

# INNOVATING FOR A BETTER FUTURE

ANNUAL REPORT 2012



**NUS**  
National University  
of Singapore

Faculty of  
Engineering

# VISION

A leading Engineering School that innovates for a better future.

# MISSION

To nurture Engineer-Leaders and to address global challenges through research, innovation, inspiration, and influence.

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**INNOVATING FOR  
A BETTER FUTURE**

## A Word from the Dean



The year 2012 has been a fruitful and productive year for Engineering at NUS. Initiatives and efforts we have put into the nurturing of Engineer Leaders have begun to take shape and yield results.

The **Global Engineering Programme** (GEP), an accelerated track launched in 2009 for outstanding students from various Engineering disciplines, has seen its pioneer cohort graduating with Honour's degrees in Engineering -- in just three years. As part of their learning journey, these students have gained valuable experiences in top partner universities and performed exceedingly well. Among those who chose to further their studies in a partner university, one GEP graduate was awarded a scholarship to do a Master's degree in Advanced Chemical Engineering at Cambridge University, and another is in Cornell University to pursue a PhD in Computational Biology. Those who chose to work before continuing with postgraduate studies found jobs of their choice even before they graduated.

Our other flagship programme, the **Design-Centric Curriculum** (DCP), has matured over the last three years since its launch. Pedagogical innovations such as Design Thinking and Systems Thinking have led DCP students to develop creative solutions to real-life problems. A successful example is the innovative idea of adding a separate dehumidification process to existing central air-conditioners, resulting in lower energy usage. This idea won the DCP students first prize in the 2012 National Climate Change Competition. DCP projects have also made their presence felt at international conferences. For example, a rehabilitation device for stroke

patients was voted at the 2012 IEEE Healthcare Innovation Conference in Houston, as the quickest device to market entry and the top device to have potentially the biggest impact on healthcare.

The Faculty's **Institute for Engineering Leadership** (IEL), established in 2011, has launched several signature initiatives. Among these, the Distinguished Speaker Series has been particularly successful. Engaging cross-disciplinary teams of students and faculties from across NUS, IEL has strengthened collaborative partnerships within NUS to ensure that NUS-developed innovations are market-ready and start-ups get the support they need. It has also launched the Frugal Innovation Lab to address unique problems in emerging economies.

The research scene at NUS Engineering for 2012 continues to be robust and vibrant. In preparation for the expansion of robotics technology and the aerospace industry in Singapore, the Faculty launched its **Advanced Robotics Centre** in August and the **Aerospace Systems Initiative** in October. The Faculty has also managed to garner more than \$103 million in competitive research grants. One notable example was the multidisciplinary team led by Assistant Professor Wang Qing who received a National Research Foundation (NRF) grant of more than \$8 million over five years to work on large-scale energy storage. His project, "Redox-flow Lithium Batteries as a New Concept and Implementable Solution for Large-Scale Energy Storage" will pave the way for systems producing very high power output with fast recharge and the use of non-toxic materials.

Associate Professor Zhang Yong's work on up-conversion nanoparticles and light therapy as a non-invasive method to treat deep-seated cancer has attracted much academic and public attention. His latest findings were published in *Nature Medicine* as well as the *Proceedings of the National Academy of Sciences, USA*. He was conferred the IES (Institution of Engineers, Singapore) Prestigious Engineering Achievement Award for his pioneering effort in this field.

Six Engineering teams were among those who will receive grants of up to \$250,000 (NRF's 7<sup>th</sup> and 8<sup>th</sup> Proof-of-Concept calls) for projects ranging from sustainable energy to engineering in medicine. Separately, Dr Ernest Chua Kian Jon is working with ST Kinetics to develop novel desiccants made from composite materials which will potentially cut energy costs. The project has received a combined funding of about \$1 million from the Agency for Science, Technology and Research (A\*STAR), Building and Construction Authority (BCA) and the Ministry of National Development (MND), the first of its kind to foster Public-Private Collaboration in green building research.

NUS Engineering spinoffs such as AyoxxA and Clearbridge continue to do well. AyoxxA Biosystems has closed a 2.6 million Euro Series A financing round. Clearbridge BioMedics swept three out of five awards at the Wall Street Journal Asian Innovation Award ceremony held in November in Hong Kong; Clearbridge NanoMedics won the most Disruptive Innovation Award at NRF's TechVenture 2012 for its unique business idea and well researched innovation.

Our students' passion and hard work continue to yield results and raise the profile of NUS. An example is Mr Jonathan Leong Yonghui who won the Best Poster Award at the Tribo-UK organised by the National Centre for Advanced Tribology, University of Southampton. This is the first time an NUS student has participated in this Conference and won such a prestigious award. Working on MEMS (Microelectromechanical systems), Mr Leong is spending a year at Imperial College London under the NUS-Imperial PhD programme.

I am also heartened by students who have found time and resources to care for the community while excelling in their studies. "Project Cheway", an initiative taken up by a team of Chemical Engineering students, is one example. These students travelled to a remote village in Cambodia and applied their engineering knowledge to derive cost effective solutions, helping villagers who rely mainly on well water to build reed beds as a method to recycle water.

Indeed, the efforts and achievements by the Faculty staff and students are a testimony to the Engineering spirit which continues to strive against adversity by coming up with innovative solutions to complex challenges.

### **Professor Chan Eng Soon**

DEAN

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*From July 2012*



The background features a complex, layered structure of horizontal and vertical rectangular blocks. The color palette transitions from a warm, bright orange on the left side to a cool, deep blue on the right side. The blocks are semi-transparent, creating a sense of depth and movement. The overall effect is a modern, digital aesthetic.

# EDUCATION

# EDUCATION



*The Faculty of Engineering is ranked  
2<sup>nd</sup> in Asia by QS.*

## **NUS ENGINEERING MOVES UP IN RANKINGS**

THE Faculty of Engineering went up seven places, from 19<sup>th</sup> in 2011 to 12<sup>th</sup> position in 2012, according to Times Higher Education World University Rankings. In 2010, the Faculty was ranked 16<sup>th</sup>.

It maintained its 9<sup>th</sup> position in the QS World University Rankings 2012/2013, and went up a notch, from 3<sup>rd</sup> to 2<sup>nd</sup> in Asia. By subject, Mechanical and Civil Engineering Departments were ranked 5<sup>th</sup>, Chemical Engineering, 7<sup>th</sup> and Electrical Engineering, 11<sup>th</sup>.

# AN INNOVATION AND ENTREPRENEURSHIP PIPELINE FOR ENGINEER-LEADERS

**ENHANCING leadership potential** – this phrase encapsulates the mission of the Institute for Engineering Leadership (IEL).

Headed by Professor Hang Chang Chieh (Executive Director), IEL, which started operations in January 2012, delivers its mission under three thrusts – innovation research, enterprise development and education. This pipeline creates new knowledge, new enterprises, opportunities and transformative programmes as part of the nurturing process of engineer-leaders.

One of the transformative programmes introduced was the IEL Distinguished Speaker Series which generated much follow-on discussion when former Head of Civil Service and NUS Pro-Chancellor Mr Ngiam Tong Dow, spoke on Singapore's wealth creators – those who can "spot opportunities where others only see obstacles". The lecture was followed by Keppel CEO Mr Choo Chiau Beng's lecture on Keppel as a wealth creator which again sparked discussion when he commented on the hollowing out of the engineering profession being a severe loss to Singapore.

In research, IEL's Centre for Technology and Innovation Management completed the first set of five local case studies centred on how leading Singapore companies managed their intellectual property (IP). Funded by the IP Office of

Singapore, the studies show that IP needs to be managed in association with the company's technology maturity, business model, and competitive landscape.

Through its Enterprise Development Lab (EDL), IEL has strengthened collaborative partnerships and established processes to ensure that NUS develops innovations which are market-ready and fledgling start-ups can get the support they need to fly out of the nest.

EDL has developed a set of technology to market programmes – the Technology Venture Lab, the Launchpad, and the Venture Funding Lab which support professors, graduate students and NUS MBA students to develop and validate commercialisation strategies for selected NUS technologies. Six of the technologies that went through the technology to market programmes have received funding.

A market to technology programme – the Frugal Innovation Lab – was also launched to address unique problems in emerging economies. Five teams are working on prototypes with Innovation/Entrepreneurship Practicum Grant funding.

Plans for the next year include a range of coach-driven action-learning programmes for entrepreneurship and innovation, as well as the development of a repository of case studies from IEL's research centres to be used in industry engagement.



*Mr Ngiam Tong Dow's public lecture on Singapore's wealth creators drew much interest from the media and the public. The lecture is part of the IEL's Distinguished Speaker Series launched in 2012.*

# DESIGN-CENTRIC PROGRAMME -- A BEACON IN TRANSFORMING ENGINEERING EDUCATION



*DCP students, Samuel Chan (far left) and Lim Fang Ming (on his left) explaining their projects to Education Minister Mr Heng Swee Keat at the Design Think Tank 2012 launch. DCP students also interacted with the Minister in a dialogue session at NUS Engineering, initiated by DCP (picture right).*

THE NUS Design-Centric Programme (DCP) launched by the Engineering Design & Innovation Centre (EDIC) as a pilot curriculum in 2009 is now a full-fledged programme, carrying the innovation and design torch high. Partnering NUS High School, EDIC is also spreading the message to younger students. Some 20 5th-year NUS High School students have been hand-picked to undergo the programme, mentored by EDIC professionals.

Said Professor Tham Ming Po, EDIC Director, "Similar to the model offered at the NUS Faculty of Engineering, DCP at NUS High will push students out of their comfort zones as they learn how to deal simultaneously with a myriad of challenges and manage uncertainties and ambiguity. The Programme will also provide them the opportunity to learn to adapt to rapidly changing scenarios."



As part of the learning journey, EDIC has also organised its first DCP summer programme for some 70 international and local students, creating a platform for learning in a unique environment. Students with different cultures, backgrounds

and disciplines worked together as a team and to appreciate complexities of real-life issues, said Dr Kevin S C Kuang who chaired the organising committee for the programme. Participants were encouraged to think critically and to synthesise information from various sources to form the big picture when solving complex problems.

“We would like to explore the roles engineers of today can play to address some of the problems associated with rapidly growing Asian cities and how a proper appreciation of the social and cultural aspect of design will lead to an effective and sustainable solution,” said Dr Kuang.

Engineering-in-Medicine education was given a major boost with the launch of a module jointly taught by staff from EDIC and the Rehabilitation Medicine Department in the Singapore General Hospital (SGH). The pilot module has 15 students and includes a clinical component in which students learn to work with patients undergoing rehabilitation, doctors and therapists in SGH and Bright Vision Hospital. Designed specially to bridge engineering and medicine, the module introduces engineering students to the realities and challenges they will face when developing practical solutions for rehabilitation medicine.

It has been a good year for DCP, with projects highlighted in various international conferences, including Singapore’s own – at the 2012 Design Think Tank launch held at the Singapore Science Centre. Projects by students, like the Stem Cells Harvester as well as the Gait Rehabilitation device for stroke patients received acclamation at the IEEE Healthcare Innovation Conference held in Houston, USA. The students’ paper on the Stem Cells Harvester was accepted by the 10th IEEE International Conference on Control & Automation, to be held in Hangzhou, China in 2013. The Gait Rehabilitation device was also voted at the 2012 IDEO – Health Innovation Conference Design Challenge as the quickest device to market entry and the top device to have potentially the biggest impact on healthcare.



*The Autodesk-NUS MOU was inked by Mr George Abraham, Head of APAC education, Autodesk and Prof Chan Eng Soon, Dean, NUS Faculty of Engineering.*

### Autodesk Professors

Another DCP milestone was the appointment of two NUS-Autodesk Term Professors at EDIC. Dr Pang Sze Dai and Dr Kevin Kuang Sze Chiang were selected for their excellent mentorship, ability to foster interaction and teamwork among students, as well as their experience in nurturing the explorer’s spirit among students and to encourage them to think out-of-the-box.

They will play a leading role in the development of the Programme, driving integration of Engineering Design and Digital Prototyping as well as Visualisation Technology within EDIC, in particular through DCP projects.

Dr Pang is an expert in protective and sustainable building technologies. Dr Kuang is active in the research areas of smart structures, advanced composites, structural health monitoring, wireless remote sensing and sensor technology – in particular optical fibre-based sensors.

Technology and skills in the use of professional software are important components in the design process. The two appointed Professors will be able to guide and help DCP students using Autodesk software for projects related to the three broad themes -- Smart, Sustainable Cities; Engineering in Medicine; and Future Transportation Systems – these being three themes that embody issues faced by Singapore and many other parts of the world.

## THE GLOBAL ENGINEERING EXPERIENCE



*Prof Quek Ser Tong (centre) with his pioneer cohort of graduates.*

IT has been an exhilarating three years for 13 students of the Global Engineering Programme (GEP). This pioneer cohort has put up a stellar performance – graduating in three years with a Bachelor’s Degree in Engineering instead of the normal four years.

Six of them have decided to pursue their postgraduate studies in topnotch universities overseas such as Stanford and Cambridge. One of them, Lee Hao Ran, has headed to Cornell University in the States to pursue a direct PhD programme. Said Haoran, “GEP provided me with the opportunity to go on an exchange programme in the University of Illinois at Urbana-Champaign. I also had the opportunity to stay on for the summer so that I could continue my research on a quantitative method for classifying brain tumours.”

His GEP mate, Ong Gim Hoe has also started his journey at Cambridge where he pursues a Master’s degree and continues his research on bio-energy. Gim Hoe said that GEP has been a good experience for him.

“It is specialised and yet allows one to look at issues through multidisciplinary perspectives. Though it is an accelerated track, it offers a great deal of flexibility as well,” he said.

GEP graduates can pursue their postgraduate studies in Singapore instead of overseas, should they so wish. Carmen Lim, for example, has decided to further her studies at Duke-NUS Graduate Medical School. They can also choose to work before furthering their studies – like Juliana Tang and Leong

Pei Yi. Juliana started work in July as an urban planner with Urban Renewal Authority and Pei Yi as an engineer with Surbana. Both graduated this year with a B Eng degree in Environmental Engineering.

Juliana, an ace student from Hwa Chong Institution, has rejected another university scholarship to become a GEP scholar when the Programme first opened its doors in 2009 as a track that allows students to complete their B Eng degree in three years instead of the normal four years. GEP was her choice as it offers wide overseas exposure – one of the universities which Juliana had spent a semester was KAIST in Korea.

Said the Programme’s Director, Professor Quek Ser Tong, “This pioneer batch has proven that they are able to face challenges. They not only managed to get their B Eng degree in just three years, they did so with excellent grades, winning many awards along the way and without missing activities such as CCA, overseas exchange programmes and internships. They also attended special lectures and chat sessions with renowned academics and industrialists, and championed overseas community projects.”

Meanwhile, GEP intake has expanded. This academic year (2011/2012), 25 students have enrolled, coming from various disciplines – Bioengineering, Civil & Environmental Engineering, Chemical & Biomolecular Engineering, Engineering Science Programme, Electrical & Computer Engineering, Industrial & Systems Engineering and Mechanical Engineering.

## ADVANCING ROBOTICS AT NUS ENGINEERING ON MULTIDISCIPLINARY PLATFORM



*Unmanned Aerial Vehicle (UAV) with wide applications including defence, is a field of robotics being researched at the Faculty.*

INTERNATIONAL experts came together at NUS to discuss new robotics and its applications in Advances in Robotics and Smart Devices, a workshop organised by the NUS Faculty of Engineering and the Global Agenda Council on Robotics and Smart Devices, World Economic Forum. The Council proposes a new model to drive global transformation in robotics and smart devices by promoting a multidisciplinary approach.

The workshop, convened by Professor Chua Kee Chaing, Head, NUS Department of Electrical & Computer Engineering, included a lively discussion on a new model for the transformation of the role of robotics and smart devices.

At the workshop, NUS Engineering Dean, Professor Chan Eng Soon announced the establishment of the **Advanced Robotics Centre (ARC)** at the Faculty. The Centre aims to synergise the efforts of researchers on flagship projects that have great impact on society, while at the same time accelerating advancement of scientific contributions through coordinated teamwork.

Robotics at the ARC will focus on four major areas – productivity, offshore technology, defence, medicine and healthcare. Robotics has a long history at NUS Engineering.

The Faculty's Electrical & Computer Engineering and the Mechanical Engineering Departments have been working on robotics since the 1990s.

The Bioengineering Department has also seen emerging capabilities at the interface of engineering and medicine. The Centre will galvanise such research efforts in order to better respond to national and global challenges. It will also work with the international research groups such as those

at Stanford University, Johns Hopkins University, Harvard University, Carnegie Mellon University and UNIST (Korea). Such collaborations will ensure relevance to research activities in terms of scientific contributions and societal impacts in a global setting.



## AEROSPACE SYSTEMS INITIATIVE TAKES OFF AT THE FACULTY

THE Aerospace Systems Initiative was launched within the Design-Centric Programme (DCP) in October, to help Engineering students prepare for the growing aerospace industry in Singapore.

For a start, the Initiative will offer a learning pathway for students to design and develop complex engineering systems for special aerospace missions. This pathway will be open to NUS undergraduates from across Engineering disciplines. It will take in 30 to 40 students per year at a steady rate. Students embarking on this pathway should possess a passion for design and a keen interest in aerospace systems. They can enter during the first year or subsequent years, and continue to conduct related research up to PhD level.

In a pilot run, 48 Engineering students have started working on related projects, including the development of a nano-satellite to accommodate a payload from NUS' Centre for Quantum Technologies.

A team, led by DCP and Engineering Science student, Priyadarshini Majumdar, has won 1st prize in the Singapore Space Challenge for their effort -- a mini satellite model that could facilitate experiments in space.

Another student, Mr Chen Shiyi (4th-year Electrical & Computer Engineering) has completed a six-month internship at the NASA Research Centre at Ames, California where he joined other interns from Mexico and Italy to participate in a PhoneSat project which will be launched by NASA.



*Dr James Newman, Professor of Space Systems at the Naval Postgraduate School (USA) and former NASA astronaut giving the keynote address at the launch of the Aerospace Systems Initiative at NUS.*

## OFFSHORE ENGINEERING MEETS CHALLENGES OF NEW FRONTIERS



*MOU inked to establish close collaboration with Brazilian universities.*

OFFSHORE engineering has been in the forefront of the industry as new territories are being explored, such as the exploitation of pre-salt deposits offshore. This development requires state of the art technologies, applying in water depths of 2000m.

Towards meeting challenges in deepwater technology, the Faculty of Engineering has sealed a Memorandum of Understanding (MOU) with Keppel Offshore & Marine (Keppel O&M), Keppel Offshore & Marine Technology Centre (KOMtech) and FloaTEC to collaborate with Brazilian universities, research industries, and offshore and marine industries. Among other areas of cooperation, it will support engineering undergraduate programmes and postgraduate research.

The MOU was signed on 9 May by NUS Engineering Dean, Professor Chan Eng Soon, Executive Director of KOMtech (Deepwater), Mr Aziz Merchant, Chief Financial Officer of Keppel O&M, Mr Wong Ngiam Jih; and Chairman, Board of Managers of FloaTEC, LLC, Mr Scott Cummins. Also present at the signing ceremony were representatives from Singapore Maritime Institute.

The four parties hope to work closely through this MOU to establish collaboration and partnerships with Brazilian universities such as the Federal University of Rio de Janeiro and the University of Sao Paulo, and Brazilian research centres such as the Centro de Pesquisas Lepoldo Americo Miguez de Mello (CENPES) to cooperate in education and research. Brazil is one of the world's major oil producers.

In September, the Keppel Care Foundation Limited has also donated \$1.4 million in support of the Keppel Chair Professorship, which was established in collaboration with Keppel Offshore & Marine Limited in 2002.

### **Big boost for offshore engineering**

In a boost to nurturing leaders in this field, Sembcorp Marine and other leading companies in Singapore have been offering scholarships to students specialising in Offshore Oil & Gas Technology for the year. Since the establishment of the Offshore Oil & Gas Technology Specialisation in 2006 at the Department of Mechanical Engineering, many have received scholarships from the industry -- with many more receiving offers of employment upon graduation.

Engineering students Arnold Leong Onn Lok and Fan Zhi Hong were the inaugural recipients of the prestigious Sembcorp Marine Lua Cheng Eng Scholarship which covers full tuition fees and living allowance besides other essentials. The scholarship, launched in March 2011, was established in memory of the former Chairman and Director of the Sembcorp Marine Board, a shipping veteran credited for building the regional Neptune Orient Lines business into a world shipping power through the 1997 merger with APL.

Going through stringent selection, the two were selected because they have demonstrated strong leadership qualities and a genuine passion for the marine industry on top of their excellent academic track records.

## SPREADING THE ENGINEERING MESSAGE



All set to go at the Amazing Lab Race.



Building a tower with marshmallows and spaghetti – all part of the fun at Women In Engineering, an event to reach out to potential female engineers.

JUDGING from the enthusiasm on their young faces, Engineering has made a mark. The Faculty of Engineering reaches out to potential engineer leaders with annual events such as Amazing Lab Race, Engineering Quest and Women in Engineering.

This year, young visitors to the campus included some 30 students from as far as Bhutan, Japan, Sweden and Columbia, as part of the International Science Camp organised by Raffles



Young visitors thrilled with augmented reality at ARAT Lab.

Institution, touring Engineering labs like the Augmented Reality & Assistive Technology (ARAT) Lab at the Mechanical Engineering Department.

“Our international students definitely had a lot of fun playing with the setups in the lab. More importantly, the various projects got them thinking deeper into how they can innovate and create products to help humanity. As a teacher, it really warms my heart for students to experience these teaching

moments that inspire!" said Dr Tan Guoxian, Research Mentor, Raffles Institution.

Some 100 students from 10 junior colleges and high schools also discovered what Chemical Engineering was all about at the NUS Chem-E Challenge 2012 React! conceptualised and organised by members of the NUS Chemical Engineering Students' Society (CHESS). Organised for the first time, it provided opportunities for participants to come out with solutions for challenges at four stations in the Department's labs.



NUS Chem-E Challenge 2012 React! in full swing.

Electrical & Computer Engineering students led by Associate Professor Tan Kok Kiong have also brought their efforts to the community. One of which was a portable and calibrated audiometer that was designed for mass hearing loss screening offered by the Integrated Health Screening programme organised by Southwest Community Development Council (CDC). Those with hearing loss were also given a set of hearing assistive device each customised to their condition.

Said Assoc Prof Tan, "Many people with hearing loss do not own hearing aids due to the high cost factor, and also the hassle of getting one and maintaining it. We want to reach out to them with frugal technology and let them hear and communicate again without the cost burden."

The effort was a spin-off from the "Electronics for the Community" programme launched four years ago with South West CDC, Agilent Technologies and River Valley High School. The programme saw about 100 students per run from 10 schools and junior colleges. Putting technology and innovation together, the students created devices which were simple to use but were yet effective in assisting the less privileged in their daily routines.



South West CDC Mayor Amy Khor with Assoc Prof Tan Kok Kiong at the CDC's Integrated Health Screening programme. Those with hearing loss were given a set of hearing assistive device designed by Assoc Prof Tan's team.





**RESEARCH &  
ENTERPRISE**

# RESEARCH & ENTERPRISE



*Prof Chua Kee Chaing trying out a Toyota Auto Body COMS.*

## OVERCOMING THE “LAST MILE” IN URBAN MOBILITY

VISITORS to the NUS campus are pleasantly surprised to see little electric vehicles (EVs) busily going about their business. These are actually Toyota Auto Body COMS. (Japanese acronym for “Chotto Odekake Machimade Suisui” which means “smooth, short rides into town”) and are part of a feasibility study by the Faculty of Engineering and Toyota Tsusho Asia Pacific Ltd (TTAP) using the campus and the NUS University Town as test bed.

The study aims to come out with a sustainable vehicle sharing system that can potentially overcome the “last mile” and environmental issues for future urban mobility. Researchers will study the robustness, performance and cost-effectiveness of such personal mobility vehicles in tropical climatic conditions, and acceptance by users for short distance travels.

Said Professor Chua Kee Chaing, Head, Department of Electrical & Computer Engineering, “With the growing popularity of EVs in the global market, this is a timely collaboration to involve our staff and students in the testing and deployment of EV technology on campus.”

Mr Yasuhiro Kakihara, Executive Vice President, Singapore Business Unit COO, TTAP added that the behavioural needs of the next generation of consumers have to be satisfied in order to create a sustainable business model.

“The launch of this project will pave the way for a new mode of transportation in Singapore to benefit the society as a whole,” he said.

## 'INSINC' TO CUT CROWDS AT TRAINS DURING PEAK HOURS

THE NUS Department of Electrical & Computer Engineering in collaboration with Stanford University has launched a transportation study involving some 20,000 commuters.

Called Incentives for Singapore's Commuters (INSINC), the study which was supported by the Land Transport Authority (LTA), advocates a reward system where commuters earn extra credits for off peak travel. Credits are earned based on the start times of commuters' trips at the MRT stations, tracked through their EZ-link cards. The more off-peak trips participants make (6.30am to 7.30am and 8.30am to 9.30am on weekdays), the more credits they will earn.

Professor Balaji Prabhakar of Stanford University said, "Congestion is a fragile phenomenon. It takes many

people to cause it, but a surprisingly small number to get rid of it. If the load in crowded trains was reduced by 10 per cent, then congestion measures, such as occupancy and the sense of crowdedness, would reduce significantly. Thus, not everyone needs to change their commuting time, and then, not every day. By balancing the occupancy of trains across peak and off-peak times, a more efficient use can be made of the transit system while increasing passenger comfort."

NUS Associate Professor Motani added that situation on the rail system can be better managed by incentivising commuters to shift some of the current peak travel demand to off-peak periods. Commuters will benefit from an improvement in their overall experience riding trains, including shorter waiting times, increased chances of boarding trains, and reduced total journey times.



Press conference at the launch of INSINC at NUS.

## DEVELOPING NEXT-GENERATION BATTERIES

SODIUM, found in abundance, is a new kid on the block in the making of next-generation rechargeable batteries. A team led by Dr Palani Balaya, Department of Mechanical Engineering and Engineering Science Programme, has turned this new kid into a star. Dr Palani believes that sodium batteries could overtake lithium batteries in the near future, especially for large scale grid storage applications. Sodium, besides being more environmentally friendly, is also easy to recover -- at a fraction of the cost of lithium metal.

Currently, lithium-ion batteries are the preferred energy storage device for most consumer electronics as well as electric vehicles. They have proven to be effective because they are long lasting with high energy density, yet compact and lightweight. But while lithium is a scarcity, sodium is the sixth most abundant element on the Earth's crust.

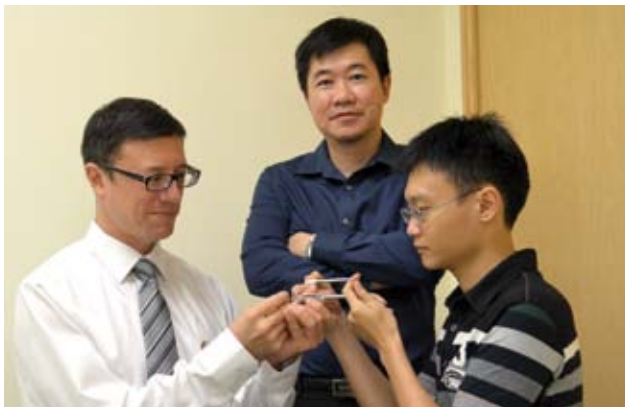
Said Dr Palani, "Sodium-ion batteries are still in the nascent stage but we expect them to be inexpensive and durable. Using a simple synthesis strategy, we have successfully developed phosphate nanostructures with an integrated

conductive network for facile insertion and extraction of sodium ions. This method yields high quality porous electro-active materials which exhibits superior sodium storage, compared to other currently known procedures."



*Dr Palani Balaya (fore) with his team at Department of Mechanical Engineering.*

## RESTORING VOICE OF THROAT CANCER PATIENTS



*The team (from left): Dr David Lau, Dr Chui Chee Kong and Mr Chng Chin Boon, with their invention.*

PATIENTS who have lost their voice box through disease such as throat cancer may be able to speak immediately after a 10-minute procedure to create a small opening at the throat – thanks to an invention led by Dr Chui Chee Kong, Department of Mechanical Engineering, and Dr David Lau, consultant ENT surgeon at Raffles Hospital. Currently, it takes about two weeks before patients can speak after the initial procedure.

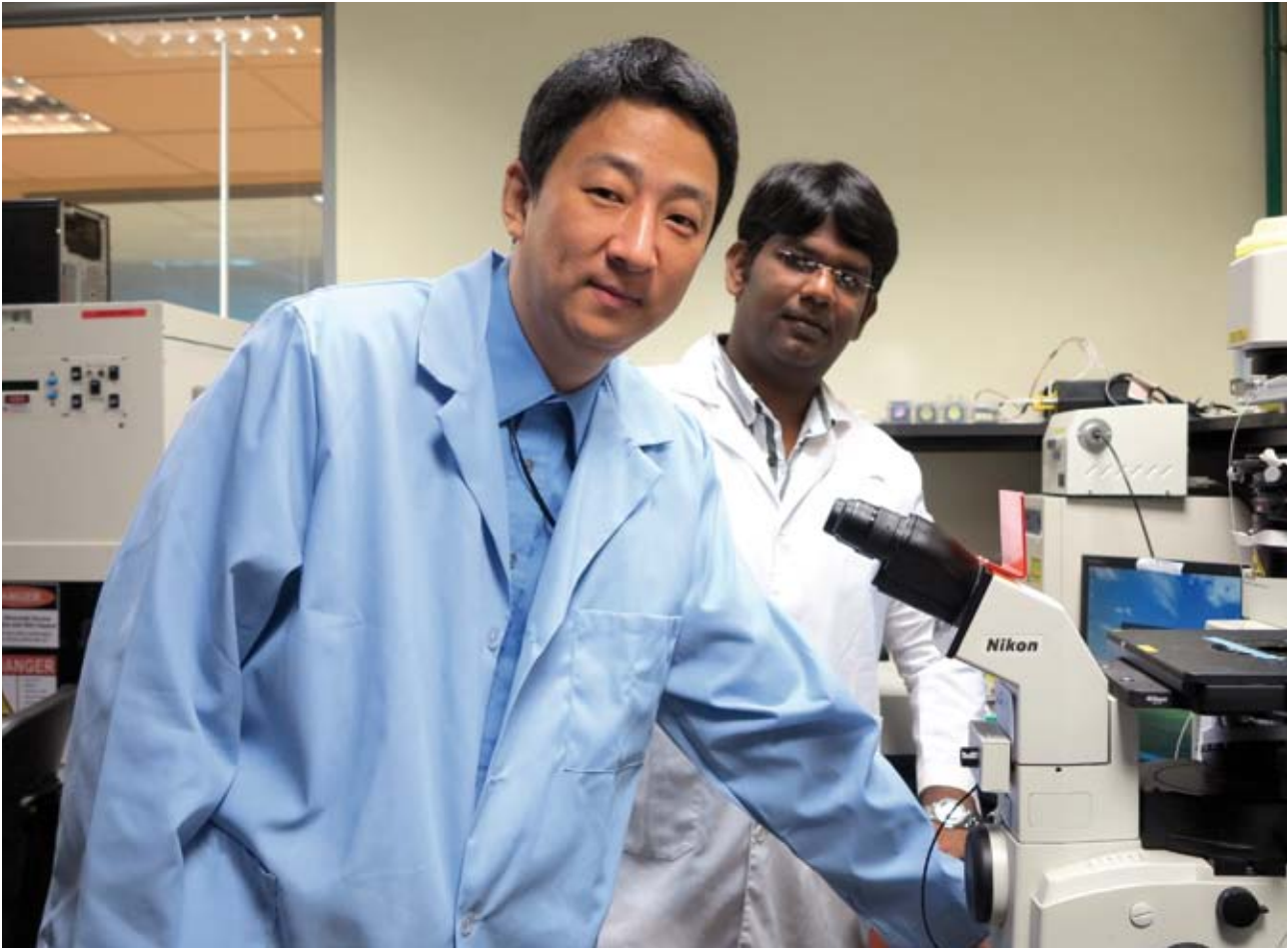
People who have undergone laryngectomy and lost their voice box can recover approximately 80 per cent of normal speech by having a voice prosthesis fitted into an opening or fistula between the trachea (windpipe) and esophagus (food pipe).

Commenting on their novel method, Dr Chui said, "Although doctors still need the nasal endoscope to guide and monitor progress during the procedure, our system ensures an immediate snug fit of the prosthesis in the passageway created between the trachea and the esophagus. Until now, this can take some trial and error to achieve good sizing of the prosthesis."

Voice prostheses vary in length for different individuals, depending on the thickness between the food pipe and the windpipe. The length of the puncture needs to be accurate. Usually, the length ranges between 6mm to 26mm. It is important that the prosthesis fits well otherwise it may be ineffective, or leak and cause discomfort.

The system has been successfully tested on animals, and is now ready for clinical human trial.

## A SAFER NON-INVASIVE WAY TO TREAT DEEP CANCER USING LIGHT THERAPY



Prof Zhang Yong (fore) with his PhD student, Mr Muthu Kumara Gnananasammandhan.

PHOTODYNAMIC therapy (PDT) as a non-invasive treatment of cancer is limited by the penetration depth of visible light needed for its activation. But an NUS Bioengineering team led by Associate Professor Zhang Yong has found a solution to overcome this, paving the way for PDT to treat deep-seated cancer. His effort was recognised at the National Engineers Day celebrations where he was conferred the IES (Institution of Engineers, Singapore) Prestigious Engineering Achievement Award.

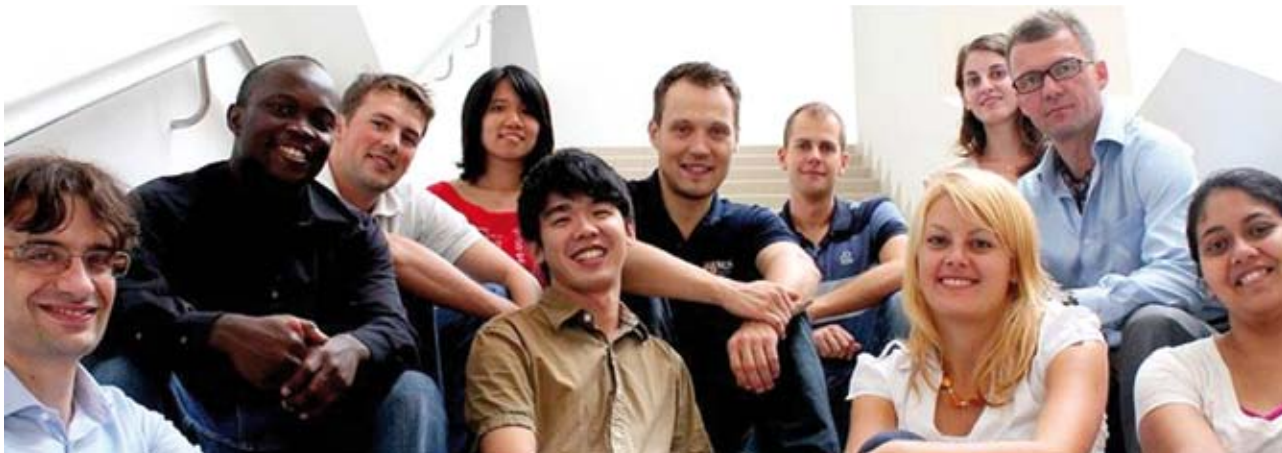
Their findings were published in *Nature Medicine* in September, in their paper, *In vivo photodynamic therapy using upconversion nanoparticles as remote-controlled nanotransducers*. In an earlier paper published in *Proceedings of the National Academy of Sciences, USA* (May, 2012), the team also revealed how they have been able to control gene expression – the release of certain proteins in our body – using their nanoparticles which could convert NIR (Near Infrared) light to UV light (visible light needed for effective activation).

Explained Assoc Prof Zhang, “NIR, besides being non-toxic, is able to penetrate deeper into our tissues. When NIR reaches the desired places in the body of the patient, the nanoparticles which we have invented, are able to convert the NIR back to UV light to effectively activate the genes in the way desired, by controlling the amount of proteins expressed each time, when this should take place, as well as how long it should take place.”

The team is currently in collaboration with other NUS researchers as well as those at the National Cancer Centre Singapore to pursue a project funded by A\*STAR that will assess the safety and efficacy of their technology, paving the way for clinical trials in the future.

The team has also embarked on several other projects that make use of the upconversion nanoparticle for point-of-care diagnostics for diseases.

## 2.6 MILLION EURO FINANCING TO ACCELERATE AYOXXA'S CUTTING-EDGE TECHNOLOGY



*AyoxxA team Singapore: CEO Dr Andreas Schmidt (far left) and Dr Dieter Trau, CSO (upper far right).*

NUS BIOENGINEERING spin-off company, AyoxxA Biosystems has closed a 2.6 million Euro Series A financing round. The round was led by Wellington Partners Venture Capital. The funds raised will be used to drive the further development of AyoxxA's proprietary platform technology and the scale-up of production of its novel bead-based biochips as the company moves towards commercialisation.

Unlike current bead-based microarrays, AyoxxA's IEBA (In-situ Encoded Bead-based Arrays) need no physical label to allow multiplex analysis, thus hugely reducing the complexity of downstream analysis while increasing the number of individual proteins that can be analysed at the same time.

Dr Andreas Schmidt, AyoxxA's CEO said: "This fundraising provides AyoxxA with the resources to significantly accelerate

the scale-up of production of our unique bead-based biochips and, through the expansion of our base in Cologne, prepare to bring our technology to market. We believe our technology can revolutionise protein analysis and with our growing presence in Europe combined with our continued access to the world-class science in Singapore we are uniquely positioned to deliver on that promise."

Dr Regina Hodits, General Partner of Wellington Partners Venture Capital, commented: "AyoxxA's technology has the potential to become the new standard for the precise, fast, and cost effective analysis of multiple protein-protein interactions in limited sample volumes. This will allow the company to initially address a research market worth hundreds of millions of dollars and longer term reach into pharmaceutical screening and ultimately diagnostics."

## SMARTPHONE-FRIENDLY GLOVES

WE all know how compulsive it is to tap away at our touch screen devices. But what happens if you are in a cold country and want to keep your gloves on?

Engineering Science Programme student Fitzkhooon Liang Yaowen teaming up Tan Yan Liang, Mechanical Engineering, and two other NUS students, have come out with a solution. Their invention, known as ISGLOVES, won an award for their innovation at DEMO Asia 2012, one of the biggest start-up competitions in the region. The product is now being marketed by FIETT, a start-up formed by NUS students and alumni of the NUS Overseas College.

Fitzkhooon said the idea came about when one of their friends used her nose to touch the screen of her iPhone in an attempt to unlock it while wearing gloves. Devices are not able to detect electrical charges from the fingertips if gloves are kept

on. The students' innovative gloves however, are embedded with conducting fibres to transmit the charges.

Said Professor Wang Chien Ming, Director, Engineering Science Programme, "I am very proud indeed that Fitzkhooon is a member of this innovative team. Touch screens have become almost an indispensable part of our lives. Hence, their invention is something that we will all need to use when travelling to cold countries or when the skin on our fingertips is too dry and hence unable to transmit signals to touch screens."



*Fitzkhooon with ISGLOVES.*

## MAJOR RESEARCH GETS SIGNIFICANT GOVERNMENT FUNDING

FOUR teams have been awarded the National Research Foundation (NRF) Proof of Concept grants (7th call). Receiving up to \$250,000 each, they were given 12 months to turn their ideas into prototypes that can be commercialised in the market. Two of the projects focused on next-generation batteries.

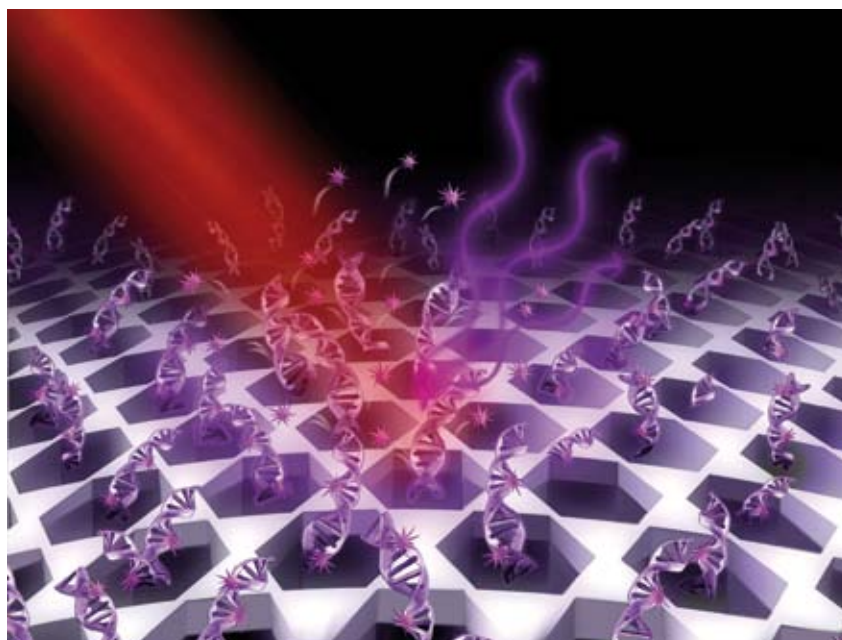
Team led by Dr **Palani Balaya**, Department of Mechanical Engineering, will develop an integrated flat-type Lithium-ion battery for portable electronic device applications, using indigenously developed cathode and anode materials.

Professor **Lu Li** leads another project on Li-ion rechargeable batteries with high energy density and fast charge-rate. They have recently developed and patented positive materials which can be charged within a short duration, and a graphene-based negative material which possesses a capacity of about three times higher than that of current commercial batteries using graphite.

Professor **Choi Wee Kiong**, Department of Electrical & Computer Engineering, Professor **Raj Rajagopalan**, Department of Chemical & Biomolecular Engineering, and Associate Professor **Too Heng Phon**, Department of Biochemistry (School of Medicine), will develop "microarray" technology for capturing and identifying "analytes" such as DNA, proteins and other substances important in biological and clinical sciences. The team aims to develop the method to enable efficient and fast detection of even trace quantities of proteins. They will also enhance the versatility of microarrays for next-generation applications.

Team led by Associate Professor **Zhang Yong**, Department of Bioengineering, will develop diagnostic tests for the detection of multiple biomarkers to enhance accuracy. They proposed to do this using Up-Conversion Nanoparticles (UCNs) for optical imaging and detection.

Professor **Lian Yong**, Department of Electrical & Computer Engineering has received the NRF Competitive Research Programme grant (8th call) to work with researchers from NUS medical school, public health school and Fujitsu Laboratories, to design and develop tiny wearable sensors that



*Research on Up-Conversion Nanoparticles gets NRF grant.*

can transmit patients' vital data to doctors automatically. Such wireless sensors would allow patients uninterrupted sleep as they need not be woken up periodically for their temperature and pulse rate to be taken.

Assistant Professor **Wang Qing**, Department of Materials Science and Engineering, also received an NRF grant for their work on large scale energy storage. His project, "Redox-flow Lithium Batteries as a New Concept and Implementable Solution for Large Scale Energy Storage", combines the advantage of great system flexibility of the Redox flow battery with the high energy density of the lithium ion batteries. Advantages of "Redox" (a contraction of the terms "Reduction" and "Oxidation") flow cells include very high power output, fast recharge (by replacing spent electrolyte) and the use of non toxic materials.

Dr **Ernest Chua Kian Jon**, Department of Mechanical Engineering and Engineering Science Programme, working with ST Kinetics, will develop and test out on a large scale, their novel desiccants made from composite materials which will potentially cut energy cost. His project is among the nine which received funding (up to \$1 million each) from the Agency for Science, Technology and Research (A\*STAR), Building and Construction Authority (BCA) and the Ministry of National Development (MND). The grant call is the first of its kind to foster Public-Private Collaboration (PPC) in green building research.

## ENGINEERING SOLUTIONS FOR MEGACITIES GET BIG BOOST

THE National Research Foundation (NRF) have awarded Associate Professors Tong Yen Wah, Karina Gin Yew-Hoong and Chia Eng Seng a five-year grant of more than \$24 million for their project, "Energy and Environmental Sustainability Solutions for Megacities".

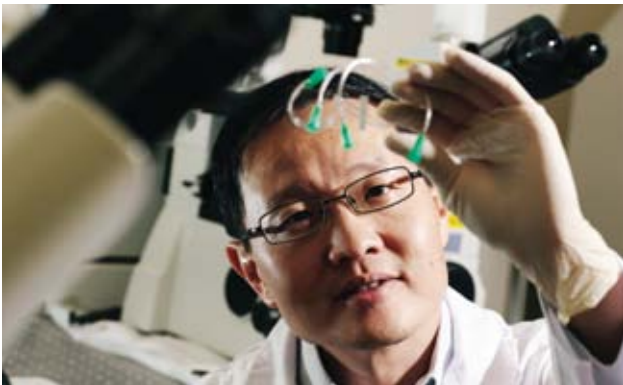
The NUS Engineering researchers will be collaborating with Shanghai Jiao Tong University and the School of Computing in a Campus for Research Excellence and Technological Enterprise (CREATE) programme on the theme of sustainable solutions for megacities.

Said Assoc Prof Tong, "The project aims to develop a platform to facilitate the understanding, design and implementation

of sustainable solutions for coupled problems in future cities, starting with two sites of different sizes and complexities, in this case a megacity like Shanghai and a land-scarce city like Singapore. "

He added that they will also be developing capabilities needed in solving coupled problems characteristic of complex city systems, including sensing, modeling, data mining, systems modeling, designing test bedding systems and adaption, and scalability of holistic solutions to a variety of environments. "This will then allow us to adapt solutions to other cities with different complexities and sizes based on calibrated modeling and test-bedding," said Assoc Prof Tong.

## CLEARLY BRIDGING ENGINEERING AND MEDICINE



NUS Bioengineering spin-off company Clearbridge BioMedics has swept three awards at The Wall Street Journal (WSJ)'s Asian Innovation Awards ceremony held in Hong Kong in November. It took the WSJ Asian Innovation Award (Gold), Technopreneur of the Year Award and the Audience's Choice Award. This is the first time a company has won three WSJ awards in a single sitting.

The Gold Prize recognises Clearbridge BioMedics' effort in contributing to world-wide efforts to detect and fight cancer. The company has developed a biochip to isolate circulating tumour cells (CTCs) which detached from tumour sites, are circulating in the bloodstream.

Clearbridge BioMedics also won first prize in the Asian Entrepreneurship Award 2012 competition in Tokyo. The prize is accompanied by a three million yen award for further development.

A sister company, Clearbridge NanoMedics, has also earlier won the Most Disruptive Innovation Award at TechVenture

2012. The Award by National Research Foundation (NRF) recognises start-ups which convey clearly a unique and disruptive business idea or technology, demonstrating vision through evidence of a well researched and well-articulated innovation, with clear and reasonable forecasts of potential business performance.

Professor Lim Chwee Teck, co-founder of both Clearbridge companies and a faculty member with the Departments of Bioengineering and Mechanical Engineering, said NanoMedics is developing various nanofibre meshes which are extremely pliable, making them ideal for contouring. Their applications range from extended-wear facial masks, anti-ageing treatment stickers as well as dermal patches for burns or difficult wounds.



*Prof Lim Chwee Teck (right) and Mr Johnson Chen, Managing Partner of Clearbridge Partners, with their three WSJ awards.*



OUR PEOPLE  
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## OUR PEOPLE. **STAFF**

### **ELECTED VICE PRESIDENT OF INTERNATIONAL FEDERATION FOR MEDICAL & BIOLOGICAL ENGINEERING**



*Prof James Goh receiving a plaque from Prof Herbert Voigt, President of the International Union for Physical and Engineering Sciences in Medicine.*

PROFESSOR James Goh, Head, NUS Department of Bioengineering, was elected Vice-President of the International Federation for Medical and Biological Engineering (IFMBE) during the IFMBE General Assembly held in conjunction with the 2012 World Congress on Medical Physics and Biomedical Engineering in Beijing, China. Prof Goh was also elected Secretary-General of the International Union for Physical and Engineering Sciences in Medicine (IUPESM) which IFMBE is affiliated to.

As Vice-President of the IFMBE, Prof Goh also holds the title of President-Elect concurrently and will assume the position of President in 2015. The IFBME is primarily a federation of national and transnational organisations which represents the national and global interests in medical and biological engineering. The Federation now has 60 affiliated member organisations. The objectives of the IFMBE are scientific, technological, literary, and educational.

### **RARE HONOUR OF RECEIVING DOUBLE IEEE AWARDS**

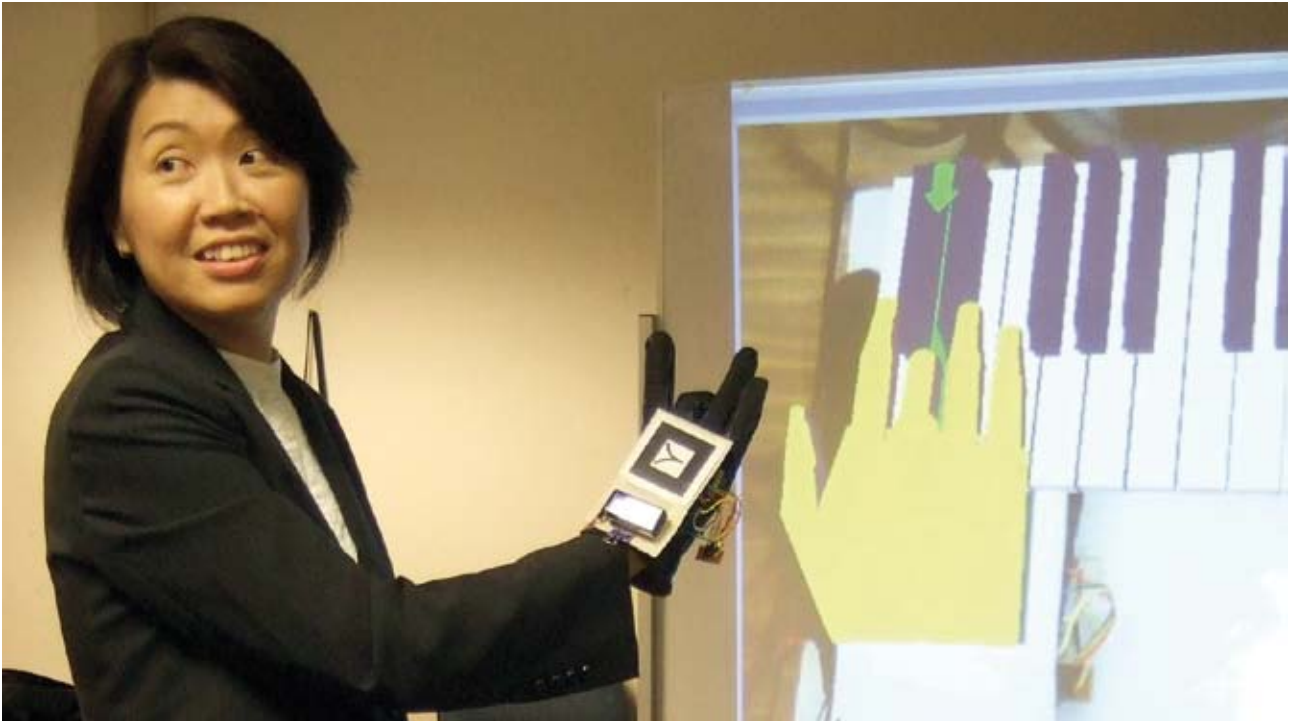


IN recognition of his outstanding leadership and contributions to the growth and impact in his area of technology, Professor Andrew Tay, Department of Mechanical Engineering, has been awarded the 2012 IEEE CPMT (Component, Packaging and Manufacturing Technology) Regional Contributions Award for Asia and Pacific Region.

He also received the 2012 IEEE CPMT Exceptional Technical Achievement Award for his exceptional technical achievement in the fields encompassed by the CPMT Society.

He is the first person in the region to have received the Award in CPMT -- and the first don in the world to get two IEEE awards in the same year. IEEE (Institute of Electrical and Electronics Engineers) is the world's largest professional association for the advancement of technology. The Conference is a premier event on the calendar of the international packaging, components, and microelectronic systems technology industry and serves as a platform for interaction among professionals from around the world.

## ELECTED CIRP FELLOW -- RARE HONOUR FOR WOMEN IN ENGINEERING



*Assoc Prof Ong Soh Khim, demonstrating the use of her innovation, the data glove, which employs augmented reality technology. Her contributions to technology with significant impact on society has brought much acclaim, including the first Singaporean woman to receive the prestigious 2009 Emerging Leader Award in Academia from the Society of Women Engineers.*

ASSOCIATE Professor Ong Soh Khim was conferred as a Fellow at the 62nd General Assembly of the International Academy for Production Engineering (CIRP) on 25th August. She is the first from Asia and the 4th female in the world to become a Fellow of the Academy. The previous three lady Fellows are from North America and Europe.

CIRP is the French Acronym for Collège International pour la recherche en Productique. Established in 1951 with headquarters based in Paris, CIRP is recognised as the highest authority in the field of production/manufacturing engineering in the world. Fellows are limited to 15 per country and a total cap of 175 at any one time worldwide. Election to Fellow represents the highest recognition of a scientist in the field of manufacturing engineering.

A Fellow is elected for life. The election process is extremely rigorous. One needs to be an Associate Member first (which is also through a highly selective process) and then to be nominated by a home Fellow together with three Fellows from different countries.

This is followed by a web-based anonymous voting. A successful candidate should receive at least 75 per cent of the positive votes from all the voting Fellows and 50 per cent of all Fellows (including those who did not vote).

Assoc Prof Ong has made significant contributions in several areas of manufacturing, the most notable being augmented reality research in manufacturing, intelligent and distributed manufacturing, sustainable manufacturing. She has published five books, over 102 refereed journal papers with citation over 1100 and an H-Index of 21.

In addition to being elected Fellow of CIRP, she has a long string of much coveted awards including the Singapore Youth Award, the US Society of Manufacturing Engineers Eugene Merchant Outstanding Young Manufacturing Engineer Award, the Outstanding Young Person of Singapore Award 2006, and the US Society of Women Engineers Emerging Leader Award in Academia 2009.

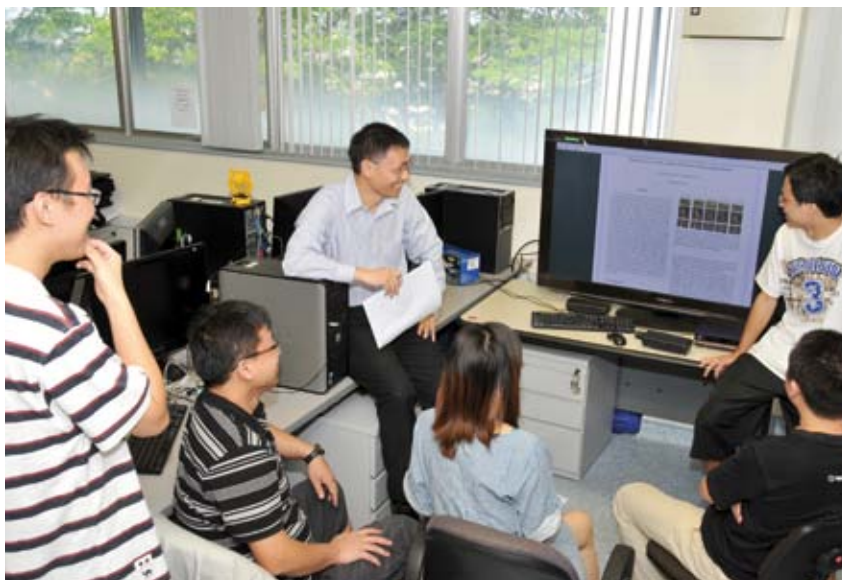
## YOUNG ECE RESEARCHER RECEIVES UNIVERSITY AWARD

FOR his outstanding contributions in multimedia, computer vision, and machine learning, Dr Yan Shuicheng, Department of Electrical & Computer Engineering, was conferred the NUS Young Researcher Award at the University Awards Ceremony on 4 May.

Dr Yan has a Hirsch index of 21, and has solved a number of fundamental problems and produced groundbreaking results in these fields, publishing several high-profile works that have been highly cited.

In 2010, he won two best paper awards at two of the most prestigious multimedia conferences. In the same year, he was also recognised for setting a record for the highest number of papers accepted at two highly-selective conferences.

Dr Yan currently serves on the editorial boards of four journals. He won the 2010 Best Associate Editor award for his service to the IEEE Transactions on Circuits and



*Dr Yan Shuicheng (seated left, near window) with students.*

Systems for Video Technology. He is also currently a guest editor of the IEEE Transactions on Multimedia.

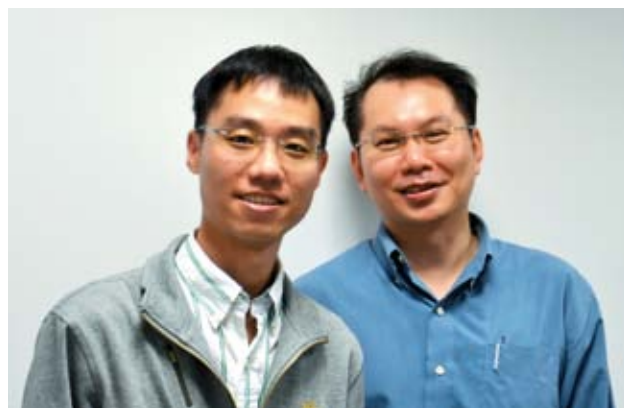
Dr Yan is a recipient of the 2011 Singapore National Young Scientist Award and the 2011 Faculty of Engineering Young Researcher Award.

## AWARD-WINNING RESEARCH ON SEMICONDUCTORS

NUS Engineering PhD student, Mr Gong Xiao and his supervisor, Dr Yeo Yee Chia, Department of Electrical & Computer Engineering, have found a novel way to transform semiconductors (GeSn and InGaAs) for future high performance and low power electronic applications.

The surfaces of GeSn and InGaAs tend to have broken bonds when a high-permittivity dielectric is directly deposited on them, resulting in lower transistor speed. Their breakthrough in technology effectively reduces the density of the broken bonds in a cost-effective way.

Their work won the bronze medal in the 6th Taiwan Semiconductor Manufacturing Company (TSMC) Outstanding Student Research (OSR) Award Ceremony. TSMC is the world's largest dedicated semiconductor foundry, which manufactures integrated circuit chips for fables high-tech companies.



*Mr Gong Xiao (left) with his supervisor Dr Yeo Yee Chia.*

This year, 160 graduate students worldwide competed for the awards. Only 24 outstanding students from top universities were shortlisted for the finals at the headquarters of TSMC, with 11 medalists emerging after a rigorous selection.

## UNRAVELLING MYSTERIES BEHIND STEM CELL DESTINY

LEE Kuan Yew Postdoctoral Fellow with the NUS Department of Chemical & Biomolecular Engineering, Dr Dalton Tay Chor Yong hopes to shed more light on the “nurturing” process of stem cells so that they can mature to function according to targeted purpose.

Dr Tay is interested to understand how small-scale micro environmental parameters can guide Adult Stem cells (ASCs) to become smooth muscle cells, which are found in several important parts of the body, for example in new blood vessels and gastro-intestinal tract.

Said Dr Tay, the only candidate in NUS to be awarded the Fellowship in 2012: “A holistic approach is needed where the micro-environment plays a vital role. My project, ‘Micro-nano Patterning Technology in Determining Cell Fate and Underlying Mechanism’ aims to understand and improve the fate decision process for ASCs, using advanced micro-nano patterning

techniques to create a micro environment that fine tunes ASCs’ response to chemical factors.”

“Eventual findings made from this project will have broad clinical implications and is envisaged to interest biologists, clinicians and bioengineers. For instance, we can now design specific micro nanoscale surfaces with defined patterns to be incorporated as part of the design criteria for advanced biomaterial applications,” he added.

Working with his mentor, Assistant Professor David Leong, Dr Tay has also extended the use of the platforms to gain better understanding of cancer progression, and also emerging fields like nanotoxicology. They are also exploring the application of micro nanopatterning technologies in other significant areas such as energy and water sustainability, drug delivery systems and bio-chemical sensors.



*Dr Dalton Tay, Lee Kuan Yew Postdoctoral Fellow with NUS Department of Chemical & Biomolecular Engineering is interested to find out what goes into the destiny of stem cells.*

## SOME OTHER NOTABLE STAFF ACHIEVEMENTS

Assoc Prof **Balasubramanian Rajasekhar** was conferred Engineering Educator Honour Roll AY2010/2011.

Assoc Prof **David K H Chua** was appointed Honorary Fellow of the Workplace Safety and Health Institute from 1 Apr 2012 to 31 Mar 2014.

Assoc Prof **Dipti Srinivasan** was conferred Engineering Educator Award AY2010/2011.

Dr **Dong Yang**, Dr **Raymond Ong Ghim Ping** & Prof **Anthony T H Chin** (Economics) won the Hanjin Prize for the best paper presented in the 2012 International Association of Maritime Economist (IAME) Conference in Taipei, Taiwan, 6-8 Sep.

Dr **Aaron Danner**, Dr **Heng Chun Huat** & Dr **Saif Khan**, Assoc Prof **Loh Kai Chee**, Dr **Pang Sze Dai**, Prof **Lee Tong Heng** & Assoc Prof **Poh Kim Leng** were conferred the NUS Annual Teaching Excellence Award (ATEA) AY2010/2011; and Teaching Award (Honor Roll) in recognition of their sustained quality performance in teaching.

Prof **Andrew Nee Yeh-Ching** was conferred honorary professorship by Beijing University of Aeronautics and Astronautics and Tianjin University in China (12 & 16 Nov). He was also conferred the Faculty's Engineering Research Leadership Award 2012.

Prof **Goh Thong Ngee** received the American Society for Quality (ASQ) Eugene L Grant Medal in Anaheim, CA, USA on 20 May, in recognition of his exceptional leadership in promoting the learning and application of effective quality tools throughout the world.

Dr **Adrian Koh Soo Jin** was awarded 3rd Prize for Scientific Research on Electroactive Polymers, at the International Conference for Electromechanically Active Polymers for Transducers and Artificial Muscles, Potsdam, Germany, 29-30 May.

Dr **Kuppan Saravanan**, a member of the team led by Dr Palani Balaya, received the Young Investigator Award for their poster on "Novel Porous Sodium ion insertion host for Sodium-ion Battery Application" at the International Meeting on Lithium Batteries in Jeju, Korea, 17-22 June.

Assoc Prof **Lee Der-Horng** was appointed Chair of the Master of Science in Urban Transport Management Programme Advisory Panel on 7 May. This MSc programme was jointly developed and offered by SIM University and the LTA Academy.

Assoc Prof **Lee Heow Pueh** was conferred the Innovative Teaching Award (Silver) AY2010/2011.

Prof **Lee Tong Heng** was conferred Engineering Educator Honour Roll AY2010/2011.

Assoc Prof **Lian Yong** was conferred the Faculty Research Award 2012.

Assoc Prof **Liu Bin** was conferred Young Faculty Research Award 2012.

Assoc Prof **Loh Kai Chee** was conferred Engineering Educator Award AY2010/2011.

Assoc Prof **Mehul Motani** was conferred the Innovative Teaching Award (Gold) AY2010/2011.

Prof **Nitish V Thakor** was appointed Provost's Chair Professor.

Assoc Prof **Ong Soh Khim**, PhD student Yang Lei and Prof Andrew Nee won the Best Paper Award at the 10th International Conference on Frontiers of Design and Manufacturing (ICFDM) held at Chongqing, China. Their paper was titled "A frame work for feature-based product modeling in a collaborative environment".

Dr **Pang Sze Dai** was conferred Engineering Educator Honour Roll AY2010/2011.

Dr **H R Pasindu**, Prof **Fwa Tien Fang** & Dr **Raymond Ong Ghim Ping** were awarded Best Paper Award for their paper "Analysis of Skid Resistance Variation on a Runway during an Aircraft Landing Operation" at the 7th International Conference on Maintenance and Rehabilitation of Pavements and Technological Control (MAIREPAV7), Auckland, New Zealand, 28-30 Aug.

Prof **Phoon Kok Kwang** was conferred Engineering Educator Award AY2010/2011.

Dr **Praveen Linga's** paper on carbon dioxide capture was listed among the top 25 most cited articles in "Chemical Engineering Science" from 2007-2012.

Dr **Qiu Chengwei**, Dr **Aaron Danner** & Dr **Tan Ping** won the inaugural TR35@Singapore Award 2012, Singapore, 16 Mar. The award by Technology Review published by MIT was presented in an award ceremony co-organised by MIT Enterprise Forum.

**Qui T Nguyen** (PhD student) and Assoc Prof **David K H Chua** received the EPPM Award at the 3rd International Conference on Engineering, Project and Production Management, University of Brighton, UK, 10-11 Sep.

Dr **Teo Chiang Juay** was conferred Engineering Educator Award AY2010/2011.

Dr **Yeo Yee Chia** & team's work on "Gold-free Gallium Nitride devices" has been featured online in "Semiconductor Today", UK, 7 June. He was also conferred the Faculty Research Award 2012.

Prof **Wang Chien Ming** was elected as a Fellow to the Academy of Engineering Singapore. He also received the IES Outstanding Volunteer Award 2012 for his volunteer work as the Editor-in-Chief for IES Journal Part A, since 2007.

Dr **Weng Jinxian** & Dr **Meng Qiang** received the 2011 Best Paper Award for their paper "A Decision Tree-based Model for Work Zone Capacity Estimation" from the Transportation Research Board, National Research Council, the National Academies, USA, 23 Jan.

Dr **Zhang Chun** won the Outstanding Lectureship Award by the Chemical Society of Japan (CSJ) at the 92nd annual meeting of the CSJ held in Keio University, 26 -29 Mar, in recognition of his contributions to theoretical/computational studies of nanomaterials.

## NATIONAL DAY AWARDS

Prof **Victor Shim** was awarded the Public Administration Medal (Silver), National Day Award.

Assoc Prof **Ashraf Kassim** was awarded the Public Administration Medal (Bronze), National Day Award.

Dr **Chew Soon Hoe**, Prof **Fwa Tien Fang**, Prof **Kam Pooi Yuen**, Prof **Gade Pandu Rangaiah**, Prof **Swaddiwudhipong, Somsak**, Assoc Prof **Tay Cho Jui**, Assoc Prof **Toh Siew Lok** were conferred the Long Service Award, National Day Award.

# OUR PEOPLE. STUDENTS

## A WINDOW OPENS IN CAMBRIDGE

JOANNE Chan, Double Degree Programme student (Mechanical Engineering and Business) went on the Shell-NUS Student Exchange Programme with Cambridge University when she was in her 3rd Year, and returned aglow with new experiences.

“It was easy to make friends and get to know the other ‘freshers’ (freshmen) from my college during Freshers’ Week. Culturally, there is a great deal of openness and willingness to explore different ideas. Everyone is open to sharing and discussing alternative worldviews and that has been one of the most enriching aspects of my exchange. The weather, needless to say, has been much colder and drier than Singapore and I’m proud to say that I’ve battled and triumphed over fresher’s flu!”

Joanne recalled she had tremendous fun playing among autumn leaves in the UK. “Sounds pretty mundane but the autumn scenery in and around my college has been pretty breathtaking. I’ve gone on the annual Oxbridge Varsity Ski Trip to Val Thorens where 3,200 students swarmed the French Alps, taking to the slopes. It was a week of intense skiing, snowball fights and really good French cheese,” she said.

She had also embarked on Cambridge’s Jailbreak, a charity event in which pairs raised money for charities by fulfilling pledges made by their friends. The aim of the event would be to get as far away geographically from Cambridge in 36 hours without using any of their own money (nor the money pledged towards charity).

The takeaways from her Cambridge stint included the way small group tutorials were conducted -- with “rigorous supervision” -- and the impromptu chats and discussions that she had with fellow students.

“One of the greatest lessons that I’ve learnt would be to give everything a chance -- to give it your best shot. It could be fitting in to a completely new culture, making sense of the new engineering concepts, skiing for the first time, going to a homestay with a British friend,” said Joanne.

Joanne has a bond with the Building and Construction Authority (BCA) and will be working there after graduation. “I am really excited about the different opportunities I’d have to put my engineering classroom concepts into real policies and to see how that can positively impact our built environment!”



*Joanne, enjoying the scenery at Cambridge.*

## WINNING SOLUTIONS FOR URBAN MOBILITY



Winners of Innovation Contest with NUS Engineering Deputy Dean, Prof Lim Seh Chun (far left) and Prof Chin Hoong Chor (far right), UMI, organiser of the event.

DESIGN-Centric Programme (DCP) students are spot on in their solutions for complex challenges. Two DCP teams took home 2nd and 3rd prizes at the Urban Mobility Initiative

(UMI)'s Innovation Contest which aimed to encourage NUS students to shape the future of urban mobility in Singapore.

Team comprising Lee Wei Hong (Electrical & Computer Engineering) and Thng Jing Xiong (Mechanical Engineering) took the 2nd prize for Prototype category, with their effort, "360 degree terrain sensor". This is a sensing system for helping drivers detect potential collisions from an all-round vision.

They also won 3rd prize for the Ideas category with their concept of a novel pneumatic double-layer airbag. A second team comprising Ee Sun Huai, Jee You Cheng and Tan Quan Yen won 2nd prize for the Ideas category. Their idea, "Island-wide Personal Public Transport" advocated a flexible system for users to use a pool of vehicles by tapping their EZ-link card on the vehicle door at designated points.

## A WINNER IN THE ART OF LUBRICATION -- ON A MICRON SCALE

DEVELOPING a sharp eye for investigating how things operate on a micron scale (often less than the diameter of a human hair) has led to Jonathan Leong Yonghui winning the Best Poster Award at the Tribo-UK organised by the National Centre for Advanced Tribology, University of Southampton.

This is the first time an NUS student has participated in this Conference, and won such a prestigious award to boot. Jonathan is a student in Mechanical Engineering, currently spending a year at Imperial College London under the NUS-Imperial PhD programme.

MEMS is an upcoming field. We are all familiar with lubrication of engines and motors in our everyday life. But when it comes to lubricating micro systems, things can get complicated.

"For instance, gaps between components can become as small as a micrometre and simply adding an additive into the liquid lubricant could lead to even higher friction and more wear," said Jonathan.

"Due to the small scale of such devices, the friction laws that we are familiar with at the macro scale are at best vague and do not take into account other factors which become

significant as we decrease the size of objects," he added. Jonathan and team supervised by Associate Professor Sujeet Kumar Sinha of NUS; Professor Hugh Spikes and Dr Tom Reddyhoff of Imperial College, have come out with a solution that is able to reduce the friction not only at low speeds but also at high speeds.



Jonathan (far right) with other team members of Imperial College at the Tribo-UK Conference. They received the Best Poster Award. This is the first time an NUS student has taken part in the conference, and won a top prize.

## BUILDING 'REED BEDS' AND BONDS IN CAMBODIA



*The students with the reed bed they built in Prey Veng.*

CHEMICAL Engineering students lived and worked with villagers in Prey Veng, Cambodia – for about two weeks. Taking part in Project Cheway! organised by the Chemical Engineering Students' Society in collaboration with Operation

Hope Foundation, some 25 students not only erected physical structures, they also built ties and spirit, organising activities such as science experiments and games for the children. One of their projects was to build a "reed bed" to recycle soap water for villagers who rely mainly on well water.

"Simple games such as skipping with ropes made from rubber bands, shooting rubber bands or even piggybacking the children could bring about such laughter and joy. Many of us came to realise how one can easily be contented as long as one is rich in intangibles such as friends and family," said Kelvin Ong Jiao Hao, a participant.

Project Cheway! hopes to send future teams to expand such projects in the villages. Back home, teams also organised a flea market to raise more funds for the Cambodians.

## UNSHAKEABLE HANDS AND MINDS WIN AT EARTHQUAKE COMPETITION

NUS Civil Engineering (CE) team garnered the 1st prize for the Most Creative Engineering Design for the 2nd consecutive year – and the Engineering Science Programme (ESP) took overall 2nd prize (Undergraduate Category) at IDEERS (Introducing and Demonstrating Earthquake Engineering Research in Schools) Competition held in Taiwan.

Said Dr Pang Sze Dai, CE team's supervisor, "The CE Team clearly demonstrated their strong grasp of the earthquake engineering, principles and applying them creatively. They faced stiff competition from the overseas universities which have strong programmes in earthquake engineering. Despite Singapore not being located in an earthquake zone and the students not having taken any course in earthquake engineering, they were able to overcome the odds by applying their knowledge in another field. This is a testament of their ability to think critically and creatively."

The ESP team's structure is capable of withstanding an earthquake the magnitude of 9.5 on the Richter scale – with only a slight tilt for wear. Dr Adrian Koh Soo Jin, their supervisor said, "The structural alignment was precise. The box columns were beautifully constructed, and the joints were glued to near perfection. I was filled with pride when I looked at their completed structure. I told the students that no matter what happens, I am proud of their performance and efforts!"



*Overcoming challenges with steady hands and clear mind: The ESP team (top) and the CE team (above).*

## S'PORE SLINGER GIVES NUS ENGINEERING A SHOT

NATIONAL basketball player Lim Shengyu is now set to score some goals in NUS Engineering. A pioneer of Singapore Slingers, the nation's first and only professional basketball club, Shengyu was to have enrolled at NUS Engineering in 2011 but the lure of SEA Games proved irresistible.

Said Shengyu, "Last year, just before the 1st week of my first semester, the national basketball men's team announced the confirmation of our participation in the 2011 SEA Games after eight long years of absence. After discussion with my coaches and manager, I decided to defer enrolment at NUS to take part in the Games. I signed on for another eight months with the Singapore Slingers as a full time player and competed in the Asean Basketball League."

"Having played for the Slingers as a fulltime player for two years now, I have managed to save a decent sum to partially finance my fees and living costs. I intend to continue playing part-time to see myself through my four years of studies," he added.

Shengyu has been playing basketball for around 10 years now. He took it up when he was in primary school. "I was introduced to the game as it was supposed to make me grow taller and stronger," he said, laughingly. It must have worked – he is 192cm tall now.

"I think my height is a gift. But that alone is never enough. To be a good player, a lot lies in hard work, determination and the right attitude," he said.

The basketballer chose Engineering because of his interest in maths and physics -- and Environmental Engineering because it is "very interesting and relevant in the current society".

"I've heard the saying that the game of basketball is 30 per cent in the hands; and 70 per cent in the mind. Essential skills of an engineer like critical thinking, analysis, an eye for detail and decision making are definitely very applicable on the basketball court," said Shengyu.



*Standing at 192cm, Shengyu says that though height is an advantage, it is qualities like hard work, determination and having the right attitude that ace the goal.*

## OTHER NOTABLE STUDENT ACHIEVEMENTS

**Chan Kah Fai Darrick**, final-year student, supervised by Assoc Prof Vivian Ng, won 1st Prize at the IEEE Region 10 Undergraduate Student Paper Contest 2012, 25 Sep

**Chen Xinwei**, PhD student, supervised by Assoc Prof Hong Liang and Prof Neal Chung, received the Chairperson's Award for the Best Poster Presentation at HOPE, Japan, 7-11 March.

**Ding Junjia**, PhD student, supervised by Prof Adeyeye Adekunle Olusola, won Best Presentation Award, 5th IEEE Magnetics Society Summer School, Nanotechnology Research Centre, SRM University, India, 22 – 27 July.

**Design-Centric Programme (DCP)** team comprising students Fan Yizhong (Mechanical Engineering) and Sriharsha Vishnu Bhat (Mechanical Engineering) participated in the International Session of the Capstone Design Fair, a key event of the inaugural Engineering Festival (E2 Festa 2012) held at KINTEX Convention Centre, Koyang City (near Seoul) in November. The team demonstrated a prototype of a wirelessly-charged electric vehicle and supporting road-charging system. The event is organised by KAIEE (Korean Association for Innovative Engineering Education). The DCP team was invited and funded by the organizer, to participate alongside other international entries. They were accompanied by Dr Choo Jian Huei from Engineering Design & Innovation Centre (EDIC).

**Ehsan Rismani-Yazdi** won the American Society of Mechanical Engineers (ASME), Information Storage and Processing Systems Division's Graduate Student Fellowship for his paper "Developing a composite Al-TiNxCy interlayer to improve the durability of Ta-C Coating for magnetic recording heads" at the 2012 ASME-ISPS/JSME-IIP Joint International Conference on Micromechatronics for Information and Precision Equipment, California USA, 8-20 June.

**Foo Wei Jian** bagged the CPG Book Prize 2012 in July for obtaining the best results for the five core modules of the Energy Systems specialisation. The award is given by the CPG Corporation Pte Ltd, a leading infra structure and building development and management services provider in the Asia Pacific region.

**Koh Kah How** and **Taiebeh Tahmasebi**, both PhD students supervised by Dr Vincent Lee Cheng Guo, won 1st Prize at the IEEE Region 10 Postgraduate Student Paper Contest 2012, 25 Sep.

**Edric Lai Kean Chung**, **Xie Haoran** and **Zhen Ni** won the Best Presentation as well as the Merit Award at the 7th Inter-University Invitational Civil Engineering Competition held at Kuala Lumpur Infrastructure University College, Malaysia, 27 -- 30 May. They were the only team which won two awards.

**Lim Shu Fan**, PhD student supervised by Assoc Prof Ashwin Khambadkone, won the 2012 APEC Nano Presentation Award at the Applied Power Electronics Conference and Exposition 2012, Orlando, Florida, USA, 5-9 Feb.

**Mridul Sakhuja**, PhD student supervised by Dr Aaron Danner & Prof Bhatia Charanjit Singh, won 2012 EU Photovoltaic Solar Energy Conference (PVSEC) Student Award in Frankfurt, Germany, 24 – 28 Sept, for having the most outstanding research work in the field of "Components for PV Systems".

**Mohsen Rahmani**, PhD student supervised by Prof Liew Yun Fook and Assoc Prof Hong Minghui, won the Incubic/Milton Chang Student Travel Grant, USA for his work, "Planar Isotropic Rotor-Shaped Nanostructures: an Alternative to Develop Oligomers".

**NUS Formula SAE team** comprising 13 Mechanical Engineering students and 1 Electrical Engineering student, clinched the following awards at the intervarsity FSAE competition, Michigan International Speedway, USA, 9-12 May:

- 29th overall out of 120 teams worldwide (top quarter)
- FSAE Chief Design Judge Award Runner-up (2nd in Engineering Design Drawing)
- 6th in Marketing Presentation
- 8th in Fuel Economy

Team comprising **Nguyen Anh Tuan, Wang Siqi** and **Xu Yang** (supervised by **Drs Akash Kumar** and **Rajesh C Panicker**) built a system called inSINQ Intelligent System of Inertial Navigation using QR-Codes. Their system which provides precise navigation in buildings where GPS signals are blocked, won first prize at the “Embedded System Design Invitational Contest” held at the Shanghai Jiaotong University in July.

**Ong Gim-Hoe & Shivom Sharma** supervised by Prof G P Rangaiah, won the EURECHA (European Committee for the Use of Computers in Chemical Engineering Education) Student Contest Problem 2012, UK for their project, “Design of a Biomass Power Plant”.

**Ong Xue Guang, John**, PhD student won JRI Best Poster Award Presentation at 24th Annual Medical and Health Engineering Student Project Competition, 27 Jan. Organised by the Institution of Mechanical Engineers (IMechE) in London. The event is UK’s foremost medical engineering student project competition.

**Priyadarshini Majumdar, Lim Qi Jian, Tan Ying Xing, Chen Lishi** and **Sethuraman Ravi** won 1st prize in the Singapore Space Challenge for the mini satellite category. The Challenge was organised by Singapore Space and Technology Association.

Design-Centric Programme student **Sriharsha Bhat** managed to stay undefeated till the quarter finals of the very challenging Brain World Cup organised by Fuji Television, outdoing participants from universities like Harvard, Stanford and ETH. He and Chemical Engineering partner, **Karan Prasad** also took top prize \$10,000 at the Great India Quiz – and 1st runner up at the Tata Crucible Campus Quiz.

**Wang Peng** won the Best Student Oral Presentation at the Desalination for the Environment and Clean Water and Energy Conference in Spain. Their presentation was on a novel idea to turn salt water into fresh drinking water using the deep freezing method and membrane distillation.

**Wong Tse Jian** was awarded the Long Service Award in February for his sustained active involvement in organising and volunteering in Yishun Reading Stars (YRS) and other special projects under the NUS Students’ Community Service Club.

# OUR PEOPLE. **ALUMNI**

## TWO NEW CHAPTERS ESTABLISHED IN CHINA



*Beijing Reunion 2012.*

GOOD news for some 400 NUS Engineering alumni in China -- they can now stay connected with their alma mater through two new Alumni Chapters established in Shanghai and Beijing.

Launching the two Chapters at reunion gatherings in Shanghai and Beijing, NUS Dean of Engineering, Professor Chan Eng Soon, encouraged alumni to exchange ideas, resources and expertise -- and to provide mutual help under the umbrella of the newly-formed Chapters. He also urged

alumni to keep in contact with the Faculty's Office of External Relations so that they can continue to work with them to grow and strengthen the NUS Engineering family in China.

The gatherings in China, organised by the Faculty's External Relations Office, have become a yearly tradition around the Mid-Autumn Festival -- traditionally, a time for family reunions. About 60 alumni attended the gatherings held in China this year.



*Shanghai Reunion 2012.*

## ALUMNI HONOURED FOR THEIR UNWAVERING COMMITMENT AND CONTRIBUTIONS TO ENGINEERING

SOME 200 Engineering alumni, some from as far back as 1973 returned to their alma mater for a grand time. The NUS Engineering Alumni Gala Dinner (held at the Kent Ridge Guild House) is an annual occasion for renewal and strengthening of the NUS bond, organised by the Faculty's External Relations Office.

As was the tradition, two major honours were conferred on alumni for their unwavering commitment and contributions to various aspects of Engineering in Singapore. Er Ong See Ho, Class of 77 (1st- Class Honours in Civil Engineering) was conferred the Distinguished Engineering Alumni Award (DEAA). Mr Chan Kok Hong, Class of 2006 (Honours in Bioengineering) was conferred the Engineering Alumni Service Honours (EASH).



*NUS President Prof Tan Chorh Chuan (2nd from left) launching the Faculty's Heritage and Life Gallery with (from left) Engineering Dean, Prof Chan Eng Soon, former deans Prof Goh Thong Ngee, Prof Seeram Ramakrishna, senior alumni Mr Lim Soon Hock and President of Engin Club, Mr Samuel Huang.*



*Er Ong See Ho (above, left) was conferred the DEAA; and Mr Chan Kok Hong (below) the EASH.*



Er Ong started work with the then Public Works Department, which was later succeeded by the Building and Construction Authority, where he is now the Deputy CEO. Closely associated with the establishment of Singapore's Changi Airport, Er Ong was also known for his involvement with Singapore's first aircraft taxiway bridge and Light-Rail Transit.

Mr Chan is a champion in initiating alumni programmes and activities. As Secretary of the Engineering Alumni Singapore, and later its Honorary Treasurer, he has demonstrated commitment to providing strong leadership.

A major highlight at the gala dinner was the launch of the Faculty's **Heritage and Life Gallery** by NUS President Professor Tan Chorh Chuan, representatives of former Engineering Deans, senior alumni and student representative. The Gallery features Engineering progress through past and present achievements.

## CLINCHING MULTI-MILLION DOLLAR DEAL WITH FRENCH AEROSPACE GIANT

HOME grown enterprise, Hope Technik founded by two NUS Engineering alumni, has clinched a major deal with Astrium, the space arm of the European Aeronautic Defence and Space Company (EADS). Mr Peter Ho, Mr Jeff Tang, Mr Michael Leong and Mr Ng Kiang Loong, graduates from NUS Department of Mechanical Engineering, founded Hope in 2006.



Full throttle for Mr Peter Ho.

Under an agreement signed at the Singapore Airshow 2012, Hope will help Astrium design, build and launch a space plane prototype. They will design the plane's avionics and test its aerodynamics and glide capability. The prototype, half the size of the actual plane targeted at space tourists, will be built at Hope's Jurong factory. It is envisaged that a helicopter will lift the model and drop it to see how it glides. In an interview with *The Straits Times*, Peter said that there will be no room for error in this project.

He added that their engineering foundation, training and skills as well as experience working on various projects, will be put to good use for this project. Since Hope started, it has been involved in building systems such as unmanned aerial vehicles for the Singapore Defence Ministry. In the last five years, they have worked on some 230 projects. Astrium aims to launch their first commercial space flight by 2017.

## MECHANICAL ENGINEER WHO BRINGS SMILES TO PATIENTS AT HOSPITAL

GRADUATING in 1998 with a B Eng in NUS, Dr Alvin Chua is the only one with engineering background at the Singapore General Hospital (SGH)'s Skin Bank Unit where he is a senior principal scientific officer.

Alvin joined SGH in 2002 after two years as a process engineer. At SGH, he was sent to Shriners Burns Institute in Texas as well as École Polytechnique Fédérale de Lausanne (EPFL) of Switzerland for further training on skin banking and the optimal use of stem cells in skin culture for the treatment of severe burns.

In October, he and his team won an award from the American Association of Tissue Banks for their discovery, a method to grow human skin in the laboratory in a much shorter time, from four weeks to about three weeks.

His final year project with the Department of Mechanical Engineering was on the corrosion characteristics of titanium bone implants which he later completed as part of his Master's degree. In 2012, he received his PhD in biomedical science (specialising in tissue scarring) at the Yong Loo Lin School of Medicine.

Said Alvin, "As an engineer, I would find it immensely satisfying to design and apply something that works in a machine or in a system. In the hospital, my greatest satisfaction is to see a fellow man coming out alive from severe burns or, an amputation of the limb is prevented as a result of the skin grafts prepared from our skin bank and laboratory."



Dr Alvin Chua is all set for more breakthroughs to bring about more smiles from patients.

## 1ST FEMALE IN THREE GENERATIONS OF ENGINEERING



*Ms Su Ying Hui with dad and grandpa who are both engineers.*

SHE has always been fascinated by how things work – and this landed Ms Su Ying Hui in NUS Mechanical Engineering, a department which has been perceived by many as a “man’s world”. But Engineering runs in her blood – her grandpa was an engineer, and her dad is an Engineering alumnus of NUS.

Said Ying Hu, Class of 2012, who now works as a design engineer with the oil and gas industry. NUS Mechanical Engineering does have its fair share of woman power – and beauties – there have been Miss Singapore Universe 2004, Sandy Chua (Class of 2007); and Ms Earth 2010, Maricelle Rani Wong, currently, an undergraduate.

“Being someone petite in a very male-dominated environment, most people think I can’t handle the intensity of engineering. For example, the intimidating calculations and getting my hands dirty in the lab. But I don’t mind getting my hands dirty at all. I enjoy the

intensity very much as I am by nature a focused and determined person,” she said.

“Engineering graduates are very versatile and can work in a variety of jobs. It doesn’t invariably involve field work, so it’s not like you come home from work every day with dirty hands. Possibilities for engineers are bountiful. So if you feel you’ve got the passion, go for it,” she added.

Proving that bit about being versatile, Ying Hui graduated with a BBA (hon) besides a B Eng degree. “I wanted to graduate from NUS with a professional degree, but at the same time have a balanced, well-rounded view about the world from a broader perspective. I feel these two degrees are very dissimilar, and for this reason, they complement each other perfectly,” she said.

## LKY AWARD BROUGHT BIG SMILES TO HIS PARENTS' FACE

SAMUEL Li Minghui received many job offers after he graduated but he wanted to be an entrepreneur. Co-founder of Witsvale, a web-based programme to make mathematics fun for primary school students, Samuel says, "Every day is like fighting a war. First thing in the morning, I start wondering, am I getting in revenue today? What should I do so that the first dollar will roll in?"

Such challenges are overcome by his keen passion to be his own boss. Valedictorian for Class of 2012 Electrical Engineering, Samuel has a long list of awards -- from Lee Kuan Yew Gold Medal for best performing graduate throughout the course of study to Outstanding Conduct and Performance in National Service Commander of the Month when he was in National Service and the top Chemistry student when he was in junior college.

However, receiving the Lee Kuan Yew Gold Medal is his proudest achievement. "I feel very special to receive an award named after one of Singapore's founding fathers. This is an award with a name that is known to my parents. They are not too well educated and so they are only familiar with names of Singapore ministers. Seeing the smile on their faces when they knew I got this award is worth all the effort!" he said.

Samuel attributed his achievements to his parents. "I have been through hard times with them and I think this really spurred me on to work hard in whatever I do. I believe that nothing is impossible as long as we work hard. Even if we fail, it's a success as we would have learnt new... and more things," Samuel reflected.



*Samuel Li with his proud parents.*

## ESP ALUMNUS TARGETS TO CHANGE THE WORLD THROUGH TECHNOLOGY AND CULTURE

ENGINEERING Science alumnus Muhd Ibnur Rashid bin Zainal Abidin, Class of 2011, has turned down an enviable job offer with Google to continue his passion in keeping this earth green.

Working with Ground-Up Initiative (GUI)'s Sustainable Living Kampung, Ibnur is driving key projects to create solutions for a sustainable future. He found such work extremely fulfilling and does not mind sacrificing a big pay packet.

The eldest in a family of five, Ibnur was a student with the University Scholars Programme which offers students an all-rounded educational experience. Besides Engineering he also read Technopreneurship at Stanford University under the NUS Overseas College Programme, and Innovation and Healthcare Policy at the Lee Kuan Yew School of Public Policy. He was also a member of

the team which won the UNESCO-Daimler Mondialogo Engineering Award in 2007 and 2009 – for their concepts to help the poor.

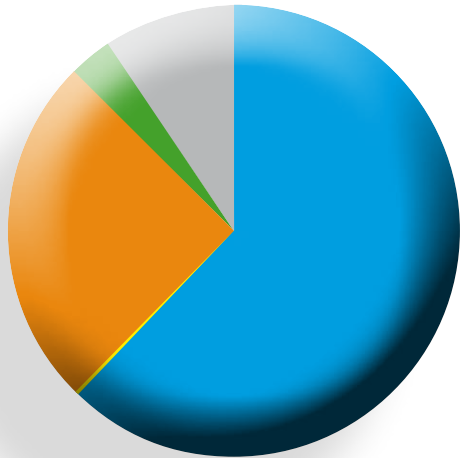
A youth delegate at the Clinton Global Initiative EPIIC Symposium on “Global Poverty and Equality” in 2008, Ibnur led a field assessment trip to villages near Medan with Pusaka Indonesia, an Indonesia-based NGO, with target to raise at least \$10,000 to support their ‘Integrated Empowerment’ Sustainability Programme. He was the Country Leader for the Singapore delegation of four outstanding individuals in the ASEAN Youth Forum on Innovation and Creativity (AYFIC) at Labuan, Malaysia in April 2011.

Said Ibnur, “I hope others too will form their own innovation teams to help solve problems facing our local community, our neighbours and our world.”



Mr Muhd Ibnur (centre) works hard on solutions for sustainability. (Picture shows Ibnur accepting the Most Innovative School Award on behalf of NUS in 2010).

# FACTS AND FIGURES. STUDENTS



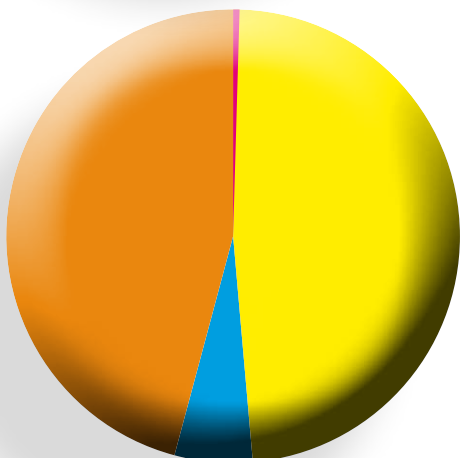
## CLASS OF 2012

● BEng	1637
● Grad Diploma	2
● MSc	659
● MEng	87
● PhD	241
<b>Total</b>	<b>2626</b>



## UNDERGRADUATE STUDENT ENROLMENT

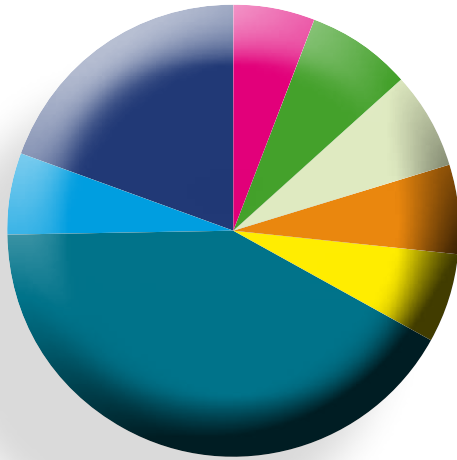
● Engineering	89
● BTech	1237
● Bioengineering	363
● Civil Engineering	395
● Electrical Engineering	1032
● Industrial & Systems Engineering	394
● Materials Science & Engineering	269
● Mechanical Engineering	1495
● Chemical Engineering	1206
● Computer Engineering	509
● Engineering Science Programme	181
● Environmental Engineering	283
<b>Total</b>	<b>7453</b>



## GRADUATE STUDENT ENROLMENT

● Grad Diploma	4
● MSc	1373
● MEng	161
● PhD	1291
<b>Total</b>	<b>2829</b>

# FACTS AND FIGURES. STAFF

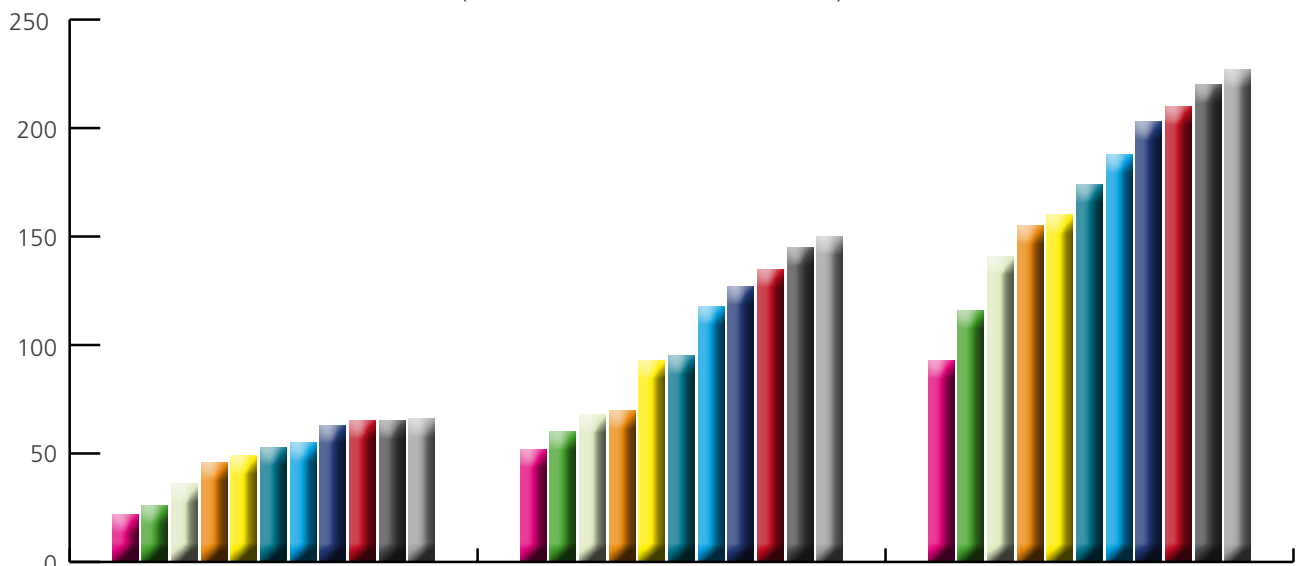


## STAFF PROFILE

Professors	91
Associate Professors	120
Assistant Professors	108
<b>Total number of full-time Faculty Members</b>	<b>319</b>
Adjunct staff	101
Other Teaching Staff	97
Research Staff	649
Executive & Professional Staff	92
Non-academic Staff	302
<b>Total staff strength</b>	<b>1560</b>

# FACTS AND FIGURES. RESEARCH

## ENTREPRENEURIAL ACTIVITIES AT NUS FACULTY OF ENGINEERING (AS AT 31 DECEMBER 2012)

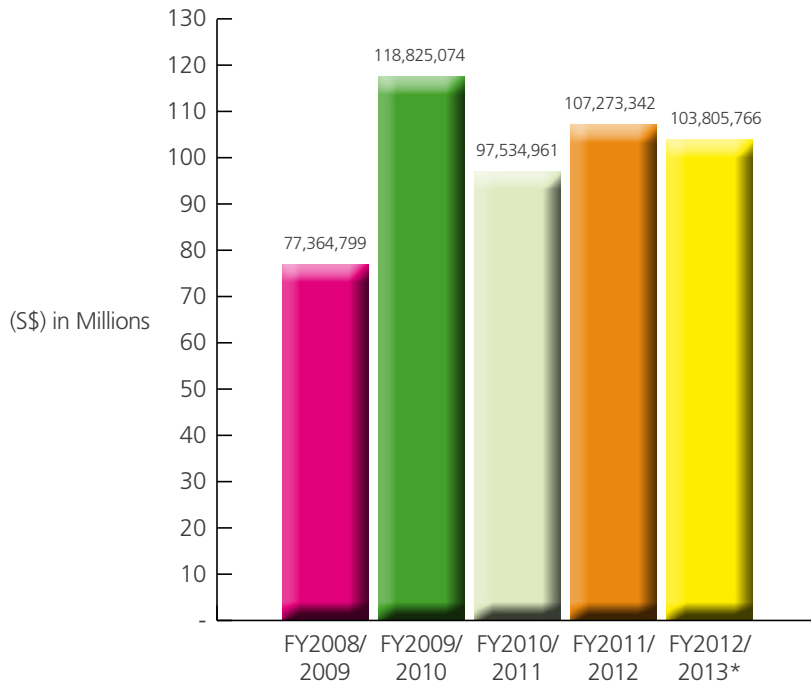


Year	Spin-off / Start-up Companies	Commercialised Products / Licensed Technologies	Inventions Patented
2002 and before	22	52	93
2003	26	60	116
2004	36	68	141
2005	46	70	155
2006	49	93	160
2007	53	95	174
2008	55	118	188
2009	63	127	203
2010	65	135	210
2011	65	145	220
2012	66	150	227

Figures are Cumulative

# RESEARCH GRANTS AWARDED TO FACULTY OF ENGINEERING

(EXCLUDING RESEARCH SCHOLARSHIPS)

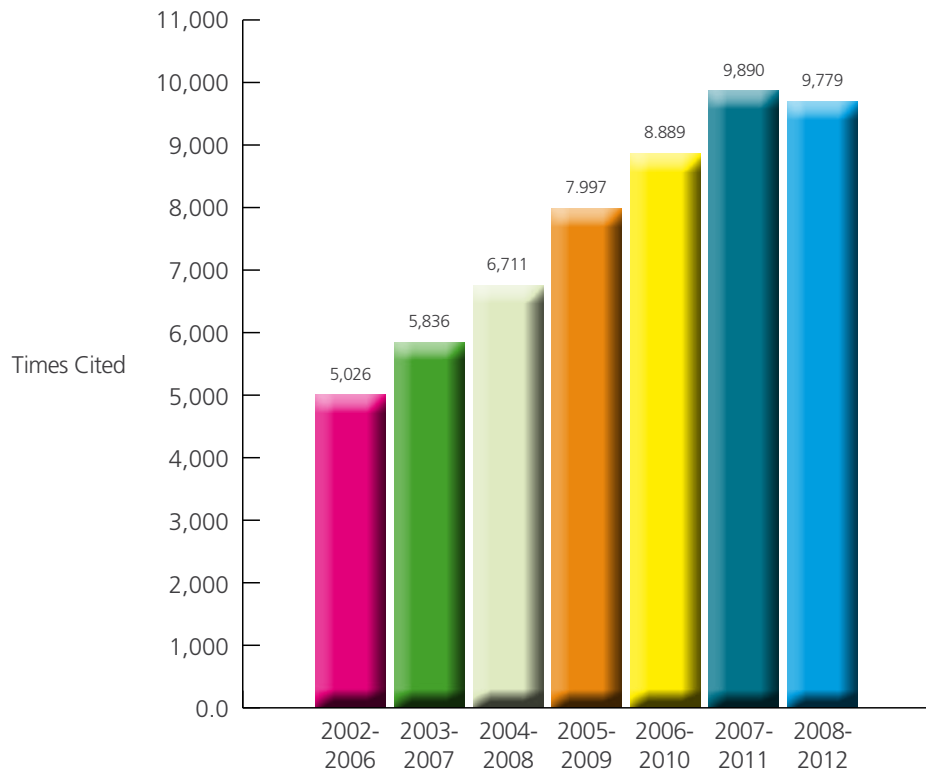


\* Ending January 2013

# NUMBER OF CITATIONS

(IN 5-YEAR INTERVALS)

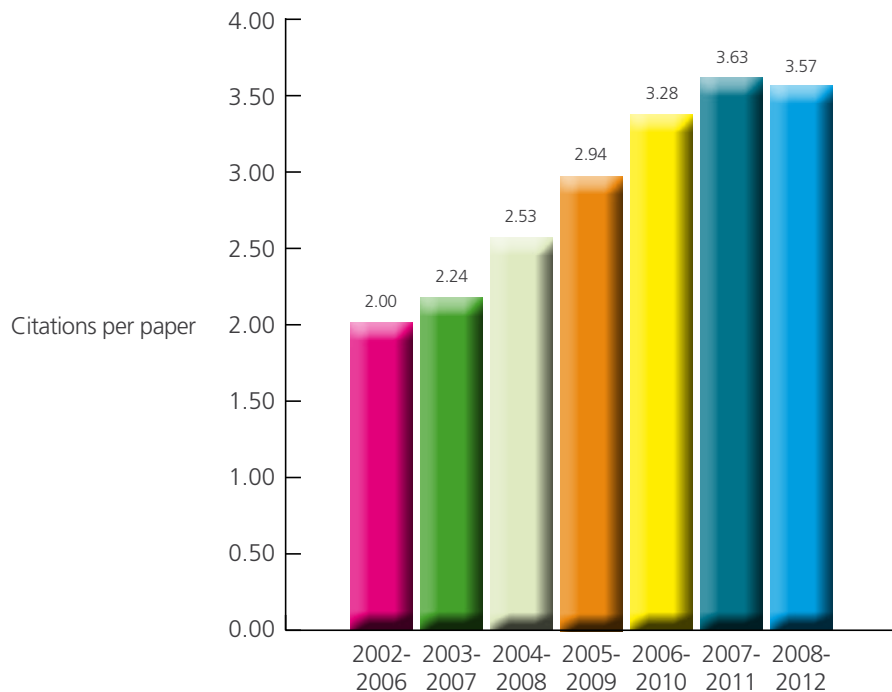
Essential Science Indicators has been updated as of November 1, 2012 to cover a 10-year plus 8-month period.



# AVERAGE CITATIONS PER PAPER

(IN 5-YEAR INTERVALS)

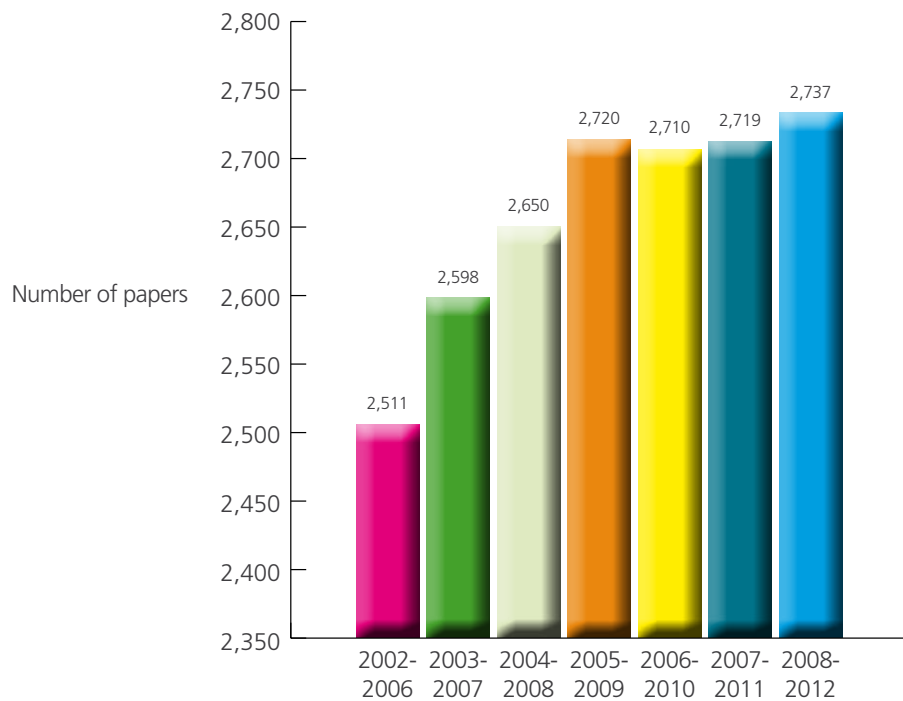
Essential Science Indicators has been updated as of November 1, 2012 to cover a 10-year plus 8-month period.



# NUMBER OF PAPERS

(IN 5-YEAR INTERVALS)

Essential Science Indicators has been updated as of November 1, 2012 to cover a 10-year plus 8-month period.



## NOTES

## NOTES

## NOTES



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