhD - Princeton University

Visiting Faculty

- **Prof Jose De Marca**
Professor, Electronic and Computer Engineering
PhD - University of Southern California

Belarus Collaboration Agreement

HKUST has signed a five-year agreement with Belarusian State University of Informatics and Radioelectronics to develop cooperation and academic contacts between the two universities. Director of the Center for Display Research and Chair Professor Hoi Sing Kwok, Electronic and Computer Engineering, represented the University at the signing ceremony in October 2007. The agreement includes student exchanges and joint projects involving nanomaterials and nanoelectronics.



Engineering Exchange Fund

A new fund has been set up to enhance engineering education exchange between HKUST and Mainland China. This follows a generous RMB 5 million donation from Dr Lau Fu Wing, President of Chiu Hing Construction and Transportation Company Ltd. The Dr FW Lau Engineering Education Exchange Fund will focus on civil engineering academic and exchange activities organized for faculty and students of HKUST and Tsinghua University.

An agreement for the fund was signed in November 2007 between Dr Lau, HKUST and Tsinghua University. Professor Philip Chan, Dean of Engineering, participated in the signing ceremony on HKUST's and the School's behalf. Ms He Mei Ying, manager of the Tsinghua University Education Fund, signed for Tsinghua.



(left to right: Prof Moe Cheung, Prof Philip Chan, Prof FW Lau, Ms. MY He)

Leading the Way

▶ **Prof Khaled Ben Letaief**, Chair Professor and Head of Electronic and Computer Engineering, received the prestigious 2007 Publications Exemplary Service Award from the IEEE Communications Society. The annual award is presented to an individual who has made outstanding contributions and given notable support and service to IEEE Communications Society publications over a sustained period of time.

▶ **Prof Chak Chan**, Chemical Engineering, gained first prize in China's 2007 Natural Science Awards, presented by the Ministry of Education. The award was given for a joint project led by Tsinghua University, in collaboration with HKUST and Tongji University. The project focused on "The Characteristics of Emission and Complex Pollution of Particulate Matter and its Precursors".

▶ **Prof Vladimir Chigrinov**, Electronic and Computer Engineering, has become a Fellow of the Society for Information Display. The Society comprises over 6,000 professionals who work in technical and business disciplines that relate to display research, design, manufacturing, applications, marketing, and sales. Only six people annually are selected to become a Fellow, an honor achieved through making a widely recognized and significant contribution to advancement of the field.

▶ **Prof Jeff Hong**, Industrial Engineering and Logistics Management, was awarded second prize in the 2007 INFORMS Junior Faculty Interest Group Paper Competition.

▶ **Prof I-Ming Hsing**, Chemical Engineering, has been appointed an editorial board member of *Biomicrofluidics*, a journal published by the American Institute of Physics.

▶ **Prof Kay Mei Lau**, Electronic and Computer Engineering, and **Prof Tianshou Zhao**, Mechanical Engineering, have been awarded Croucher Senior Research Fellowships for 2008-2009 for their breakthrough research in compound semiconductors and fuel cell technology respectively.

▶ **Prof Ricky Lee**, Mechanical Engineering, and **Prof Zexiang Li**, Electronic and Computer Engineering, have been made IEEE Fellows. The School of Engineering now has 14 IEEE Fellows among its faculty members.

▶ **Prof Richard So**, Industrial Engineering and Logistics Management, was named Symposium Chair for VIMS 2007, the first international gathering on visually induced motion sickness, fatigue and photosensitive epileptic seizures. He was also one of the speakers at the event, which took place at HKUST.

▶ **Prof Fugee Tsung**, Industrial Engineering and Logistics Management, has been elected Regional Vice-President (Asia) of the Institute of Industrial Engineers. He has also been elected to the institute's 2008 National Leadership Council.

▶ **Prof Qian Zhang**, Computer Science and Engineering, and doctorate student Ji Luo gained the Best Paper Award at the IEEE Global Telecommunications Conference 2007 (ASNA Symposium). IEEE GLOBECOM is an annual international conference which spans the range of communications technologies and presents the latest developments in voice, data, image, and multimedia. The award-winning paper was entitled "Relative Distance Based Localization for Mobile Sensor Networks".



Prepared for **Different Career Paths**

In his second article for In Focus, Professor Edmond Ko, Department of Chemical Engineering and Senior Advisor to HKUST's Vice-President for Academic Affairs (Deputy to the President), examines the important role of learning outcomes in engineering education and the School's four-year undergraduate curriculum to be introduced in 2012



The concept of learning outcomes is a convenient way to define the impact of an educational process on students. A learning outcome is what a student should know or can do as a result of a learning experience. The learning outcomes that university graduates should possess can be broadly classified into three categories: knowledge, skills, and attitudes.

The focus of traditional curriculum design is on knowledge outcomes that are related to the content of a discipline. However, in recent times, stakeholders of higher education have increasingly recognized the importance of skill and attitude outcomes in producing graduates who are internationally competitive in the marketplace. In fact, many of the desirable attributes for engineering graduates that I mentioned in the last issue of *In Focus* belong to these two categories.

At HKUST, 15%-20% of engineering graduates each year pursue further studies. Of the remaining 80% or so, about half work in engineering-related fields (for example, manufacturing and industries, construction) and half in the commerce and business sector. These employment statistics show that we need a curriculum with sufficient flexibility to prepare students for different career paths, along with a strong advisory system to help them make informed decisions. Above all, skill and attitude outcomes should be treated as essential components of the curriculum.



Skills and Professional Knowledge

Skill outcomes include professional skills and generic skills. Those generally valued by employers include language skills, communication skills, interpersonal relationships, teamwork, problem solving, critical thinking, and an interest in life-long learning. Attitude outcomes include values often stressed by traditional moral and ethics education, for example, social consciousness, sense of responsibility, self-consciousness and values, attitudes in dealing with different situations and people. Attitudes that are more directly work-related include self-management, zest, self-motivation and risk-taking.

A concern often expressed by engineering educators is that spending time on developing skill and attitude outcomes will adversely affect the advancement of students' professional knowledge. Along this line, a recent research report from the United States is of interest. The study* found that since the Accreditation Board for Engineering and Technology began promoting outcome criteria (EC 2000), there had been concurrent improvement in students' skill and knowledge outcomes. Even though this is an initial finding, it reminds us that in designing engineering curricula, we should not just think of how to divide the pie. Instead, we should enlarge the pie through using effective learning and teaching methods to benefit students in different ways simultaneously. It should be noted that the Hong Kong Institution of Engineers, in reviewing its accreditation criteria, has proposed to increase the emphasis on outcome-based elements.



“Skill and attitude outcomes should be treated as essential components of the curriculum”

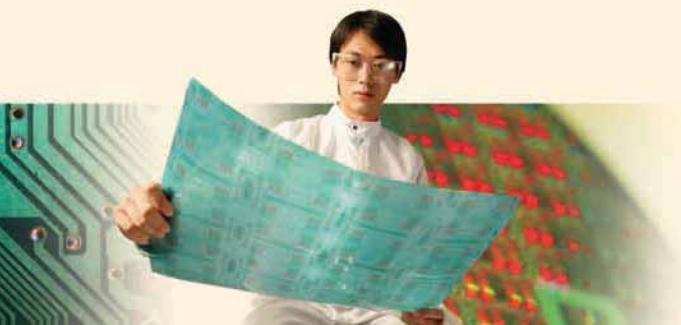
Research on student learning has repeatedly identified the usefulness of aligning learning outcomes with pedagogy and assessment. Thus, with enhancement of student learning as the primary objective, the University Grants Committee is encouraging its institutions to adopt an outcome-based approach in planning the four-year undergraduate curriculum to be introduced in 2012.

Task Force

In this regard, an inter-institutional task force has been formed to take the initiative forward. Prof Mounir Hamdi, Computer Science and Engineering, is serving as a co-convenor and I am also a member of this task force. We will work closely with colleagues at both local and overseas institutions in identifying and disseminating best practices that will help the School of Engineering in the design and implementation of its four-year curriculum.

The School of Engineering has also benefited from recent visits by Dr Ira Jacobson and Prof Karl Smith, two experts on outcome-based education, especially in relation to the accreditation of engineering programs. Through a series of seminars, workshops, and department-based meetings, faculty members from all engineering departments had fruitful discussions with Dr Jacobson and Prof Smith on a wide range of learning and teaching issues. We are poised to move ahead with enthusiasm and purpose in providing the best possible learning outcomes to our graduates.

* Lisa R. Lattuca, Patrick T. Terenzini, and J. Fredricks Volkwein, *Engineering Change - A Study of the Impact of EC2000* (2006), ABET, Inc.



Cutting-edge Course Delivery Brings Awards

It has been a rewarding time for lecturers from a range of different departments in the School of Engineering with their teaching excellence recognized by a number of recent awards.

Creativity in delivering course materials has seen **Prof Jogesh Muppala** and **Prof David Rossiter**, both from Computer Science and Engineering, gain HKUST Teaching Innovation Awards for successfully introducing new ideas, techniques and practices in their courses.

Prof Muppala has made innovative use of Web 2.0 technologies, such as blogs, podcasting and web feeds, to deliver information in a contemporary format that students can relate to and enhance collaborative and cooperative learning.

Through podcasting, for example, Prof Muppala has been able to effectively capture and automatically distribute lectures, allowing students to revisit a learning session at anytime. The initial phase took the form of an audio recording. Later, after feedback from students, this was extended through development of a tool called ReCap to synchronize audio with PowerPoint slides and annotations made during the lecture in Real Media format.

Prof Rossiter and his team have developed a web-based voice tool, known as the Gong system, designed for educational use and primarily to assist language learning. This system allows people to communicate using text and voice over the Internet. Students and teachers can participate in different discussion boards in the system, leave text and voice messages inside these boards, and listen to and reply to messages from other people. Features include audio indexing, multi-lingual interface and adjustable speed for voice playback.

The system, which is freely available, has received tremendous feedback from teachers and students worldwide. In the past two years, approximately 4,500 users have used the Gong system at HKUST and 85,000 people worldwide.

Meanwhile, **Prof Gary Chan**, Computer Engineering Program, was selected for the School of Engineering Teaching Excellence Appreciation Award 2006-07. Prof Chan has been a member of CPEG since 1999 and became Program Director in 2006.

In addition, HKUST undergraduates have voted **Prof Lambros Katafygiotis**, Civil Engineering, and **Prof Neville Lee**, Industrial Engineering and Logistics Management, among the University's top teachers in the Best 10 Lecturers Election 2008.





Powering Ahead with Alcohol Fuel Cell Technology

Finding the next generation of efficient, clean, energy-conversion technologies that operate without the use of fossil fuels is one of the great challenges of the 21st century.

For Prof Tianshou Zhao, Mechanical Engineering and Associate Director of the Center for Sustainable Energy Technology, the key to the future lies in fuel cells. The internationally renowned professor has published more than 120 papers in leading academic journals over his 12-year academic career at HKUST. He is particularly well known for his research achievements in fuel cells, represented by more than 50 papers in this area. These papers have been cited more than 800 times in the past four years. Many of his fundamental studies have provided important insights in the understanding of fuel cell mechanisms and helped to improve fuel cell performance.

Prof Zhao and his research team are pioneering development of direct alcohol fuel cells (DAFCs), which can convert the chemical energy of liquid methanol or ethanol directly into electricity. This type of fuel cell creates the potential for a cost-effective, energy-conversion system that is highly efficient and low in emissions.

As such, it offers several advantages over hydrogen fuel cell technology, another sustainable energy-conversion system, as hydrogen is costly to produce and difficult to store given its light weight. The direct alcohol fuel cell is a top competitor to replace conventional batteries in portable electronic devices. It also has the potential to take over from internal combustion engines in cars.

Prof Zhao and his group have focused on modeling, design, fabrication, diagnostics and system integration of direct alcohol fuel cells and achieved a number of technological breakthroughs.

The team has created a passively operated prototype direct methanol fuel cell (DMFC) that has achieved the highest performance (about 35 mW/cm²) reported in open literature. "This type of fuel cell is particularly attractive for powering portable electronic devices due to its simple and compact structure," Prof Zhao said. Meanwhile, the discovery that hydrogen evolves spontaneously from DMFC has enabled

Microchip Points Way to On-the-Spot DNA Tests



Forensic evidence results and identification of illnesses may be more immediately available in the future thanks to the exciting development of a polymerase chain reaction (PCR) microchip by

Professor I-Ming Hsing, Chemical Engineering, and his research team.

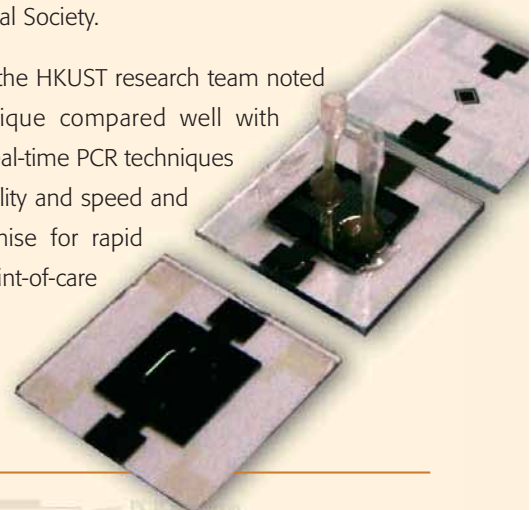
PCR can transform a few pieces of DNA into billions of copies. It is used in criminal investigations, for diagnosing disease, and a range of other applications. Currently, testing needs to take place in laboratories, due to the size and complexity of today's PCR machines. However, the search for a more portable form of testing has been on-going for many years.

By miniaturizing the technology required to perform PCR, the HKUST team has brought on-the-spot testing, for example, at crime scenes and surgeries, a step closer.

Prof Hsing's method, known as electrochemical real-time PCR (ERT-PCR), uses electrochemical DNA sensors to provide simultaneous DNA amplification and detection on a silicon-glass microchip.

The development has received international attention with the research team's results highlighted as a press-release item of the American Chemical Society and published in the January 15 2008 issue of *Analytical Chemistry*, a semi-monthly journal of the American Chemical Society.

In the journal report, the HKUST research team noted that the new technique compared well with fluorescence-based real-time PCR techniques with regard to portability and speed and held significant promise for rapid DNA detection for point-of-care testing applications.

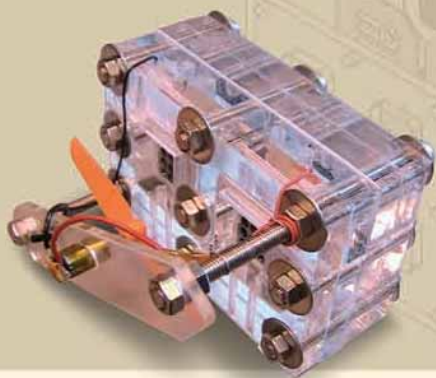


researchers to develop a new technique to produce hydrogen at room temperature.

Methanol has conventionally been regarded as the best choice for alcohol fuel cells in terms of power output. However, in another advance, Prof Zhao's team have recently shown that a new type of fuel cell using ethanol, a more environmentally friendly and sustainable fuel, can yield a higher power output than DMFC.

"Environmental concerns make it important that new energy-conversion technologies are developed to replace the current fossil-fuel, combustion-based systems," Prof Zhao explained. "Fuel cell technology is an exciting and immensely satisfying field to be working in given the huge impact it could have on people's lives everywhere."

Laboratory website: <http://www.me.ust.hk/~mezhaio>



Fueling Ideas on Energy

Prof Tianshou Zhao is globally recognized for his contributions to the field:

- Editor-in-Chief, *Advances in Fuel Cells*
- Asian Regional Editor, *Applied Thermal Engineering*
- Board member, 10 international journals
- Fellow, American Society of Mechanical Engineers
- Winner, Overseas Outstanding Young Investigator Award, Natural Science Foundation of China.

At the end of 2007, six of his papers received the accolade of being ranked among the top 1% research items in their field by number of Science Citation Index citations.

His research on fuel cells, micro/nano-scale multiphase transport and the advanced lattice Boltzmann method has been further acknowledged with his selection for a Croucher Senior Research Fellowship for 2008-09. He received the award at a presentation ceremony on March 27, 2008.

Joint Computer Projects Win Funding

Three School of Engineering projects are among the nine from HKUST to be chosen in the National Natural Science Foundation of China (NSFC) and Hong Kong's Research Grants Council's (RGC) joint research scheme for 2007-08.

All three of the School's projects come from the Department of Computer Science and Engineering. Prof Bo Li's project, conducted with Prof Hai Jin of Huazhong University of Science & Technology, investigates the theory and practice of large-scale peer-to-peer based live video streaming over the internet; Prof Qian Zhang, together with Prof Zhisheng Niu, Tsinghua University, examines multi-dimensional diversities in wireless opportunistic networks; and Prof Lionel Ni's research, carried out with Prof Jinpeng Huai of Beihang University, looks at trustworthy computing for large-scale peer-to-peer systems.

Competition for funding support was keen with a total of 23 projects selected out of 380 applications. Life science and information technology proved the main fields for such joint research, with six projects approved in information technology and eight in life sciences. NSFC and RGC contributions came to RMB 7.5 million and HK\$15 million respectively.

The joint research scheme was set up to promote collaboration between research teams and individual researchers in Hong Kong and Mainland China by leveraging the strengths of both sides in order to bring complementary skills to a project. The research areas included in the scheme are information technology, life science, new materials science, marine and environmental science, Chinese medicine, and management science.

PROJECT POWER

In Focus highlights four, final-year undergraduate projects that offer creative ways to recycle, conserve, and assist pollution analysis.

Mechanical Engineering

Smart Way to Generate Green Energy

Project participants: Gao Zhaoli, Issac Hung Chun Wai, Leui Lap Chung, Li Chiyin, Yin Hao

Faculty advisor: Prof Qingping Sun

Designing and building a prototype green generator using shape memory materials gave five mechanical engineering students the exciting opportunity to work on a final-year project with great energy recycling potential. "We wanted to see how this smart material could produce useful green energy," said team leader Li Chiyin.

Shape memory alloy wires alter their shapes via phase transition when subjected to a temperature of around 80° Celsius, changing from curved to straight. By designing appropriate pulleys, generators and water heating and cooling systems, the students were able to harness the motion resulting from the shape memory alloy's phase transition to rotate a set of gears and generate electricity.

"A martensitic phase transition is the key process in converting heat energy to mechanical energy," Leui Lap Chung explained. "This kind of alloy continuously transfers heat energy directly to mechanical energy. It is also pollution free." Such a green generator can be used to recycle heat energy that is produced in industrial processes and power stations but currently wasted. In locations with natural hot springs, there is further potential.



Electrical and Computer Engineering

Lights, Campus, Action!

Project participants: Chris Chan Tsz-chung, Eric Tang Sze-ming, Jimmy Wong Wa-tai

Faculty advisor: Prof Philip Chan

Energy-saving on the HKUST campus in the form of solid-state street lighting was the focus for three Electrical and Computer Engineering students. Their project continued the research into solid-state lighting of previous final-year students by making and deploying several light-emitting diode (LED) lights on campus to evaluate their efficiency in reducing power consumption and refine the system design.

Team leader Chris Chan said: "Last year's final-year team had developed a LED light module that worked in a laboratory setting. We wanted to take this further and test the model in a real-life setting."

Doing so was not always straightforward. Challenges included giving up the original idea of a solar panel due to installation difficulties with regard to the HKUST campus. The hardest tasks were to ensure compliance with all the safety regulations and to maintain the stability of the light unit. However, by working together with the faculty, students who had worked on the project earlier, the Facilities Management Office, and Building Services Section, they were able to succeed.



GEARING UP FOR THE WORLD OF WORK

- All School of Engineering students are required to carry out a Final Year Project lasting two-three semesters.
- Projects emphasize design, synthesis, application and creativity.
- The work should involve application of engineering knowledge and research.
- Students usually work in groups to develop team-building skills under the supervision of faculty.
- Progress reports, a detailed final report and a presentation must be given.

Chemical Engineering **Solar Glass Looks Ahead**

Project participants: Amy Chan Oi Sum, Jeffrey Ching Wai Kwong, Simon Wong Shung Yan, Steven Yip Suen Hei

Faculty advisor: Prof Guohua Chen

Semi-transparent glass is a common feature of Hong Kong's skyscrapers. Such glass is used to dim natural light in buildings. It also results in reflected light beams, a potential source of power that is currently being lost. In this project, the four Chemical Engineering students set out to utilize nanotechnology to combine a solar power cell with glass and turn reflected light into electrical energy.

"Our project could contribute to reducing the amount of conventional electricity consumption in buildings using 'Solar Glass', thus decreasing pollution," Amy Chan said.

A glass pane solar cell requires an extremely thin absorber (ETA) of nano-scale thickness. Cadmium telluride with its suitably low band gap energy (1.5eV) was selected to absorb the photons in light waves ranging from 450nm to 800nm, enabling conversion into useful electrical energy. Another reason for investigating ETA solar cells was the cost-effectiveness of materials.

"The chemical engineering courses we have taken at HKUST have been highly relevant for the development of our project," Jeffrey Ching said. Among them, Electronic Materials Processing for Chemical Engineers provided an overview of semi-conductors; Introduction to Materials Science and Selection gave understanding of the properties of materials; Nanomaterials and Applications in Chemical Engineering taught methods to characterize nanoparticle properties; Environment Impact Assessment & Management Systems assisted in developing a safe, scientific procedure; and Products and Processes raised awareness of the importance of creating environmental benefits.



Computer Science and Engineering **Visualizing Air Pollution**

Project participant: Winnie Chan Wing Yi

Faculty advisor: Prof Huamin Qu

With the deterioration of Hong Kong's air quality, Winnie Chan Wing Yi worked on a project that provided a unique solution to aid the study of air pollution: a comprehensive system for weather data visualization.

"The project is a useful aid to analysis, enabling scientists to visualize complex environmental data and inspire further investigation of unusual patterns that can be discerned from the vivid graphical presentation," said Winnie, now a Master of Philosophy Year 1 postgraduate in the School of Engineering. "It is also an extremely effective presentation tool, allowing the general public to 'see for themselves' how the region or area where they live is affected by pollutants."

The initial system employs both established visualization techniques, such as parallel coordinates and polar systems, and various novel methods to address special challenges posed by weather data. The latter include circular pixel bar charts embedded into polar systems, enhanced parallel coordinates with S-shape axis, and weighted complete graphs to facilitate research and discovery.

As a member of the visualization research group, Winnie helped to develop the weather data visualization system, incorporate the basic weather data attributes, and worked with HKUST's Environmental Central Facility on analysis.



Feedback from domain scientists on Winnie's project has been extremely positive, with further development of the system being explored. The project also received two prizes at the Hong Kong ICT Awards 2007 (see P10).

SENG Innovation Recognized at ICT Awards

The School of Engineering's creative approach to information and communication technology (ICT) solutions was on winning form at the Hong Kong ICT Awards 2007, with projects by faculty members and students scooping six prizes.

At the second ICT award ceremony, Professor Liu Yunhao and PhD student Li Mo, Computer Science and Engineering, were presented with the Best Innovation and Research (Open) Gold and Grand awards for their "Coal Mine Surveillance with Wireless Sensor Networks" project. The pioneering system helps to promote safety for those working in coal mines by providing environmental monitoring data about mine conditions. The wireless sensor network can detect and alert personnel to gas leaks, water seepage and oxygen-enriched areas. In emergency situations, it also allows more informed decisions about rescue work and escape plans.

"The existing system relies on underground cables at the work face and in tunnels," Li Mo said. "Our wireless sensors are much more flexible." Reliability and speed of information delivery when irregularities are detected were additional advantages, he said.

The system was praised by the judging panel as a cost-effective and scalable application which uses off-the-shelf, reliable technologies that are available today. It comprises several nodes, each comprising a microcomputer, sensor and antenna. Information from the nodes is then transmitted to a central control room for decision-making on action.

The project seeks to reduce fatal accidents in mines, according to Prof Lionel Ni, Head of Computer Science and Engineering. Several thousand people were killed in Mainland China alone in 2007. Tests have been carried out in an Inner Mongolian coal mine for the past three years.

The project also received international acclaim at the 7th International Symposium on Information Processing in Sensor Networks, one of the leading global forums on wireless sensor networks.

In the Best Innovation and Research (College and Undergraduate) category for 2007, MPhil student Chan Wing Yi, Computer Science and Engineering, received the Silver Award and a Certificate of Merit for her "Visual Analysis of the Air Pollution Problem in Hong Kong" (see also P8-9). Her project offers novel methods for weather data visualization, providing sophisticated analysis while making the information accessible to the scientific community and the public.

Adding to the School of Engineering's success, the Motivision team gained the Best Digital Entertainment (Student) Award and a Certificate of Merit for their "Virtual Air Hockey" game. The team comprised MPhil student Leo Yeung Chi Ho, Electronic and Computer Engineering, Chan Hong Ching, and Henry Lam Man Wa. All three members are graduates of the School of Engineering's Computer Engineering Program.

Virtual Air Hockey turns traditional air hockey into a multimedia arcade game in which players use hand gestures over a specially designed table to move virtual mallets and puck. The game combines computer vision, gesture recognition and multimedia to offer innovative, next-generation, real-motion entertainment.

The ICT awards were established in 2006 to recognize excellence among Hong Kong ICT professionals and organizations and boost awareness of Hong Kong's work in this area among the public and industry. The awards are a collaborative project involving ICT professional bodies, academia and the Hong Kong government. They also seek to encourage innovative ICT solutions that can extend Hong Kong's reputation in this field locally and globally. The 2007 ICT awards received a total of 330 entries.



HKUST MPhil Student Chan Wing Yi won ICT Awards' Best Innovation and Research (College and Undergraduates) Silver Award by visualizing air quality data.



Chan Hong Ching (left) and Henry Lam Man Wa with their Virtual Air Hockey Game.



Head of Computer Science and Engineering Prof Lionel Ni and some School of Engineering ICT award-winners.

Li Mo, winner of ICT Awards' Best Innovation and Research Grand Award, with a sensor node used on his coal mine surveillance project.



Student Achievements



- ▶ A group of Mechanical Engineering undergraduate alumni (2006-07 graduates) gained second prize in the Design and Make Competition 2007, held in Shaoguan, Mainland China, in October 2007. The five alumni were **Cha Kin Lun**, **Huang Kim Ping**, **Stephen Kwok Chin To**, **Man Wing Hong** and **Yip Ka Wing**.
- ▶ PhD candidate **Juncheng Jia**, Computer Science and Engineering, has become one of 29 doctoral students in Asia to be awarded a 2007 Microsoft Research Asia Fellowship.
- ▶ A team of three students, **Kong Lai Yan**, Electronic and Computer Engineering, **Chan Ho Ting**, Computer Engineering Program, and **Chong Fung Kei**, Electronic and Computer Engineering, won a certificate of merit in the Creative Design of Assistive Projects for the Elderly 2007 contest. The students' device was an easy-to-use voice recorder to assist the elderly in daily life.
- ▶ The final-year project of graduate **Kwok Yin**, Civil Engineering, was named second runner-up in the HKIE Geotechnical Division Best Final Year Project competition 2006-07. The project focused on "Physical Tests and Numerical Modeling on Debris Mobility using Leighton Buzzard Sand Fraction C".
- ▶ PhD candidates **Yat Hei Lam** and **Tsz Yin Man**, Electronic and Computer Engineering, were invited to present their innovative IC design techniques at the International Solid-State Circuits Conference (ISSCC) 2008, also known as the "Chip Olympics". The conference is the foremost global forum for presentation of advances in solid-state circuits and systems-on-a-chip.
- ▶ Postgraduate students **Zhiqin Liang**, **Zhou Jiantao**, **Liwei Guo** and **Mengyao Ma**, Electronic and Computer Engineering, received the Best Paper Award at the Pacific-Rim Conference on Multimedia 2007. The paper was entitled "A Novel Multiple Description Approach to Predictive Video Coding". It was co-authored with their supervisor Prof Oscar Au.
- ▶ PhD student **Shuzuo Lou**, Electronic and Computer Engineering, won an A-SSCC/ISSCC Student Design Contest Award at the IEEE Asian Solid-State Circuits Conference (A-SSCC) 2007. Shuzuo also presented his paper and gave a demonstration at the International Solid-State Circuits Conference 2008.
- ▶ **Luk Sung Hei** and **Fung Man Kwan**, Year 2, Civil Engineering, have been awarded Arup Scholarships in recognition of their outstanding academic achievements. They will also be provided with opportunities to receive internship training at Ove Arup & Partners Hong Kong Ltd.
- ▶ PhD student **Pengcheng Ma**, Mechanical Engineering, received the Best Student Paper Award from the International Symposium on Electronic Materials and Packaging (EMAP 2007). His paper was entitled "Electrical Conducting Behavior of Hybrid Nanocomposites Containing Carbon Nanotubes and Carbon Black".
- ▶ MPhil graduate **Sze Ngok Man**, Electronic and Computer Engineering, was awarded the Best Paper Award (Second Place) in the IEEE International Symposium on Electronics Design, Test & Applications (DELTA). The paper was entitled "Threshold Voltage Start-Up Boost Converter for Sub-mA Applications". It was co-authored by Prof Wing Hung Ki and Prof Chi Ying Tsui.
- ▶ Graduate **Tang Siu Kit**, Civil Engineering, received the Hong Kong Institution of Engineers' (HKIE) Structural Division Award for best 2006-07 graduate.
- ▶ Graduate **Tang Tze Fai**, Civil Engineering, was awarded the HKIE Geotechnical Division Award for best 2006-07 graduate.
- ▶ Graduate **Wong Chi Kwan**, Civil Engineering, gained the ASCE Best Final Year Project Award 2006-07 for his project entitled "Urban Development with Sustainable Public Transit Services".
- ▶ **Yuen Yu Ping**, Year 3, Civil Engineering, was awarded the HKIE Civil Division Scholarship 2006-07 for his outstanding academic performance.
- ▶ **Charlie Zhu Shucheng**, Year 2, Computer Engineering, was awarded first prize in the IEEE Hong Kong Section 2007 Undergraduate Student Paper Contest. His award-winning paper focused on "P2P (Peer-to-Peer) Content Protection". It was written as part of HKUST's Undergraduate Research Opportunity Program in 2007. The paper was also put forward for the IEEE Region 10 (Asia Pacific) Student Paper Contests.



Designs on a Digital Lifestyle

Smart designs for smart gadgets took center stage at HKUST's first electronic design competition for students, sponsored by multinational company Samsung.

More than 50 School of Engineering undergraduates in 19 teams participated in the Pioneering a New Digital Lifestyle with Samsung — Smart Gadgets Competition 2007. Four teams were short-listed for the finals with the Display Box 360 team eventually named the overall champion for its creative projection of text and graphics.

Winning team members Chan Tsz Sau, Lo Fu Kin and Chan Wing Yee, Year 3, Computer Engineering Program, created a gadget which is able to produce a 360-degree projection of text and graphics by spinning a set of configured light-emitting diodes (LEDs) at high speed. The resulting projection makes it appear as if text is floating in the air. The prototype also supports sliding and blinking text.

The team took five weeks to construct the machine and had to overcome difficulties, such as short-circuiting before finally succeeding in building a working prototype. "This competition was a great learning experience for all of us," Chan Tsz Sau said. "As engineering students, it is vital that we realize our dreams by putting what we learn into practice and gaining real product design experience. To have our project recognized by a worldwide electronics giant like Samsung is extremely encouraging."



Competition judges included representatives from Samsung, HKUST and other technology leaders. "Samsung and the School of Engineering share the same vision for creating a better global society through technological innovation," said Mr B W Kim, managing director, Samsung Electronics Hong Kong. "That

vision will be pursued by our younger generation and Samsung is committed to working with educators like HKUST in the long run to help foster the creativity and skills of our future digital-lifestyle pioneers."

The winners earned a four-day trip to Korea, including a visit to Samsung's Seoul headquarters. Three runners-up were also chosen. In selecting the top designs, judges looked at creativity and innovation, impact on enhancing the quality of life, technical competence, practicality, and the team's presentation skills.

"The School of Engineering strives to provide a nurturing environment for young engineering students to develop their skills and grow," said Professor Paul Ching-Wu Chu, HKUST President. "As part of that effort, we are keen to work with the private sector to give our students hands-on experience that will benefit their education and future career prospects." The electronic design competition was a great example of the success of this approach, he said.



Programmers Reach ACM World Finals



Computer science undergraduates from the School of Engineering have beaten more than 6,000 teams from countries around the globe to advance to the world finals of the annual ACM International Collegiate Programming Contest.

The successful three-member team comprises Chiu Sung Him, Year 2, Computer Engineering Program and first-year Computer Science and Engineering students Yan Zhepeng and Wu You. They were led by Professor Ke Yi and PhD candidate Li Rui, both from the Computer Science and Engineering Department.



The prestigious yearly contest is organized by the Association for Computing Machinery in the US. The contest provides a platform for university students to develop their analytical skills and problem solving skills, and is recognized as the largest-scale and highest level event of its kind. It has been running for over 30 years.

In total, five HKUST teams participated in this year's Asia regional ACM programming contests and all secured good results. Some 6,700 teams from 1,800 universities from more than 80 countries and regions took part in the preliminary events. One hundred teams will participate in the finals to be held in April in Alberta, Canada.

Successful Start for RFID Apprentice Scheme

Four dual degree students in Technology and Management have each won a HK\$10,000 cash prize for their business proposal on the application of Radio Frequency Identification (RFID) technology in the hotel industry and two gained internship offers.

The students were part of a group of 12 Technology and Management undergraduates taking part in the first Schmidt-HKUST Apprentice Program. The winners were Chris Chan Kwun-Yin, Jack Chin Jun-Xing, Anthony Lee Lap-Tak and Shera Lai Pak-Wa.

The program, jointly organized by HKUST Dual Degree Program in Technology and Management and Schmidt & Co., (HK) Ltd., enabled the dual degree students to take part in a three-month attachment at the company. Schmidt Electronics Group is one of Asia's leading integrated technology and service providers. Students on the program received intensive RFID training, including seminars, talks, site visits and mentorship.

Students were divided into teams of four to design business proposals for RFID applications for different industry sectors. Along with the hotel industry, proposals focused on the jewellery and theme park businesses. Winners of Schmidt's employment contracts were announced at a ceremony held in December 2007.

Mr Matthew Man, General Manager of Schmidt RFID, said the program sought to explore RFID applications in service industries beyond mainstream logistics or manufacturing sectors in Hong Kong. He was also happy to see such collaboration between academia and industry, with the students delivering innovative and practical business solutions.



Members of the winning team: Chin Jun-Xing Jack, Lai Pak-Wa Shera, Lee Lap-Tak Anthony and Chan-Kwun Yin Chris (left to right)



Bridge contest inspires young engineers

Innovative design and a dynamic presentation by the budding engineers at Shun Lee Catholic Secondary School proved the winning format at the Secondary School Bridge Design Competition 2008 in February.

The annual contest is organized by The Civil Engineering Students' Society, Hong Kong University of Science and Technology Students' Union and the Department of Civil Engineering. Its goal is to inspire students to explore engineering, build problem-solving skills, enhance teamwork, and to provide an opportunity to practice presentation skills.

This year's contest attracted applications from 50 schools with 13 school teams being selected to participate and four going through to the finals. The school teams were made up of five to eight students per group.



In the finals, student teams were judged on the appearance of their bridges, the results of a loading test and a three-five minute presentation outlining the concept behind their design.

Judges comprised Mr Joseph

Choi, Chairman of the Civil Division, Hong Kong Institution of Engineers, Prof Moe Cheung, Head of Civil Engineering and Prof JS Kuang, Civil Engineering.

The other finalists were Baptist Lui Ming Choi Secondary School, La Salle College and Lions College.

A total of 13 schools participated.

- Baptist Lui Ming Choi Secondary School
- Heep Yunn School
- Holy Trinity College
- Hon Wah College
- La Salle College
- Lions College
- Methodist College
- Ng Wah Catholic Secondary School
- Our Lady Of The Rosary College
- Po Leung Kuk Wu Chung College
- Shun Lee Catholic Secondary School
- Tin Shui Wai Government Secondary School
- Tuen Mun Government Secondary School



Engineering Days Build the Future



Two special events for secondary schools in the New Territories in May will introduce the latest engineering advances and life at the School of Engineering to students.

The Engineering Days, under the theme of Engineering Our Future, form part of the School's community initiative to promote interest in the field among secondary school students. The first takes place at Tuen Mun Town Hall on May 17 from 1pm-4pm, the second at Yuen Long Merchants Association Secondary School on May 19 from 2pm-5pm.

On the program will be demonstrations of innovative applications and project demonstrations, including the MOXI digital painting system, an earthquake simulator, and fuel-cell power generation. School of Engineering professors will introduce the School and its various engineering disciplines. They will discuss the cutting-edge field of nanotechnology and the important issue of internet security.

Engineering students will also be on hand to give first-hand accounts of their experiences and to answer questions on studying at HKUST.

The Engineering Days have been organized after the success of a similar, smaller-scale event at Tai Po Kau Yan College in 2006. It is anticipated that the events in Tuen Mun and Yuen Long will act as a pilot for future activities for secondary students in other areas.



Fracture Conference Breaks New Ground

In a successful first for China, the Eighth International Conference on Fundamentals of Fracture (ICFF VIII) was held at the Hong Kong University of Science and Technology and in Guangzhou in January 2008.

ICFF, the highest academic international conference in the research area of fracture, offers a global forum for discussion of the most recent scientific and technological developments in the field. The Eighth International Conference included contributions from continuum mechanics, bioscience, ceramics, metallurgy and physics, among other disciplines. The five-day conference received tremendous international support with around 150 leading professors and scholars from 18 different countries and regions attending the event.

Major topics included fracture, creep, and fatigue of engineering materials and smart materials; environment effects; and dynamic fracture. Keynote presentations and poster sessions enabled a full exchange of ideas and intensive debate throughout the conference. Discussions and presentations involved theory, modeling, calculations, simulations and experiments.

Prof Tongyi Zhang, Mechanical Engineering, HKUST, co-chaired the event together with Prof Biao Wang, Sun Yat-sen (Zhongshan) University and Prof Xiqiao Feng, Tsinghua University. China has never previously hosted the conference. The only other time it has been held in Asia was in Japan in 1993.



HKUST Hosts Computer Science Forum

The Computer Science Deans Forum celebrated its 10th gathering in November 2007 with a two-day event at the Hong Kong University of Science and Technology, hosted by the Department of Computer Science and Engineering.

The annual forum brings together Deans and Department Heads of Computer Science from Chinese universities and institutes to share ideas about professional developments, scientific infrastructure at universities and recent trends in research and education. It was jointly initiated by seven top

universities in Mainland China and first launched in 1998. The seven founding universities were Beihang University, Harbin Institute of Technology, Nanjing University, National University of Defense Technology, Peking University, Tsinghua University and Zhejiang University.

The theme of this year's forum was Internationalization of Graduate Studies. The gathering was well supported with 110 participants in attendance. It was the first time the meeting had been held in Hong Kong.



ENVIRONMENT - STEPPING UP SUSTAINABILITY

In a significant step for sustainable development on campuses and in Hong Kong, an enterprising Environmental Week will be organised at the Hong Kong University of Science and Technology from June 2-7, 2008.

The School of Engineering together with the School of Science, School of Business and Management, and School of Humanities and Social Science will join forces to organize discussions and activities on sustainability issues facing universities and the global community. There will also be participation by the Office of the Vice-President for Academic Affairs; Facilities Management Office; Health, Safety and Environment Office; and the Office of University Development and Public Affairs.

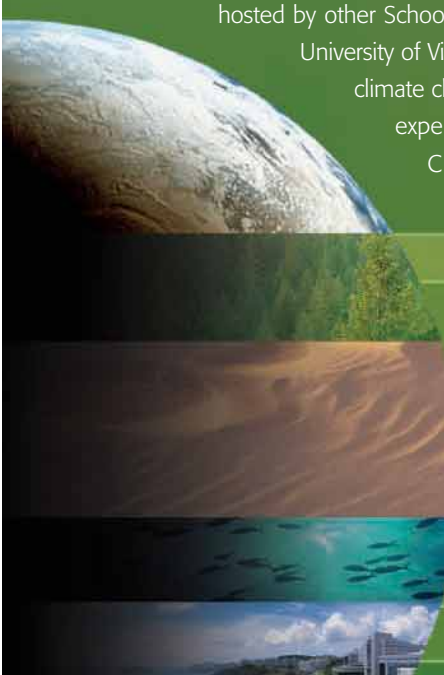
Among the activities planned is a talk on green building architecture by Professor Phil Jones from Cardiff University in the UK, which is being hosted by the School of Engineering. Speakers hosted by other Schools include Prof Andrew Weaver, University of Victoria, Canada, who will discuss climate change and Prof Wang Canfa, an expert in environmental law from China University of Political Science and Law. Prof Wang is

also Director of the Center for Legal Assistance to Pollution Victims.

Green campus initiatives will be explored to highlight how universities can tackle the environmental challenges they face. Two panel sessions covering "Universities as Leaders of Innovative Change" and "Linking Universities to the Community" will involve key figures from non-governmental organizations, the business sector and academia in Hong Kong. In addition, a Green Challenge Student Project, sponsored by Hang Seng Bank, will be held.

Another key event will be a round table discussion aimed at establishing a Sustainability Office in HKUST for developing short and long-term goals.

Prof Christopher Chao, Mechanical Engineering, is representing the School of Engineering in the planning and organization of the Environmental Week program. "Environmental issues are a pressing concern for the community and the world at large. Given the School of Engineering's leading research in cutting-edge technologies and the pioneering applications we develop, we are in a unique position to lead positive change," he said. "The activities of Environmental Week can heighten awareness and inspire all members of the School to work towards engineering a cleaner, sustainable future."



Date	Event
June 2-4	<ul style="list-style-type: none"> Campus sustainability, energy-saving and environmental initiatives, organized by HKUST's Health, Safety and Environment Office and Facilities Management Office Green Challenge Student Project contest
June 5-6	<ul style="list-style-type: none"> Discussion and talks by academics and international experts including: <ul style="list-style-type: none"> Prof Phil Jones, Cardiff University, UK Prof Andrew Weaver, University of Victoria, Canada Ms Leith Sharp, Director, Harvard Green Campus Initiative, Harvard University, US Mr David Newport, Director, Environmental Center, University of Colorado, US Prof Wang Canfa, China University of Political Science and Law and Director of the Center for Legal Assistance to Pollution Victims
June 7	<ul style="list-style-type: none"> Round table discussion on developing a Sustainability Office

Calendar of Events

May 2-3, 2008

RoboCup Junior Hong Kong 2008
S H Ho Sports Hall, HKUST

May 17&19, 2008

Secondary Student Engineering Days, Tuen Mun and Yuen Long
Tuen Mun Town Hall, May 17
Yuen Long Merchants Association Secondary School, May 19

June 3-5, 2008

2nd Integration and Commercialization of Micro and Nanosystems International Conference and Exhibition
Co-chair Prof Ricky Lee, Mechanical Engineering, held at HKUST
www.asmeconferences.org/MicroNano08/index.cfm

July 14-19, 21-26, 2008

Youth IT Summer Camps
Organized by the Computer Science and Engineering Department, HKUST

The above events are subject to change without prior notice

Don't be the Missing Link ...

Alumni relationships are invaluable assets to the School and alumni. To foster the growth of our alumni network, please keep us informed of your recent news and send us your updated contact information via email to seng@ust.hk.

Stay connected and keep in touch!

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