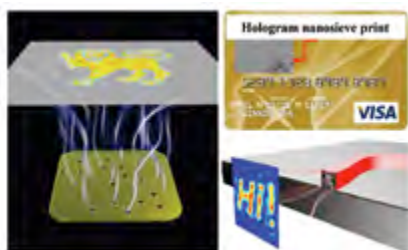


ASSISTANT PROFESSOR QIU CHENGWEI AND HIS TEAM DEVELOP A NOVEL METHOD TO PREVENT HIGH-LEVEL FORGERY OF DOCUMENTS, CREDIT CARDS AND EVEN IDS.

PAGE 07



NUS ECE RANKED 6TH IN THE QS WORLD UNIVERSITY RANKINGS BY SUBJECT 2015 FOR ELECTRICAL & ELECTRONIC ENGINEERING

TRIPLE HONOURS FOR DR ZHANG RUI

IF HE HAD NOT BECOME A SCIENTIST, HE WOULD PROBABLY HAVE BEEN A HIGH-SCHOOL TEACHER, SAID ASSISTANT PROFESSOR VINCENT TAN.

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NUS TEAM CLINCHED MULTIPLE AWARDS AT FSAE 2015.

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HoD SPEAKS...



Prof John **Thong**
Head, Department of Electrical & Computer Engineering, NUS

“ It has been said that an organisation, no matter how well designed, is only as good as the people who work and live in it. ”

It has been said that an organisation, no matter how well designed, is only as good as the people who work and live in it. This maxim equally applies to the ECE Department, and we have been fortunate to have a great team of colleagues to carry out our mission as part of an institution of higher learning. Renewal characterises a dynamic organisation that plays at the forefront of education and research, as new academic talent injects vibrancy into the establishment. In connection with this, we are pleased to welcome Dr John **Ho**, who recently joined us as an assistant professor. Nevertheless, it is always with some sadness that we bid farewell to colleagues who leave the Department, in particular, stalwarts who have been with the Department for many years and who have engendered a sense of community and familiarity. Professor **Liew** Ah Choy, former HoD of ECE and an indefatigable supporter of the Department, retired in June 2015 and we celebrated his achievements at a farewell lunch earlier this year. We are happy that he remains affiliated with the Department as an Adjunct Professor. Mr Walter **Lim** and Ms Lily **Png**, who have been with us for 33 and 20 years, respectively, also retired, and we wish them well in their retirement years.

The Department continues to excel in education and research and we are proud to report the achievements of our colleagues. I am delighted that two of our colleagues, Associate Professor Mehul **Motani** and Assistant Professor Akash **Kumar**, won the Annual Teaching Excellence Award this year. Associate Professor **Ho** Ghim Wei, who received the L'Oreal UNESCO for Women in Science Fellowship in 2014, was honored this year with the JCI Ten Young Outstanding Young Persons honoree award, as well as an IES Prestigious Engineering Achievement Award. Assistant Professor **Zhang** Rui won the NUS Young Researcher Award, and the IEEE Marconi Prize Paper Award in Wireless Communications. He is listed as a Highly Cited Researcher (Thomson Reuters) in the 2015 edition, alongside Associate Professor **Yan** Shuicheng who was also listed in the 2014 edition. Our two colleagues made the mark among 15 researchers across all disciplines from Singapore this year.

As educators who strive to play an influential role in the development of our students, we inherently have a sense of pride in their accomplishments. This issue shares some of their experiences and success stories. I hope you will also enjoy the accounts of several colourful parties held during the summer months, a period of transition in which we bid farewell to the graduating Class of 2014, and welcome the freshmen.

DEPARTMENT MANAGEMENT TEAM UPDATE

Associate Professor **Liang Yung Chii** has been appointed Deputy Head (Research & Graduate Programmes) with effect from 1 September 2015.

He replaces Professor **Lim** Teng Joon, who has assumed the role of Vice-Dean (Graduate Studies, Faculty of Engineering).

We welcome Assoc Prof Liang on board the Department Management Team!

We thank Prof Lim for his past service with the Department, and wish him all the best in his new post.

PROF LIEW AH CHOY'S RETIREMENT

The ECE community organised a farewell lunch on 24 April 2015 to celebrate the accomplishments of Professor **Liew Ah Choy** as former Head of Department and esteemed colleague. Prof Liew retired from the Department after 36 years of leadership, teaching and scholarship.

Prior to joining the National University of Singapore, Prof Liew served as an Assoc Prof in Electrical Engineering at the University of Malaya.

During his service, Prof Liew held numerous leadership positions in NUS, including the Vice Dean of Engineering Faculty, Director of Office for Continuing Education, and Director of International Relations.

In addition, Prof Liew had been specialist consultant to many projects for government agencies and private companies in Singapore and the region. He received several awards and honours from both academic and professional institutions, including the prestigious Public Service Award from the President of Singapore.

As an international expert in the field of high voltage technology and switchgear, Prof Liew was well known for his high standards and intellectual rigour in the classroom. Besides being one of the early pioneers in developing the activities of IEEE Singapore, Prof Liew served as the Chairman of IEEE Singapore Power Chapter during a period of rapid growth of its technical activities.

Prof Liew's dedication to students and teaching has been his hallmark. The department was blessed to have had him at the helm from 1993 to 1997.

At his farewell lunch, several colleagues paid tribute to Prof Liew' outstanding contributions to the university

and described him as being instrumental in shaping the development of the department into one of the best in the world.

Our best wishes to you, Prof Liew!



MS LILY PNG'S RETIREMENT

We bade farewell to Ms Lily **Png** who retired from the Department at the end of September 2015 after 20 years of service.

Ms Png first joined the Department on 20 November 1995, serving Prof Daniel **Chan** who was then Deputy Head for Admin. Ms Png then went on to serve Prof **Yeo** Swee Ping, Prof Ashraf **Kassim**, Prof **Wu** Yihong, Assoc Prof **Loh** Ai Poh, Assoc Prof **Tan** Leng Seow, Prof **Choi** Wee Kiong, Assoc Prof **Chor** Eng Fong and Assoc Prof Vivian **Ng** in their various Deputy Head positions.

We thank her for her many years of service to the Department and wish her all the best.



MR WALTER LIM'S RETIREMENT

We bade farewell to Mr Walter **Lim**, who retired from the Department at the end of July 2015. He had been with us for 33 years.

Mr Lim joined the Department in September 1982, serving Prof **Ling** Chung Ho, who was then the Laboratory Supervisor of the Microelectronics Laboratory. Subsequently, Mr Lim served Prof **Choi** Wee Kiong as the Laboratory technologist-in-charge of the ECE Workshop in 1993, and later the Laboratory technologist-in-charge of the Microelectronics Laboratory in 1996. Mr Lim also served as Chairman of the Non-Academic Staff Committee from July 1996 to June 1998.

We thank Mr Lim for his many years of service to the Department and wish him all the best.



FAREWELL TO COLLEAGUES TRANSFERRING OUT

We bade farewell to two colleagues, Ms **Tan** Yong Suan and Ms **Leng** Mun Tze. They have been transferred out of the Department to join the shared services of the Office of Human Resources.

We wish them all the best.



Mun Tze and Yong Suan (1st and 2nd on right) with colleagues

NEW APPOINTMENTS

FACULTY / ACADEMIC

- DR John S Y **HO** joined ECE Department as Assistant Professor on 27 July 2015. Dr Ho obtained both his M.S and Ph.D. degrees in Electrical Engineering from Stanford University, USA, in 2012 and 2015, respectively. Dr Ho's research focus is in the development of novel wireless technologies and miniaturised electronic devices for integration in living systems.

TEACHING ASSISTANTS

- MR **NGO** Tung joined ECE Department as a Teaching Assistant on 17 August 2015.
- MR Muhammad Qasim **MEHMOOD** joined ECE Department as a Teaching Assistant on 21 August 2015.

NATIONAL UNIVERSITY OF SINGAPORE SOCIETY (NUSS) PROFESSORSHIP

Professor Supriyo **Datta** was appointed Visiting Professor in ECE Department on 1 April 2015, under the National University of Singapore Society (NUSS) Professorship. During his one-year appointment, Prof Datta will develop areas of collaboration with theoretical and experimental groups in spintronics and nanodevices, besides delivering technical seminars and a public lecture.



During his one-month visit to NUS in June 2015, Prof Datta gave lectures on quantum and spin transport to NUS students and researchers. The specialised lectures helped NUS students and researchers to further develop their research skills in this emerging field.

He also provided thoughtful insights for different research groups during his visits to the various laboratories, thus helping to form synergistic research plans for NUS researchers. In addition, Prof Datta took time to meet with Ph.D. students and post-doctoral researchers at NUS to discuss their research.

Prof Datta delivered the NUSS Professorship Public lecture hosted by NUSS titled 'Lessons from Nanoelectronics' to an audience of more than 200 on 23 June 2015.

Prof Datta has been the Thomas Duncan Distinguished Professor in Electrical and Computer Engineering at Purdue University since 1999. He received his B.Tech. from the Indian Institute of Technology at Kharagpur, India in 1975. After receiving his Ph.D. from the University of Illinois at Urbana-Champaign in 1979, he joined Purdue University in 1981.

Although Prof Datta started his career in ultrasonics, he has focused on current flow in nanoscale electronic devices since 1985. The approach for the description of quantum transport pioneered by his group has been widely adopted in the field of nanoelectronics. In recognition of his pioneering work, Prof Datta was elected to the US National Academy of Engineering (NAE).

Prof Datta is also known for his contributions to molecular electronics and spin electronics and has been recognised for his ability to communicate the significance of his research to scientists in other disciplines.

INTRODUCING DR JOHN S Y HO



Tell us about yourself.

I was born and raised in California, in the heart of the Silicon Valley. Against the hectic backdrop of the Valley, my childhood was listless, but I did enjoy spending my leisurely hours toying with things. At first, just imaginary games on paper, then virtual ones on computers. A few things I made were cute, a small number clever,

but none that I would call inspired. I did find, however, that I could be particularly stubborn about getting things to work, however absurd the ends.

The first programme that I wrote (on my middle-school TI graphing calculator) asked the user for a name. For example, if you say “Bob”, it would print “Bob is an idiot”. Of course, if you entered “John”, it would reply “John is a genius”. I was not a genius because it took at least a few days to get the programme to work. I would later find this stubbornness, this compulsion to get things to work, an integral part of engineering.

What are your research interests?

I am interested in electronic approaches to medicine. Electronics can provide exquisite control over the world around us. Recent advances have begun to show that local modulation of the body with electronic devices may provide more effective treatment for some disorders than drugs that act globally throughout the body. There are many challenges that need to be overcome before such treatments can become practical. My current research seeks to develop small-scale electronic implants and new ways to wirelessly power such devices.

What are your dreams and hobbies?

“What I cannot create, I do not understand”. Feynman’s quote haunts me, occasionally, in my dreams even as there is still so much that I do not understand!

How do you feel about the current research climate in Singapore?

As with most things regarding the climate here, it is hot!

What do you hope to accomplish in the Department?

A chancellor of a large public university once joked that a university is “a series of individual faculty entrepreneurs held together by a common grievance over parking”. Research is, in many ways, an act of entrepreneurship. How so? It is an uncertain idea that must be pursued with every physical and intellectual resource. I hope to learn (and to teach) the elements of research. I also hope to find parking.

ATEA AWARD FOR ASSOC PROF MEHUL MOTANI

Associate Professor Mehul **Motani** has been awarded the Annual Teaching Excellence Award (ATEA) which recognises faculty members who have displayed a high level of commitment to teaching and helping students learn.



Says Assoc Prof Motani, “Technology presents an enormous opportunity for educators to transform and enhance students’ learning. Technology is not a panacea; rather it is a tool that enables educators to implement their ideas.”

One way in which Prof Motani uses technology is to create an interactive classroom with instantaneous student-student and student-teacher communication using mobile devices. Such instantaneous feedback enables him to intervene when a large portion of the students misunderstand a basic concept so that he can clear up the misunderstanding quickly.

About his approach to teaching and learning, students have this to say, “Assoc Prof Mehul is engaging in both online and live lectures. He is open to feedback, brutally honest (which is good, actually), and very approachable. During class sessions, he gives us useful feedback in order to push us towards the right direction for our final year projects.”

AWARD OF ECE SCHOLARSHIPS

This year, ECE Scholarships were awarded to two outstanding local freshmen who have performed well academically. The award is bond-free and each recipient will receive \$10,000 per annum. The ECE scholarship is made possible with the generous donations by staff, alumni and corporate partners.

Let's hear from our new scholars.

Leow Zheng Yu (Computer Engineering)

Hey there! I am **Leow** Zheng Yu, currently pursuing Computer Engineering in NUS. I was from Ngee Ann Polytechnic where I graduated with a Diploma with Merit in Electronic and Computer Engineering. I chose Computer Engineering because I like the way it impacts society and its relevance to everybody. Computers are being used in every field and have changed our way of life. It has enhanced and improved the performance of every field of life. The need for Computer Engineering is crucial, and I am fortunate to pursue this course in NUS.

I was from Bukit Panjang Government High School. During my secondary school days, I actively participated in Co-Curricular Activities and Community Involvement Programme. I joined Basketball and Scouts, and was elected the Senior Patrol Leader of my Scouts Group. I learned and applied a lot of leadership skills, handled different types of situations and overcame many challenges. The Scouts Motto is: "Be Prepared", and this has always been my code.

I moved on to Ngee Ann Polytechnic, and joined the Song Composing Club (SCC) and Electronic and Computer Engineering (ECE) Society. I was exposed to different genres of music during my time as a performer in SCC. Being in a band and performing in public was a memorable experience. While in the ECE Society, I took charge of organising freshmen camps, crafting out programmes and coordinating with different cells, as well as helping out in numerous projects for the club. The experience was rewarding and my leadership skills were enhanced.

During my National Service (NS), I was fortunate to go to Officer Cadet School and to be commissioned as an Infantry Officer. The motto, "To lead, to excel, and to overcome", was impressed upon me and it reminded me to lead my men well. I overcame many obstacles and challenges as an officer, and this process was very rewarding. I was given an appreciation of services award from an armour unit that I was attached to.

Besides these past commitments in schools and NS, I am a competitive golf player representing Warren Golf Country Club in the SGA Premier League. I enjoy playing the piano during my free time. Currently, I am the Vice-President of the NUS Outdoor Activities Club and I will be leading a team together with the Club President to produce projects for



From left: **Lai** Jiongjing Darren, A/Prof Vivian **Ng** and **Leow** Zheng Yu

our members, students and even to the public. Finally, as a member of the NUS ECE Undergraduate Student Council, I am happy to serve and contribute to student life in NUS ECE.

Lai Jiongjing Darren (Electrical Engineering)

Hi! My name is **Lai** Jiongjing Darren. I graduated with a diploma in Biomedical Engineering from Ngee Ann Polytechnic. I have heard that it can be a struggle for polytechnic graduates joining the university. However, I hope that by being adaptive and prepared to meet the requirements of the university, things will work out well.

I am proud to be able to pursue my degree in Electrical Engineering here in NUS. In our modern world, nearly every object has an electrical component to it. As we progress, we will find new ways to make these objects smaller, faster and more economical. I am interested to learn about such technologies and hope to, upon graduation, contribute to its further innovation.

I am very passionate about community service. The fact that you have made someone's day can be very heart-warming! In my days in Ngee Ann Polytechnic, a group of friends and I started our own CCA, FoodAid. This motivation came from our Community Service trip to the Philippines after seeing first-hand how people live in poverty. FoodAid was set up to help needy families locally. We consistently held food donation drives in schools or in housing estates. The donations collected were then repacked and distributed to needy families.

Academics aside, I enjoy travelling. I feel that travelling allows you to widen your perspective and trains you to become more independent. Hopefully, I will be able to go for the Student Exchange Programme during my stay here in NUS.

In addition, I enjoy reading and watching movies. I find reading helps to broaden my knowledge and watching movies helps me relax. These activities allow me to be prepared to take on the challenges that lie ahead.

ECE SAFETY DAY

On 28 July 2015, ECE held its 2nd Safety Day event with “Occupational Hazards” as its theme. This annual event was targeted at the ECE community comprising 300 staff and researchers.

Two guest speakers graced the occasion. The first guest speaker was Dr Patrick **Tan**, Director of the University Health Centre (Health Service, Wellness and Counselling & Psychological Services). His talk on “Management of Stress”, punctuated with his trademark humour, was warmly received.

Dr Gregory **Chan**, Senior Specialist Occupational and Diving Physician from Work Health & Safety Inc Pte Ltd, next spoke on “Staying Healthy at Work”. He talked about the potential hazards of long hours spent at a desk or in front of a computer and shared tips on simple exercises that bring relief to tight muscles.



Dr Patrick **Tan**'s captivating talk on “Managing Stress”



Safety Chairman, Assoc Prof **Tan** Leng Seow giving the opening address



Participants doing simple stretching exercises

This was followed by another talk, this time anchored by the Faculty of Engineering (FoE)'s Safety Manager, Mr Gabriel **Chen**. He shared with us on “The correct use of Carbon Dioxide Fire Extinguisher and Water Hose Reel” at the workplace.

The audience then proceeded to the open space at Level 3 of EA-E1A for their hands-on fire-fighting practice. The participants eagerly waited for their turn to learn the skills of fire-fighting under the guidance of Mr Gabriel Chen, Mr **Rahmat** Bin Alias and ECE Safety Committee Members. This exercise was in line with the directive of the Office of Safety, Health and Environment (OSHE) to arm the NUS community with practical hands-on knowledge to deal with emergencies, such as fires.

Three invited vendors, namely LSH Industrial Solutions Pte Ltd, HTM Medico Pte Ltd and Fave (The Dried Fruits & Nuts People) lent their support to our event.

A buffet lunch for all participants provided a ‘filling’ end to the event. In addition, each participant left with an umbrella as a memento.

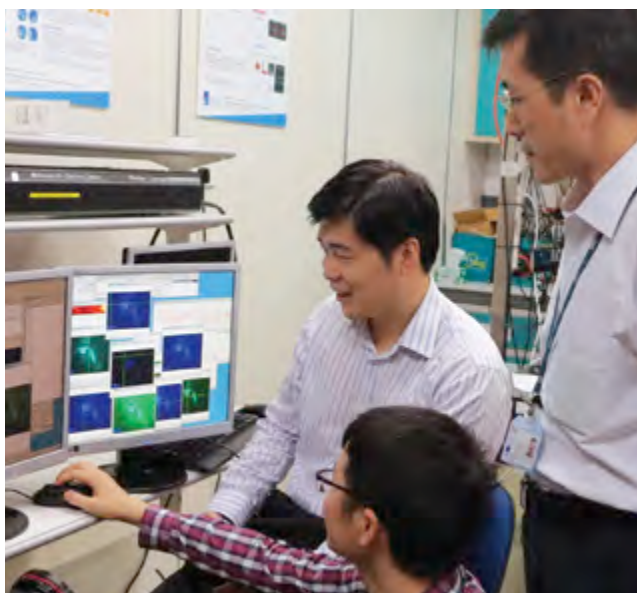
ECE TEAM DEVELOPS NOVEL OPTICAL SIEVES TO COUNTER FORGERY

Assistant Professor **Qiu** Chengwei and his team have developed a novel method to prevent high-level forgery of documents, credit cards and even IDs. Their findings were published in *Nature Communications* (5 May 2015), entitled “Ultra-high-capacity non-periodic photon sieves operating in visible light”.

Their revolutionary technology opens up a new optical avenue for unparalleled security at nanoscale precision. The essence of his invention lies in the design of an “ultra-capacity nano-photon sieve”, a unique device with the capacity to incorporate more than 34,000 nanoholes (~300nm in diameter) randomly distributed in its surface. This feature enables the display of a high-pixel and high-quality holographic image at a controlled position.

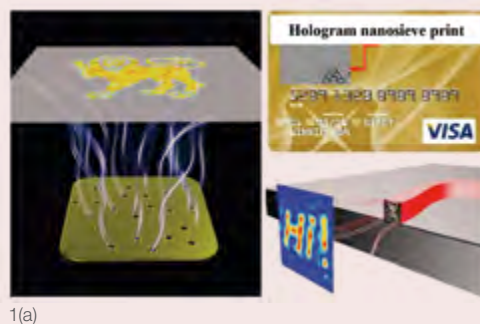
Holograms are often used to enhance security. Explaining how their technology works, Dr Qiu said, “Highly secured virtual information is stored in the collection of these nanoholes and they can only be retrieved and read at a particular distance when a proper polarised illumination is employed. Our device can be customised for various applications. The dimensionality, display distance, polarisation and wavelength dependence can be tailored according to needs.”

Dr Qiu says that with their capability to handle such a large quantity of nanoholes, they will be looking into developing multiple holographic images at multiple displaying planes, wavelength or polarisation-dependent 3D images and other emerging applications.



Dr **Qiu** Chengwei (seated) with his team, (from right) Dr **Teng** Jinghua, Principal Scientist and Head (Patterning & Fabrication), Institute of Materials Research and Engineering and Dr **Huang** Kun, research fellow with ECE.

Figure 1(a): Illustration of the ultra-capacity of nanosieves to display a logo. Such nanosieves can be printed onto documents (e.g., credit cards, bank notes, passports, etc) using traditional lithographic nanofabrication methods to enhance security in an optical way. The planar and ultrathin sieve can be deposited onto the end of waveguides or fibers (and their arrays) to project the controllable holographic images.



1(a)

Figure 1(b): A fabricated sample of 34034 nanoholes to generate a holographic bird image at farfield (experimental result). Two specific areas are selected to show the zoomed-in picture of the randomly distributed nanoholes, directly captured from the sample used in the paper.



1(b)



Figure 2: The confocal microscope where the nanosieve [Figure 1(b)] is placed and illuminated by green light. It is used to observe the hologram in Figure 1(b).

JCI HONOUR FOR NUS ENGINEERING RESEARCHER

Associate Professor **Ho** Ghim Wei, received the honoree award (Scientific and/or Technological Development) at the Junior Chamber International (JCI) Ten Outstanding Young Persons (TOYP) 2015 award ceremony on 29 May 2015.

“The TOYP finalists are stellar examples of how success can be achieved through hard work and tenacity, regardless of where they started. Through their enthusiasm, determination and commitment, they have made significant and meaningful contributions to society,” said Dr Amy **Khor**, Senior Minister of State for Health and for Manpower, who presented the awards at the gala dinner.

Annually, JCI selects 10 outstanding persons who have made important contributions in a variety of fields. The theme for 2015 ‘Where Great Minds Meet’ represents JCI’s desire to bring together outstanding Singaporeans and recognise them for their achievements.

Nominations for the TOYP award were received from ministries, statutory boards, major organisations and associations. Successful candidates were shortlisted for a panel interview. This year, there were more than 200 nominees, of which 14 were finalists for honoree and merit awards of different categories.

Assoc Prof Ho has received in excess of \$10 million research funding for her work in the field of solar energy conversion technologies. As Principal Investigator (PI) and Co-PI for such research, she has published more than 80 scientific articles. A recipient of the L’Oreal UNESCO for Women in Science Fellowship in 2014, Prof Ho is keen to



Assoc Prof **Ho** Ghim Wei (third from left) receiving the Award from Dr Amy **Khor**, Senior Minister of State for Health and for Manpower.

contribute to scientific and technological advancements in energy and environmental sustainability.

“This research field poses many cross-cutting themes ranging from the study of materials and conversion efficiency to socio-economic impact. Such multi-faceted research involves in-depth considerations that span fundamental understanding to applied research that is complex and interrelated. All these require a well-planned research strategy that enables the development of a pragmatic and highly efficient decarbonised energy and environmental system,” she said.

Looking forward, Assoc Prof Ho hopes to bring about a greater recognition of the under-represented woman contributing in the field of Engineering Science, through the impact of her education and research innovations.

IES PRESTIGIOUS ENGINEERING ACHIEVEMENT AWARDS 2015

Mr **Tan** Chuan Fu, Research Engineer and Associate Professor **Ho** Ghim Wei won the Institution of Engineers Singapore (IES) Prestigious Engineering Achievement Award 2015 during the IES Awards Night on 23 July 2015.



(From right) Assoc Prof **Ho** and Mr **Tan** posing with Guest-of-Honour Mr **Chan** Chun Sing at the award ceremony

Their research on “Self-Powered Hybrid Cell with Enhanced Photocatalytic Functionalities for Hydrogen Production and Waste Water Treatment” featured an innovative and contemporary multiple-renewable solar and vibrational energy-powered catalysis system. This system boasts multifunctional nanomaterial innovation with water purification and hydrogen generation capabilities. The self-powered system offers a sustainable solution to both urban and rural societies in providing clean water and energy resources.

Congratulations to Mr Tan and Assoc Prof Ho!

TRIPLE HONOURS FOR DR ZHANG RUI

Assistant Professor **Zhang** Rui's recent ground-breaking research on the use of radio signals for simultaneous wireless information and power transfer has been making waves and winning awards.

Prof Zhang has been conferred three prestigious honours this year: the NUS Young Researcher Award, the IEEE Marconi Prize Paper Award in Wireless Communications, and Thomson Reuters' Highly Cited Researcher 2015. He received these honours in recognition of his significant and pioneering contributions to the new research field of wireless information and power transfer.

Although wireless information transfer via radio signals, also generally known as wireless communication, has been studied and implemented for several decades, the research and application of wireless power transfer is still in its infancy. Yet many of us regularly benefit from the use of wireless power transfer in our daily lives, e.g. in mobile phones, RFIDs, wireless sensors, etc. Radio signals can carry both information and energy at the same time, hence new research that aims to achieve efficient wireless information and power transfer simultaneously using the same optimised radio waveform is both exciting and promising.

Assistant Prof Zhang's research focuses on a new unified study of wireless information and power transfer by characterising the fundamental performance limit of information versus power transfer trade-off and the development of practical transmitter, receiver designs to achieve the performance limit. His research has been instrumental in the development of the next-generation wireless infrastructure capable of supporting both data and energy access over the air to mobile devices.

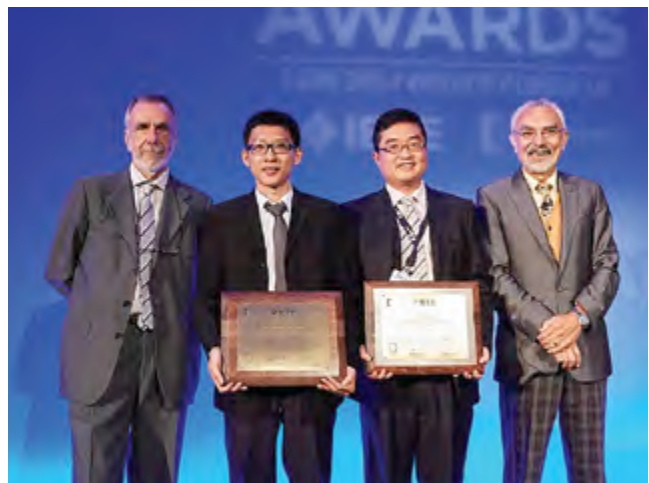
The NUS Young Researcher Award is an annual award conferred on NUS researchers below 40 years of age based on their impact and promise in research. The award carries a prize money of S\$2,000 and a research grant of S\$10,000.

The IEEE Guglielmo Marconi Best Paper Award is an annual award, sponsored by Qualcomm Inc., for the best original paper in the field of Wireless Communications published in the IEEE Transactions on Wireless Communications. The award comprises a plaque, honorarium of US\$1,000 and travel grant of US\$3,000. Prof Zhang's award paper, "MIMO Broadcasting for Simultaneous Wireless Information and Power Transfer" was published in IEEE Transactions on Wireless Communications, Vol 12, No 5, May 2013, pp 1989-2001.

For his extensive research in several frontiers of wireless communication, Dr Zhang has been listed as one of Thomson Reuters ISI highly-cited Researcher 2015.



Assistant Prof **Zhang** Rui received the NUS 2015 Young Researcher Award from Prof **Tan** Chorh Chuan (NUS President) in recognition of his research contributions to the field of wireless information and power transfer.



Assistant Prof Zhang (third from left) received the IEEE Marconi Prize Paper Award in Wireless Communications at the award ceremony held on 9 June 2015, London, UK, at the IEEE International Conference on Communications.

He has published extensively in his field, with over 200 publications that have been cited more than 9,000 times. In particular, 23 of his journal publications are listed as Highly Cited Paper by Institute for Scientific Information (ISI) Essential Science Indicator on Web of Science, each being among the top 1% of the most cited papers among all papers published over the last ten years in his field. This list represents some of world's leading scientific minds. Over 3,000 researchers earned the distinction by writing the greatest numbers of reports officially designated by Essential Science Indicatorssm as Highly Cited Papers. In this way, they rank among the top 1% most cited for their subject field and year of publication, thus earning them the mark of exceptional impact.

ASSOC PROF YAN SHUICHENG IS ISI HIGHLY-CITED RESEARCHER ONCE AGAIN

The Thomson Reuters listing of Highly Cited Researchers 2015 represents some of world's most influential scientific minds. About 3,000 researchers are given this distinction annually for having written the greatest number of reports officially designated by Essential Science Indicators as Highly Cited Papers. Such researchers rank among the top 1% for being the most cited for their subject field and year of publication.



Currently a (Dean's Chair) Associate Professor, Dr **Yan** Shuicheng is one of the 157 researchers worldwide listed in the Engineering field owing to his quality research in multimedia, computer vision and machine learning areas from year 2003 to 2013.

Of his series of highly-cited research papers on subspace learning and sparsity analysis, more than 30 papers have been cited 100 times or more each. His H-index is 59 and Google citation number is more than 19,000. Besides academic impact, Assoc Prof Yan's research has been licensed to industry, e.g. products using his licensed fashion search technology attract more than a million users per day.

Assoc Prof Yan is currently leading the learning and vision (LV) research group in the department. This research group is very active in developing leading methodologies for visual classification tasks, e.g. object classification, object detection, and object segmentation.

For the past five years, the research group has participated in two series of flagship computer vision competitions, The PASCAL Visual Object Classes Challenge (VOC) from 2010 to 2012 and the ImageNet Large Scale Visual Recognition Challenge (ILSVRC) from 2013 to 2014. The group has won the top two prizes seven times.

DR VINCENT TAN: ONE OF ASIA'S RISING SCIENTISTS

If he had not become a scientist, he would probably have been a high-school teacher, said Assistant Professor Vincent **Tan**.

Hailing from the University of Cambridge (B.Eng and M.Eng in Electrical and Information Sciences Tripos) and the Massachusetts Institute of Technology (Ph.D. in Electrical Engineering & Computer Science), Dr Tan has always loved to teach and share his passion with the younger generation of scientists, engineers and mathematicians.

Jointly appointed by ECE and the Faculty of Science's Department of Mathematics, Dr Tan's research interests include information theory, machine learning and statistical signal processing. He is an associate editor for coding and communication theory for the journal IEEE Transactions on Communications.

Having won several awards for his work, including the A*STAR Philip Yeo Prize for Outstanding Achievement in Research in 2011 and the NUS Young Investigator Award in 2014, Dr Tan hopes to push the frontiers of understanding of optimal strategies for the transmission of data across noisy media and for statistical learning.

In information theory, which is the study of the fundamental limits of communication systems, Dr Tan has pioneered the study of finding asymptotic estimates of coding rates in multi-sender, multi-receiver settings. This study is pertinent as practical coding systems operate with finite delays and a non-vanishing error probability and so the probabilistic analyses that he and his collaborators have performed serve as better benchmarks for real-world, networked communication systems compared to the traditional Shannon limit.

Dr Tan has performed unified finite-delay analyses for numerous models of multi-user communication systems including distributed lossless data compression, multiple-access channels, interference channels, and channels with random state. These are basic building blocks for the modern wireless systems in today's heavily networked world. This research culminated in a monograph entitled "Asymptotic Estimates in Information Theory with Non-Vanishing Error Probabilities" which has been published by Foundations and Trends on Communications and Information Theory.

"I believe this monograph will be extremely useful to the communications and information theory academic communities in the years ahead. Not only was the mathematics employed in the analyses non-standard, new mathematical techniques such as quantitative multivariate versions of the central limit theorem and modified forms of the Gartner-Ellis theorem had to be employed for sophisticated multi-user problems. The mathematical theorems that were developed may be of independent interest in other domains such as statistical inference," said Dr Tan.

In machine learning, Dr Tan has worked on using information-theoretic ideas to establish performance limits for the learning of graphical models with and without latent variables. Such models are popular visualisation tools as they allow the practitioner to understand the correlations and causations between different variables, e.g., smoking causes lung cancer, etc.

Explained Dr Tan, "Graphical models with latent variables are useful for us to understand hidden causes that one can infer from data. For example, in computer vision, an active area of research is the use of the scene context, which can be regarded as a hidden variable. Indeed, if one knows that an image is that of an airport runway, then one would expect to find more airplanes than chairs. Hence, if we build a model of that context ("the airport runway"), then the subsequent detection of various objects can be much more accurate."



Assistant Professor Vincent **Tan**, recently featured in the "Asia's Rising Scientists" feature of the Asian Scientist newsletter

A particular application that Dr Tan has already made an impact on is in the domain of clinical data analysis where he used graphical modelling techniques to understand the susceptibility of different groups of British children to asthma.

Together with his collaborators from Microsoft Research Cambridge and the University Hospital of South Manchester, Dr Tan pioneered the use of an advanced machine learning technique to deduce finer structure for various asthmatic conditions, such as susceptibility to dust mites, pets and various types of food. This technique has already shown potential for the analysis of other allergies.

Said Dr Tan, "Looking forward, I hope to work with my team of students and research scientists to solve challenging mathematical problems that have a direct or indirect application to communications, machine learning and beyond. In addition, as an academic who has gone through the Singapore education system, I hope to be a good role model for students in secondary schools, junior colleges and polytechnics to take up a career in science and engineering. I will be active in reaching out to those who need career advice."

Related links:

<http://www.asianscientist.com/2015/09/features/asias-rising-scientists-vincent-tan/>

<https://www.ece.nus.edu.sg/stfpage/vtan/>

FINDING A NICHE IN DIGITAL MARKETING

In this issue, we are proud to feature one of our distinguished alumni, Mr Jereme **Wong**, Chief Operating Officer of clickTRUE Pte Ltd.

Which year did you graduate from ECE?
2001.

Would you share some memorable experiences you had as a student in NUS?

I signed up for NVAC (NUSSU Volunteer Action Committee) in my first year at NUS, thinking that I could do some volunteer work to give back to society. Initially my mindset was to go in and be a normal volunteer without taking up too many responsibilities.

At that time, there was a new project (Telok Blangah Moral Welfare Home) that just got started and the Project Director was a Year 4 Engineering student who was about to graduate. For some strange reason, I was nominated to be the Project Director to take over the entire project although I had no prior experience in running a volunteer group.

Nevertheless, I took on the job, and to my surprise, I found it really refreshing and satisfying to spend weekends organising activities for the destitute and caring for them. Up to then, my focus had been on academic achievements. However, when I started involving myself with volunteer work, I realised that there is so much more to life than just academic pursuits.

How has NUS contributed to your success?

The four years of academic training gave me the chance to strengthen my critical thinking skills. At the same time, it was a great place to build up networking contacts and meet many friends. Some of them are my business partners today.

You are currently the Chief Operating Officer of clickTRUE Pte Ltd. What made you start your career in digital marketing and online advertising?

I started a media company called Hardware Zone Pte Ltd in my second year of NUS (1998) together with some friends. We published a popular technology website, www.hardwarezone.com, and also managed to launch a few technology magazines in five different countries. The company was later acquired by the Singapore Press Holdings in 2006. With the experience gained in media and advertising, we started clickTRUE as a digital agency within the SPH Group. The agency specialises in helping brands to achieve performance marketing through various digital channels.

Did you meet with any difficulties during your career development? And how did you resolve them?

Back in 1998, entrepreneurship was not a buzz word like it is today. We did not have much help or many resources.

Hence, every step in building a company was not easy. We were also not taught to manage people in school. But somehow, we managed to grow the company to comprise almost 150 staff across five countries. We managed to figure out how to motivate and manage staff by ourselves. As we had a few partners, we spent a lot of time exchanging pointers to sharpen our people management skills. In addition, with no mentor to guide us, many things were done in a trial and error manner. Keeping a positive and can-do attitude certainly helped to move things forward every time.

What are the major milestones in your career progression?

Back in the days of Hardware Zone, I had the chance to take on an Editor role, before becoming a Creative Director in charge of the print magazine, HWM. With zero experience in publishing, it was a personal feat to manage a team to produce a monthly magazine from scratch. The magazine eventually became the leading technology magazine across five countries, with more than 200,000 in print circulation. Later on, as the company grew, I tried out sales and eventually became the Media Director of the company. One major milestone as a Media Director was growing the company to one with a \$10 million revenue before it was acquired by SPH.

What skills and qualities do you think an engineering graduate should have to be competitive in today's ever-changing landscape?

I personally think soft skills are critical for anyone to stand out in today's competitive landscape. The ability to listen, and respond in an appropriate manner is a very important first step to master in the workplace. Getting this right will reveal your maturity in handling issues at work. Thereafter, one needs to be resourceful and able to apply critical thinking skills to solving problems.

What philosophy do you live by?

There is a popular Chinese saying “先学会做人 再学会做事”. Simply put, a person must have a good character and soft skills before he can succeed in his work. Looking back at my journey this far, this is one philosophy that keeps me grounded.

Finally, what are your hopes and aspirations for the department and our NUS ECE Alumni Committee?

I honestly hope that the faculty can provide more opportunities to expose students to a broader perspective early in their tertiary life. This could be done via “ask-me-anything” coffee talks by people from various walks of life, to give students a chance to understand life beyond the academic.



NUS TEAM CLINCHED MULTIPLE AWARDS AT FSAE 2015



Jun Jie (6th from right) with team and NUS FSAE Advisor, Prof **Seah** Kar Heng (far right)

The NUS team clinched multiple awards at FSAE 2015 held in Michigan, USA on 16 May 2015.

Instrumental in the design and engineering of the NUS FSAE car is Design-Centric Programme student **Shia** Jun Jie. His simple yet innovative wireless telemetry system helped the team clinch the world championship (for Cummins Inc. Applied Technology Award) and made ECE proud!

The NUS FSAE car made history when it returned from Michigan, ranking 7th in the world (out of 120 teams). Besides setting a new record since NUS started taking part in the competition in 2004, the team clinched four other awards, namely:

- a) Number 1 in Business Presentation Event
- b) Number 2 in Acceleration Event (Drag Race)
- c) Number 3 in FEV Powertrain Development Award
- d) Number 4 in Bosch Engineering Design Drawing Award

Recalling his experience in Michigan, Jun Jie who graduated in July with a B Eng degree in Electrical Engineering, said, "Getting the first place in the Cummins Award was truly unexpected as there were many outstanding entries and innovations submitted during the competition from many schools."

Explaining their award-winning system, Jun Jie said, "It is an in-house development using the Arduino platform. It receives data from the logger that is on the car. After a series of data decoding from the propriety system, the

data is extracted and packaged into usable information ready to be sent out. It can then be received on PC and mobile Android platforms for data analysis on the go."

The final winning factor, Jun Jie says, lay in the innovative use of a simple mobile phone to receive real time data from the car. "The judges were also impressed by the use of simple and low cost devices to achieve results that would otherwise have cost hundreds or even thousands of dollars!" he added.

The system was built using borrowed parts from the Design-Centric Programme (which hosts the FSAE project) and a fellow research engineer. The bulk of the work was spent on software development. The other components, such as the PC and phone were easily available as the system is compatible with all Windows PCs and android phones.

With the availability of real time data, the FSAE team was able to monitor important parameters such as temperature and vital pressure of the system to ensure that the FSAE car was in optimal operating condition. This way, the team did not have to stop the car periodically to check the system, allowing the driver to have maximum track time.

Challenges were many in the course of the project. For example, the entire project was built on little or even no prior knowledge. "We had to learn on our own what should go into the wireless telemetry system as this was beyond the scope of our academic syllabus. A huge portion of

our time was spent learning how to get the code right and debugging it when it wasn't right. I am fortunate to have team mates who were willing to spend long hours on many occasions to brainstorm," Jun Jie said.

Commented NUS FSAE advisor, Professor **Seah** Kar Heng, "Jun Jie was a direct-intake Year-2 student. Armed with a polytechnic diploma and an innate interest in engineering, he was well-placed to tackle this difficult task of developing a telemetry system for our race car. After years of hard work and perseverance, he finally managed to deliver the goods. It is a testimony to his consummate competence."

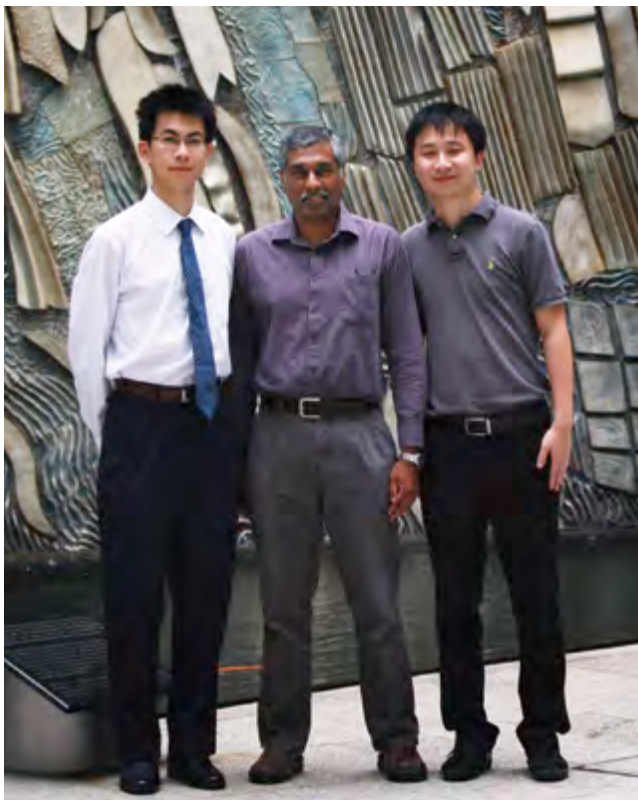
Jun Jie comes from a family with no engineering background. "But since young, my dad and I would sit down and start dismantling household appliances to see how things work on the inside. We even managed to repair a speaker together when I was in secondary school. My mum inspired me to work hard. She has always been the best role model in hard work and perseverance. She never gave up trying to give me a better life and always waited up for me late at night when I took the last bus home after leaving the design lab," Jun Jie said.



Jun Jie (in the driver's seat) has always loved cars. His wireless telemetry system for the NUS FSAE car won the World Champion (for Cummins Inc. Applied Technology Award).

Jun Jie was determined to join NUS. "It was the ultimate goal for me since I was small. NUS Engineering to me has always been a place that provides a full spectrum of learning. I was accepted by NTU but I chose NUS as I think it offers a more holistic education," he said.

WINNING THE THUMOS CHALLENGE



(From left:) Ph.D. student **Yuan** Jun, Prof Ashraf **Kassim** and Dr **Ni** Bing Bing

The THUMOS Challenge was held this year in conjunction with one of the top computer vision conferences, the IEEE Conference on Computer Vision and Pattern Recognition (CVPR 2015), from 7 to 12 June 2015, in Boston, USA.

The competition aims to explore new challenges and approaches for large-scale action recognition with a large number of classes held using open source videos in realistic settings. The competition consists of two tasks or tracks, action recognition and temporal localisation in untrimmed videos. For this year, the dataset used in the challenge contained over 430 hours of videos and over 45 million frames.

A team comprising researchers from the Advanced Digital Sciences Center (ADSC/UIUC, Singapore) and NUS, namely Dr **Ni** Bing Bing (Researcher, ADSC/UIUC) and Mr **Yuan** Jun (Ph.D. Student), submitted their research work to both tracks. Their outstanding, state-of-the-art performance won them the top position in the temporal localisation category. Their results were also a significant improvement over the results of the previous year. Congratulations to Dr Ni and Mr Yuan!

Both Dr Ni and Yuan Jun are Prof Ashraf **Kassim's** former and current Ph.D. students, respectively.

YEAR END PARTY 2015



Crowd at the Year End Party 2015



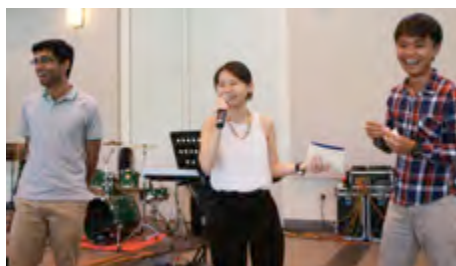
Acoustic guitar performance put up by EE4 student and President of the USC, Alex **Toh**



Dr **Chua** Dingjuan (in black half-mask) and her students having fun at the photo booth



Performance by a rock band comprising a EE2 student, Joanne **Tan**, and four students from Ridge View Residences



Dr Rajesh **Panicker** (left) and a student competing in a game of charades

The Department held its second year end party on the afternoon of 9 May 2015 at the Tembusu College dining hall to celebrate the hard work that ECE undergraduate students and academic staff had put in over the past academic year. The party, which bore the theme “Super Hero”, was organised by the ECE Undergraduate Student Council (USC). Over 140 students and staff turned up for the party, ready to let their hair down and have fun.

The afternoon was filled with a series of enjoyable and entertaining programs. The event kicked off with a welcome address by Deputy Head (Undergraduate Programmes & Student Life), Assoc Prof Vivian **Ng**, followed by a sumptuous spread of lunch buffet treats.

Midway through the lunch, the audience was entertained by various performances on stage which included a beautiful acoustic guitar performance put up by EE4 student and President of the USC, Alex **Toh**,

and a high-octane performance by a rock band comprising a EE2 student and four students from Ridge View Residences. The audience was next treated to a rousing game of charades in which professors were pitted against the students. Assoc Prof Ganesh **Samudra** and Dr Rajesh **Panicker** courageously came on stage to act out the different super heroes. After a fun and lively battle between the two faculty members and students, the students, not surprisingly, emerged victorious.

One of the party highlights was a portable photo booth which was highly subscribed by students and professors alike. Everyone had a good time snapping photos that were printed on the spot for them. The party drew to a close with the song, “Gravity”, beautifully performed by **Liang** Yi Ran from Ridge View Residence.

All in all, the party was a fantastic way for the students to say “Good-bye” to NUS ECE for the academic year of 2014/15.



A group photo consisting of faculty members and graduands



Prof **Lim** Teng Joon dancing and singing in a game of "Don't Forget The Lyrics"

GRADUATION NIGHT 2015

Graduation Night 2015 was held on 3 July 2015 at Parkroyal on Kitchener Road and was specially organised by the ECE Undergraduate Student Council (USC). This is the first year that the graduation night was held outside of NUS campus.

The evening gathered slightly over 100 graduating students and faculty members. Dressed in glitzy dresses and suits, the participants were buzzing with excitement before the start of the event.

Head of Department, Prof John **Thong** opened the event with a heart-warming farewell speech for the class of 2015. Following that, a scrumptious dinner for the evening commenced.

During the dinner, everyone had a great time catching up with one another, swapping stories of their ECE journey with much joy and laughter. Throughout the dinner, programmes that had been lined up for the evening entertained the audience to create a memorable experience for all. Interactive table games got the crowd going and attractive lucky draw prizes were given out to a lucky few.

Next, students and Prof **Lim** Teng Joon boldly came on stage to sing and complete the lyrics in a game of "Don't Forget The Lyrics". It was



Graduands stringing all the items collected for the first table game



Graduands having fun at the photo booth



Assoc Prof Marc **Armand** (right) leading the choir

remarkable that all of them were able to complete the lyrics without any difficulty. Shortly after, four pairs of students were invited to participate in a fruit-eating competition by feeding each other watermelons. The crowd started cheering for the participants as they tried their best to finish their allotment of watermelons. Countless photographs with peers and lecturers were taken at the photo booth as a keepsake to remind them of their time in NUS ECE.

The highlight of the evening was a performance by ECE staff and faculty. They sang the ECE Graduation Song 'Salute to Our Graduands' to the tune

of "Gaudeamus Igitur" which means 'Let us rejoice' in Latin. The night came to a close with a special photo montage prepared by the USC.

Looking back at the early days since the start of the first semester in NUS ECE, our graduands have indeed come a very long way. At the end of the event, it was a lovely chance for the graduands to reminisce about their days in NUS ECE and celebrate together the fruits of their four years of labour.

We wish our graduands all the best as they look towards the next stage of their lives. We know they will do NUS ECE proud!

FRESHMEN PARTY 2015

The Freshmen Party for the incoming 2015 freshmen was held on 25 August 2015 at Town Green in University Town. This year, the party was organised by the ECE Undergraduate Student Council (USC) and ECE Club.



Assoc Prof Vivian **Ng** (second from left) with her advisees



Assoc Prof **Yang** Hyunsoo (right) with his advisees



Students and faculty members participating in the game of Bingo



Melodious harmony by the Raffles Hall Choir



Assoc Prof Marc **Armand** (left) leading the NUS ECE Choir

This special evening gathered over 230 freshmen, seniors and faculty members, marking the start of student life in NUS ECE as faculty members and students welcomed the freshmen.

The event started off with a welcome address by Head of Department, Prof John **Thong**, followed by an ice-breaking game of Bingo which allowed everyone to get to know one another. Running around and actively finding fun facts about one another as part of the game helped to break the ice.

Following that was a game of “Know Your Advisor” which allowed the freshmen to learn fun snippets about their advisors. The emcees’ more probing questions about the advisors were greeted with smiles and laughter. The audience was then treated to a tasty buffet spread.

As the evening came to an end, various performances took over the stage. Awesome performances by the Raffles Hall Choir and Ridge View Residences Band set the cool ambience for the party. Subsequently, Assoc Prof Marc **Armand** gave an edgy rock performance on the electric guitar. The event ended with a bang when a group of ECE staff and faculty sang a brand new freshmen song entitled ‘We’re a Family’ to the tune of ‘Every Breath You Take’, thus ending the evening on a sweet note.

It was heartening to see the crowd enjoying themselves and supporting this event! Here’s to an amazing start to the NUS ECE journey!

DSO NATIONAL LABORATORIES INTERNSHIP EXPERIENCE



Derek **Cai** (far left), at the DSO Guided Systems TechKNOWfair in 2014. With him are his B.Eng team mates: Brij Bharatbhai **Samani**, He Wei, **Duan** Xuya and **Chen** Menglei.

He is one of the select few to be working on cutting-edge defence technologies to enhance Singapore's defence capabilities. What began as a two-month internship may soon become a career like no other.

B.Eng graduate Derek **Cai** Kunyao shares his interesting journey into the secretive but exciting world of defence R&D.

My first encounter with DSO:

I received an email from NUS regarding the DSO TechKNOWfairs. This is an annual knowledge sharing event where DSO's seven divisions open their doors to students to give them a glimpse into their R&D work. I'm glad I registered to attend one of the fairs.

I was really excited at what I saw and grabbed the opportunity to enquire about their internship opportunities. This was definitely a good decision to make because by the end of my internship, it was clear to me that DSO was the best place to apply my technical knowledge for serious research and development work, and pursue a technical career path.

Were you impressed by your internship?

Yes! I like the casual working environment, and how everybody is, nevertheless, so dead serious about technology, knowledge and learning. Just to prove this point - the internship interview was very informal and relaxed, but after I accepted the internship offer, my supervisor gave me a reading list to complete before starting! They are committed and dedicated to what they do.

During my internship, I had a taste of the challenging but interesting work at DSO. But what really impressed me was the excellent mentorship from senior staff. They were very passionate about their work and provided me with a very positive experience. This was a strong motivator in my decision to join DSO as a defence engineer.

So what's the difference between being an intern and a permanent staff member now?

The intern's programme is clearly defined and structured for a short-term stay. Things are clearly broken down into manageable stages, and the work does not deviate too drastically from what you are familiar with.

However, as a permanent member of the staff, the work I have to handle is more ambiguous in nature. It cannot be planned the same way as the internship because staff work involves research and development that aims to be cutting-edge. I am also required to learn a lot on the job, because information about defence research and development is not commonly available externally. I thrive on the challenge of acquiring the knowledge and skills that I need to do my job well.

Sounds like you are enjoying your work thus far!

In my short time at DSO as a defence engineer, I find the working environment to be very conducive. My colleagues are experienced and are always willing to share their expertise and help when I require it. This is important for our professional development, especially for a fresh graduate like me.

How is DSO unique to you?

The DSO people make the organisation unique. Their curiosity and thirst for new and interesting knowledge is strongly inherent and cultivated within the company. It is in the culture. You can see it in all the staff, both young and old.

Do you think you have found a great job that fits?

Yes, I want to learn and develop every day, and my work enables this. I like that I can discuss my long-term goals with my reporting officer, and explore the training options that I require to get there. I find great purpose in the work that I do as I am involved in projects that have a direct impact on the SAF, thus contributing to national security and defence.