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MEDIA RELEASE

25 SEPTEMBER 2013

**SINGAPORE HONOURS TOP SCIENTIFIC TALENT FOR GROUND-BREAKING
R&D CONTRIBUTIONS**

Deputy Presidents of NUS and NTU to receive the highest Science & Technology award in Singapore for their outstanding contributions to Singapore's research and development scene

1. Eight of the Republic's top research scientists and engineers will receive the 2013 President's Science and Technology Awards from President Tony Tan Keng Yam at an awards ceremony on 25 September 2013.

2. The awards are the top honours in Singapore conferred on outstanding individuals and teams for their achievements in science and technology and their contributions to research and development (R&D) in Singapore.

3. The President's Science and Technology Medal, the highest of honours, will be presented this year to Professor Barry Halliwell, Deputy President (Research & Technology) and Tan Chin Tuan Centennial Professor at NUS; and Professor Freddy Boey, Deputy President and Provost at NTU. Both individuals will be conferred the prestigious award for their distinguished, sustained and exceptional contributions to Singapore's science and engineering landscape.

Advancing the bioengineering and nanomedical sector through entrepreneurship in R&D

4. Professor Freddy Boey, Deputy President and Provost at NTU, has contributed to research beyond the academic arena and in industry at large. As both an academic and entrepreneur, Professor Boey has been able to render his scientific research into commercialised products, and raise Singapore's profile as a hub for medical device innovation. One of Professor Boey's inventions is the customizable hernia mesh, which lowers the risk of inflammation and infection. This "made-in-Singapore" invention was the first of its kind to be approved for sale by the USA Food and Drug Administration (FDA) in December 2012. Another invention, a fully biodegradable drug eluting stent, has been implanted in 30 patients in Columbia over the past 6 months. These two devices have world market values in excess of US\$ 5 billion and US\$ 1 billion respectively.

5. Professor Boey has won more than S\$42 million in competitive research grants to date and developed 30 primary patents, the majority of which have been licensed and some even commercialized. These patents have resulted in six spin-off companies, which he founded to commercialise his biomedical inventions. He also has exceptional academic credentials, having published over 300 top journal papers with a citation exceeding 7,000.

6. In the last three years, Professor Boey has also won more than S\$36 million in research grants, including a prestigious S\$10 million individual NRF Competitive Research Programme grant for his work on fully biodegradable cardiovascular implants. He was also instrumental in bringing top Israeli university, Technion, into partnership with NUS and NTU through a S\$20 million NRF Technion-Singapore grant on nanomedicine for cardiovascular diseases.

7. Said Professor Boey, "I am especially delighted to receive such prestigious recognition from my own country. In the past 28 years that I've been at NTU, I've seen the climate for innovation and research evolve to a standing which is on par with the best in the world. I am proud that Singapore is a country which believes technology and innovation does make a difference and is relevant for society".

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Strengthening research on the role of free radicals and antioxidants in human health, nutrition and disease

8. A world-leading expert on the role of antioxidants and free radicals, Professor Halliwell has won many international accolades such as the “Lifetime Achievement Award” by the Society for Free Radical Biology and Medicine in the USA, and Fellowship at the Society for Free Radical Biology and Medicine, for his outstanding contributions to the field of free radical chemistry, redox biology and antioxidants. His laboratory in NUS was ranked Number 1 worldwide in 2007 by highest citation score in *Free Radical Research*. In the past 15 years that he has been based in Singapore, he has become one of the world’s most highly cited researchers in Biology & Biochemistry, Neuroscience & Behaviour and Pharmacology & Toxicology.

9. Beyond his research expertise, Professor Halliwell is also Deputy President in-charge of Research and Technology at NUS. He has built and strengthened the research infrastructure in the university by recruiting some of the best scientific talent in the world; transforming NUS from simply a good teaching university to one with a worldwide standing for its emphasis on research excellence. In the last 15 years he’s been at NUS, competitive research funding has tripled and there is now over \$500 million per year worth of investments.

10. His close collaborations with industry and support from organisations like the NRF have seen him responsible for innovations such as developing the NUS-GE Singapore Water Technology Centre - GE Water’s first collaboration with a university in the Asia-Pacific. Other prolific research collaboration agreements include those with Carl Zeiss and Rolls Royce.

11. Said Professor Halliwell, “I am honoured and humbled to receive this award. The research excellence that has been achieved at NUS and in Singapore generally has only been possible through a team effort of many people, of which I am but a small part.”

Breakthrough discoveries to increase crop yield and promote food security

12. The President's Science Award will be presented to Associate Professor Yu Hao of the Department of Biological Sciences, National University of Singapore. Professor Yu is honoured for his research on the molecular mechanisms underlying plant reproduction, with a particular focus on the process of flowering in plants. His innovative work has addressed many of the fundamental questions in the field which have been unanswered since the 1930s. His breakthrough discoveries also have had a far reaching impact on increasing crop yield, particularly in food production.

13. A/Prof Yu's discoveries have been applied to economically important crops such as rice, oil palm and orchid so as to improve flowering time and seed yield. He has found a way to genetically modify rice to eliminate the 'foolish seedling' disease, which causes a plant to continue growing but not produce seedlings. Through his research A/Prof Yu was able to eliminate this genetic malfunction to increase crop yield and solve some of the problems of food shortages in society.

Genre-defining research in optics and nanophotonics

14. Professor Boris Luk'yanchuk from A*STAR's Data Storage Institute has spent the past 14 years working on different projects related to advanced concepts in Data Storage Techniques. In each project he has undertaken, he has been able to strike a good balance between basic science and applied science. His body of work has helped to contribute to the discoveries of important scientific knowledge in laser thermochemistry, laser ablation, laser cleaning, plasmonics and optics and photonics.

15. Acknowledged internationally for his exceptional work, Professor Luk'yanchuk is viewed as a thought leader in various sub-fields of optics and photonics and has been recognized for placing Singapore on the map for modern plasmonics and meta material research. In 2004, he was awarded the Institution of Engineers Singapore's Prestigious Engineering Achievements Award *"in recognition of an outstanding engineering project which has made significant contributions to Singapore's development"*.

Re-inventing human language technology to empower and benefit Asian societies

16. The President's Technology Award will be presented to the team from the Institute for Infocomm Research, A*STAR, led by Professor Li Haizhou. The other team members are Dr Ma Bin, Ms Aw Ai Ti and Dr Su Jian. Professor Li and his team have developed a suite of speech and language technologies, such as the "Abacus engine", which can break down language barriers for Asian languages. The Abacus engine can identify the accent, dialect, language and identity of a speaker through his/her voice, and translate the language to another. This technological breakthrough is significant as it opens up tremendous opportunities for innovative applications and services in the field of human communication.

17. The Abacus engine has been accredited by the US National Institute of Standards and Technology and it is a platform that is deployable by many mobile and internet companies. Through its technological deployment, the Abacus engine has empowered speech-to-speech translation, multilingual real-time chatting, messaging, web and documents translation and cross-lingual internet search to the benefit of millions of people.

18. The team's technology has not only set industry standards and placed Singapore prominently at the centre of Asia in terms of speech technology; it has also garnered significant commercial success. Professor Li and his team have attracted up to approximately S\$14 million of direct R&D funding and licensing from industry as at April 2013.

19. Said Mrs Ow Foong Pheng, Permanent Secretary, Ministry of Trade and Industry and Chairman of the PSTA Main Selection Committee, "The quality of research demonstrated by all the candidates was of a very high standard. What set the award winners apart was not only the excellent science they did but also the ability to translate their research into societal and economic benefits."

Young Scientist Awards (YSA)

20. This year's Young Scientists Awards (YSA) will be awarded to three promising research scientists and engineers aged 35 years and below. The recipients are: Assistant Professor Chi Yonggui, Robin from NTU, Assistant Professor Qiu Cheng Wei from NUS and Dr Khor Chiea Chuen from A*STAR. They have shown great promise to be world-class researchers in their fields of expertise. The awards will be presented by Mr S. Iswaran, Minister, Prime Minister's Office, and Second Minister for Home Affairs and Trade & Industry.

21. More information on the winners of PSTA and YSA are at [Annex B and E](#) respectively.

Background

22. This is the fifth year that the PSTA is presented. Formerly known as the National Science and Technology Awards launched since 1987, the Awards were elevated to the status of the President's awards in 2009 to highlight and give due recognition to the important role research scientists and engineers play in Singapore's development.

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AGENCY FOR SCIENCE, TECHNOLOGY AND RESEARCH

Enclosed:

Annex A – List of PSTA winners

Annex B – Citations of PSTA winners

Annex C – Factsheet on Judging Process and Award Selection Committees

Annex D – Information Sheet on YSA (including list of YSA winners)

Annex E – Citations of YSA winners

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About the Agency for Science, Technology and Research (A*STAR)

The Agency for Science, Technology and Research (A*STAR) is the lead agency for fostering world-class scientific research and talent for a vibrant knowledge-based and innovation-driven Singapore. A*STAR oversees 14 biomedical sciences and physical sciences and engineering research institutes, and six consortia & centres, located in Biopolis and Fusionopolis as well as their immediate vicinity.

A*STAR supports Singapore's key economic clusters by providing intellectual, human and industrial capital to its partners in industry. It also supports extramural research in the universities, and with other local and international partners.

For more information about A*STAR, please visit www.a-star.edu.sg.

About the President's Science and Technology Awards (PSTA)

The President's Science and Technology Awards (PSTA) are the highest honours bestowed on exceptional research scientists and engineers in Singapore for their excellent achievements in science and technology, and outstanding contributions to the development of the research and development landscape in Singapore.

The PSTA were formerly known as the National Science and Technology Awards (NSTA), which was started in 1987. The elevation of the award to Presidential status in 2009 underpins Singapore's efforts to raise the level of excellence in R&D and strengthen the growing community of scientific talent in Singapore.

The PSTA consists of the following awards:

- o President's Science and Technology Medal (PSTM)
- o President's Science Award (PSA)
- o President's Technology Award (PTA)

President's Science and Technology Medal (PSTM)

The President's Science and Technology Medal is awarded to outstanding individuals who have made distinguished, sustained and exceptional contributions and played a strategic role in the development of Singapore through the promotion and management of R&D. Recipients receive a specially designed gold medal and a

citation.

President's Science Award (PSA)

The President's Science Award is presented to research scientists and engineers in Singapore who have made outstanding contributions in basic research leading to the discovery of new knowledge or the pioneering development of scientific or engineering techniques and methods. Recipients will receive a crystal trophy, a citation and a prize of \$50,000.

President's Technology Award (PTA)

The President's Technology Award gives recognition to research scientists and engineers in Singapore who have made outstanding contributions to research & development resulting in the invention or discovery of significant technology with industrial applications. Recipients will receive a crystal trophy, a citation and a prize of \$50,000.

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LIST OF PRESIDENT'S SCIENCE AND TECHNOLOGY AWARD WINNERS

President's Science and Technology Medal (PSTM)

- **Professor Freddy Boey**
Deputy President and Provost
Nanyang Technological University

- **Professor Barry Halliwell**
Deputy President (Research & Technology)
Tan Chin Tuan Centennial Professor
National University of Singapore

President's Science Award (PSA)

- **Professor Yu Hao**
Department of Biological Sciences
National University of Singapore &
Temasek Life Sciences Laboratory

- **Professor Boris Luk'yanchuk**
Data Storage Institute
Agency for Science, Technology and Research

President's Technology Award (PTA)

- **Professor Li Haizhou, Dr Ma Bin, Ms Aw Ai Ti, Dr Su Jian**
Institute for Infocomm Research (I²R)
*Agency for Science, Technology and Research (A*STAR)*

**CITATIONS OF PRESIDENT'S SCIENCE AND TECHNOLOGY AWARD
WINNERS**

President's Science and Technology Medal 2013

Professor Barry Halliwell

Deputy President (Research & Technology)
Tan Chin Tuan Centennial Professor
National University of Singapore

“For his outstanding contributions to the development of the research landscape in Singapore and his excellent research on the role of free radicals and antioxidants in human health, nutrition and disease”

Professor Barry Halliwell has played a pivotal role in developing research excellence in Singapore in his capacity as Deputy President at the National University of Singapore (NUS) and as a role model in personally conducting excellent research and training local manpower.

Professor Halliwell has occupied key roles at NUS and in national bodies that support research for over 15 years. As co-chair of the NUS Life Sciences Curriculum (2004 to 2008), he helped steer the introduction of an integrated life sciences curriculum, which trains manpower for Singapore's Life Science initiatives. He is currently the Deputy President (Research and Technology) (DPRT) at NUS, a position newly created in 2006 to help NUS increase its research quality and productivity to aid Singapore's transition to a knowledge-based economy. Professor Halliwell drives the University's research agenda, promoting a broad base of high-quality research from which several peaks of excellence have grown. This involves playing a key role in the recruitment and mentoring of excellent senior and junior researchers. He also steered the development of an effective research policy framework which helped NUS researchers to win 3 of Singapore's Research Centres of Excellence (RCEs), as well as build other peaks of excellence in a range of areas. As a result, NUS is now highly ranked for its research achievements in several areas relevant to Singapore, from Asian studies to membrane technologies to cancer biology. NUS' competitive research grant income has tripled during his tenure as Deputy President.

Professor Halliwell worked closely with other agencies and industry to promote the development of new research initiatives in Singapore, in fields including ageing, clean energy, sustainability and interactive and digital media. The NUS “Virtual Institute for the Study of Ageing” has achieved high visibility, for example. Strong University-Industry partnerships have developed in several areas, from Solar Energy to imaging.

Professor Halliwell also assisted the National Research Foundation (NRF) in its mission. One example is CREATE (Campus for Research Excellence and Technological

Enterprise). He provided most of the input for the research component of the document that proposed location of CREATE at NUS, which has led to exciting synergies in research and technology between NUS and the CREATE partners.

Professor Halliwell has been a member of several boards which make strategic decisions on R&D in Singapore. A few examples, he sits on the National Medical Research Council (NMRC) panel evaluating proposals from the Translational and Clinical Research (TCR) Flagship Programme. He was the co-chairman of the research grant evaluation panel of NMRC from 2007 to 2011. He sits on the executive committee on Environmental and Water Technologies (EWT), providing input on the development of the EWT sector in Singapore, an area in which NUS and Singapore are ranked among the world leaders. Professor Halliwell is widely sought after as a consultant on research strategies to Universities, industry, public bodies and other organizations worldwide.

Professor Halliwell was also the Founding Executive Director of the NUS Graduate School of Integrative Sciences and Engineering (NGS). Established in 2003, NGS offers scholarships to encourage students to undertake Ph.D. education that transcends disciplinary boundaries. NGS has trained a diverse talent pool with over 700 Ph.D. graduates and current students, 46% of whom are Singapore citizens or Permanent Residents. NGS rapidly built up strong links with relevant NUS Faculties/Schools/Research Institutes, leading overseas Universities and especially with the Agency for Science, Technology and Research (A*STAR). Although Professor Halliwell stepped down as Executive Director in 2008, he still oversees NGS as DPRT.

Despite his heavy administrative duties, Professor Halliwell is a role model in maintaining his personal research, being a world-leading expert on the role of antioxidants and free radicals in nutrition, health and disease. An antioxidant mechanism he discovered that is used by plants to protect against damage (the ascorbate-glutathione cycle) is now often called the Halliwell-Foyer-Asada cycle. It has taken on a new importance recently because enhancing it allows crop plants to resist environmental stresses related to global warming, such as heat and drought. Pof Halliwell was a pioneer in establishing the key role of transition metal ions in catalyzing free radical reactions *in vivo* in multiple human disorders, ranging from problems of premature babies to cancer chemotherapy and atherosclerosis. He is renowned for his applications of robust methodology to measure the oxidative damage caused by free radicals *in vivo*. These methods have, for example, helped to establish a role for oxidative damage in cancer development and in Alzheimer and Parkinson diseases, among others. They have also been used to identify nutritional strategies to minimize oxidative damage in the human body. Professor Halliwell has also contributed substantially to our understanding of the role of oxidative damage in many other areas, including the mechanisms by which air pollutants (ozone, nitrogen dioxide, cigarette smoke and PM_{2.5}) damage the human body.

Professor Halliwell has published 225 papers in leading international journals since joining NUS. He has trained multiple research assistants, fellows and students, over half of whom are Singapore citizens. His textbook *Free Radicals in Biology and Medicine* is in its fourth edition (published Jan 2008 by Oxford University Press; fifth edition in preparation), and is used worldwide (cited over 19,000 times to date). Thomson Reuters identified Professor Halliwell as a highly cited scientist in three areas, indicative of the broad relevance of his research, namely Biology and Biochemistry, Neuroscience and Behaviour, and Pharmacology and Toxicology. His Hirsch index is 139. He has received numerous awards, including the Lifetime Achievement Award by the American Society

for Free Radical Biology and Medicine, Ken Bowman Research Award from the Institute of Cardiovascular Sciences (Canada), Fellow of the American Association for the Advancement of Science and the NUS Outstanding Researcher Award 2012. He received Singapore's Public Administration Medal (Silver) in 2010.

For his outstanding contributions to the development of the research landscape in Singapore and his excellent research on the role of free radicals and antioxidants in human health, nutrition and disease, Professor Barry Halliwell has been awarded the 2013 President's Science and Technology Medal.

President's Science and Technology Medal 2013

Professor Freddy Boey

Deputy President and Provost

Nanyang Technological University

“For his distinguished contributions to Singapore’s scientific research landscape, particularly in the bioengineering and nanomedical sector, and his role in nurturing young research talent”

Professor Freddy Boey, Nanyang Technological University (NTU) Deputy President and Provost, has a sterling track record of breakthrough commercial applications that have given the “made in Singapore” label pride of place on the international stage. Before becoming Provost, he served as the Chair of NTU's School of Materials Science and Engineering from 2005 to 2010. He was instrumental in leading its transformation into one of the world's largest materials engineering institutions with about 1,000 undergraduates and close to 250 research students. Through his efforts, the school has developed a solid reputation for materials science research, generating industry-leading technologies that can be commercialised.

After 27 years at NTU, Professor Boey has witnessed its transformation from a teaching university into a research-intensive university. He has graduated 33 PhDs to date and mentored 15 post-doctorates. For Professor Boey, who received the Public Administration Medal (Silver) in 2010, the best ideas are always global. That is why he prefers NTU's PhD students to do part of their research overseas. His current biomedical research team comprises 12 PhDs and more than 10 post-doctorates and Senior Research Fellows. Under his exemplary mentorship, about 15 of his past and current students and staff have been or are now involved in their own or his start-up companies. Indeed, Professor Boey's own research in biomaterials for medical devices

has contributed to the school's and NTU's growing global profile and standing, besides generating a buzz in international healthcare.

Professor Boey's spirit of experimentation is matched by a prolific output and paired with the belief that his work should improve the lives of others. He also believes in teamwork – each of his inventions involves collaboration with other professors, graduate students and research staff. His first invention is a piezoelectric heart pump that was the world's smallest when it was unveiled in 2003. At 50 grams, the pump is four times lighter and uses less power than conventional heart pumps. His second in 2004 is a fully biodegradable drug eluting stent, co-developed with Professor Subbu Venkatraman from NTU, which reduces the formation of excessive fibrous tissues that could block the stented artery. The stent has been successfully implanted in 13 patients in the South American country of Colombia over the past eight months. His current inventions, again with Professor Subbu Venkatraman, include a fully biodegradable device that helps to plug heart defects like a hole in the heart, as well as an injectable nano-liposome based device to treat Glaucoma, developed in collaboration with Dr Tina Wong from the Singapore Eye Research Institute. The latter has recently been successfully implanted into several patients in Singapore, showing excellent results.

An exceptional materials science and engineering pioneer, Professor Boey has developed 30 original patents, the majority of which have been licensed. These patents have also resulted in several spin-off companies, which he founded to commercialise some of his biomedical inventions. Several of his biomedical devices have received US Food and Drug Administration (FDA) approval for sale and the Conformité Européenne (CE) mark. These include a surgical tissue retractor that has been sold in the US, India, Japan and Europe as well as a customisable hernia mesh that uses a new functional material to lower the risks of inflammation and infection, the first such surgical mesh approved by the US FDA.

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Research and education remain Professor Boey's abiding passions. He has won more than S\$42 million in competitive funding for research including a prestigious S\$10 million individual grant under the National Research Foundation's (NRF) Competitive Research Programme to develop fully biodegradable cardiovascular implants for hole-in-the-heart conditions. He has also clinched a S\$20 million NRF Technion–Singapore grant for his research in nanomedicine for cardiovascular diseases, and a S\$1.25 million grant from the NRF Translational Flagship Project. Professor Boey has published 344 top journal papers with a citation of 7,436 and an H-Index of 44.

Professor Boey's sustained contributions to Singapore's research and development (R&D) scene are not just in academic and scientific research. He serves as Director on the boards of the Intellectual Property Office of Singapore and the DSO National

Laboratories, and is a founding Fellow of the Singapore Academy of Engineers. He is also on the boards of several nationally funded research centres. He was also an appointed member of both the University Blue Ribbon Commission and the Blue Ribbon Implementation Commission.

Professor Boey was conferred the prestigious Imperial College London Fellowship in the Faculty of Medicine in 2012, for his exceptional achievements in medical technology and his outstanding contribution in developing the Lee Kong Chian School of Medicine, a joint medical school between Imperial College and NTU. He was also conferred an honorary doctorate from Loughborough University in December 2011 for his outstanding achievements as an engineer and academic leader. In November the same year, he received the Distinguished Alumni of the Year Award from Monash University in recognition of his achievements as a teacher, researcher and innovator, including his exceptional contributions to nanomedicine, as well as his volunteer work since his student days. In September 2013, Professor Boey was awarded an honorary professorship from Nanjing University of Technology, in recognition of his academic and scientific leadership in NTU.

For his distinguished, continuous and relentless contributions to Singapore's science and engineering landscape, particularly in advancing the bioengineering and nanomedical sector through R&D and his role in nurturing young research talent, as well as his contributions in developing NTU into a global University with a strong focus on world-class education, research and innovation, Professor Freddy Boey is awarded the 2013 President's Science and Technology Medal.

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President's Science Award 2013

Professor Yu Hao

Department of Biological Sciences
National University of Singapore
&
Temasek Life Sciences Laboratory

“For his outstanding research in plant functional genomics and its biotechnological applications to economically important crops”

In the last decade, Professor Yu Hao has been dedicated to uncovering the molecular genetic mechanisms of plant reproductive development, with a focus on flowering time control, floral organ development, and phytohormone signalling. Flowering plants are the most diverse and ecologically successful group of organisms on earth. They reproduce in an unpredictable environment through generating flowers that contain reproductive organs. As this reproductive process determines yield in crop plants and affects the survival of plant varieties that are adapted to changing environment and climatic conditions, Professor Yu's research on plant reproductive development provides important solutions to vital problems relevant to our everyday life, such as the supply of food, medicine, and bioenergy.

Using *Arabidopsis* as a model plant, Professor Yu's laboratory integrates molecular genetic approaches with deep sequencing, proteomics and bioimaging tools to study the fundamental mechanisms of cell proliferation and differentiation. Several of his recent findings provided ground-breaking understanding in plant reproductive development. His lab found the first regulator that controls the transport of florigen that is synthesized in leaves, but transported to the shoot tip to generate flowers. This finding contributes significantly to addressing the famous “Florigen” question raised in 1930s, and provides the key information for manipulating flowering time in crops. His major recent breakthroughs also include the discovery of a conserved genetic pathway determining inflorescence architecture across flowering plants and a “Relief of Repression” mechanism that balances plant growth and defence through modulating two phytohormone pathways.

These major findings have not only contributed greatly to plant science, but also provided essential gene resources and mechanisms for classical breeding and genetic engineering of economically important crops. Based on the fundamental discoveries in plant reproductive development of *Arabidopsis* and the platform technologies established, Professor Yu's laboratory is creating novel and high-value varieties with desirable flower and seed traits for rice, orchid and oil palm.

Prof Yu's research has gained wide international recognition and was published in many prestigious journals. The research materials generated in his lab have been

distributed to over 60 labs in more than 18 countries. He has been invited to serve as Editorial Board member for international refereed journals published by 7 publishers, including the reputable ones published by PLoS, Springer, and Oxford University Press. He was invited as reviewer for 36 international refereed journals, including those top-notch ones like Science and Nature Genetics, and also as reviewer for 11 foreign and local grant agencies. He was the recipient of Singapore National Academy of Science Young Scientist Award (2006), NUS Young Researcher Award (2007), Singapore Youth Award for Science and Technology (2007), Dean's Chair Professorship in Faculty of Science, NUS (2011), and Outstanding Scientist Award in Faculty of Science, NUS (2011).

For his outstanding research in plant functional genomics and its biotechnological applications to economically important crops, Professor Yu Hao is awarded the 2013 President's Science Award.

President's Science Award 2013

Professor Boris Luk'yanchuk
Data Storage Institute
Agency for Science, Technology and Research

"For his outstanding contributions to the theory of laser-matter interactions and light scattering by nanoparticles, in particular to Fano resonance in plasmonic materials"

Professor Boris Luk'yanchuk, a principal scientist in Advanced Concepts and Nanotechnology with the Data Storage Institute, has played a vital role spanning 14 years in the development of modern Data Storage Technologies (DST). He has been instrumental in the development of various scientific projects related to advanced concepts in DST.

Prof. Luk'yanchuk's efforts were further recognised with the publication of pioneering papers in the theory of laser-matter interactions, plasmonics and modern optics. Among the recent discoveries of Professor Luk'yanchuk and his team are the following five achievements as mentioned:

- The creation of laser beam with longitudinally polarized light (Nature Photonics 2, 501 (2008));
- Pioneering investigation of Fano resonance in plasmonic materials and metamaterials (Nature Materials 9, 707 (2010));
- Nanoscopy with virtual image and super resolution (Nature Communications 2, 218 (2011));

- Creation of "magnetic light" by laser induced magnetic moments in dielectric materials with high refractive index (Nature / Scientific Reports 2, 492 (2012))
- First realization of the Kerker's resonance in optical range (directional light scattering by spherical silicon nanoparticles) (Nature Communications 4, 1527 (2013)).

Papers by Prof. Luk'yanchuk yielded high international reputation and citation. His paper on Fano resonance in plasmonic materials and metamaterials, in particular, has earned the highest citation among the papers published by A*STAR Institutes over the last few years.

In recognition of his outstanding achievements, Professor Boris Luk'yanchuk was awarded IES Prestigious Engineering Achievements Award 2004 (Team). He is an Honorary Professor of Johannes Kepler University, Linz, Austria and Fellow of the Optical Society of America. Given Prof. Lukiyanchuk's depth of knowledge in the field of modern physics, he was appointed Chair of a few International Conferences in Singapore that included Symposia of ICMAT Conferences. He is also the topical Editor of "Journal of Optics" and the Editor of many Special Issues of Applied Physics A.

Prof. Luk'yanchuk's accolades also include novel discoveries in laser cleaning, laser thermochemistry, laser ablation, plasmonics, optics and photonics, and nanoscopy with virtual image. He was responsible for the investigation of interference phenomena in the near field, and suggested combining "nano-Fano" with "nano-vortices" in nanostructures. This method permits control of a topological charge on a nanoscale, giving rise to a promising application for future information technologies and quantum optics.

For his outstanding input to the theory of laser-mater interactions and light scattering by nanoparticles, in particular to Fano resonance in plasmonic materials, Professor Boris Luk'yanchuk has been awarded the 2013 President's Science Award.

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President's Technology Award 2013

Professor Li Haizhou, Dr Ma Bin, Ms Aw Ai Ti, Dr Su Jian

Institute for Infocomm Research (I²R)

Agency for Science, Technology and Research (A*STAR)

"For the outstanding contributions to human language technology that have empowered the industry and benefited the Asian society."

Professor Li Haizhou, an internationally-renowned scientist, and his team Dr Ma Bin, Ms Aw Ai Ti, and Dr Su Jian have made a remarkable breakthrough in human language technology that transforms the interface of mobile applications and breaks down the language barriers for Asian society.

Among the 7,105 living spoken languages that *Ethnologue* documented in 2013, 2,304 are spoken by Asians, representing more than half of the world's population. However, traditional human language technologies were developed using English and other major languages as the workbench, which cannot be applied to many Asian languages. Over the past nine years, Professor Li and his team pioneered new approaches to speaker recognition, multilingual speech recognition, tonal language processing, as well as lexical, syntactic, semantic and discourse analysis. These novel inventions now serve as the foundation of the Abacus language engine, a commercial grade technology solution for the Bahasa Indonesian, English, Malay, Mandarin Chinese, Thai, and Vietnamese languages. Abacus accurately converts continuous speech into text, identifies the accents, dialects, and languages being spoken, establishes a speaker's identity by his/her voice, and translates languages between one another.

The technological breakthrough is significant. The Abacus engine achieved a leading performance in US National Institute of Standards and Technology (NIST) international benchmarking competitions, including NIST Language Recognition Evaluation 2007, NIST Speaker Recognition Evaluation 2008 and 2012, and NIST Text Analysis Conference 2011, representing the state-of-the-art in academia and industry. In developing the Abacus engine, the team addressed the unique research problems that Asian languages face, such as multilingual speech and tonal language processing, and translation between Asian languages. The team also formulated a novel industry process for rapid technology deployment that has been adopted widely by the industry.

The team's recent achievements have put Singapore on the world map. Professor Li was elected as a Board Member of the International Speech Communication Association (ISCA) in 2009 and the Vice President of ISCA in 2013. He was named one of the two Nokia Visiting Professors 2009 by the Nokia Foundation. Dr Su Jian was elected as an Executive Committee Member of the Association for Computational Linguistics (ACL) in

2012. Their work has also been published as an 'Invited Paper' in the Proceedings of the IEEE in 2013, the most highly-cited general interest journal in electrical engineering and computer science, and honored as 'The Most Cited Article' in Elsevier Speech Communication during 2008-2013. One major outcome of the team's research is the establishment of the Baidu-I²R Research Centre (BIRC) in Singapore. In 2012, the internet giant Baidu and I²R set up BIRC as Baidu's first overseas joint laboratory to further the research of speech information processing and Asian language processing. The establishment of BIRC is an endorsement of the team's technological achievements.

The Abacus language engine has become one of the most sought after solutions internationally for text input, question and answering, spoken dialogue, and voice biometrics in mobile applications. For the past three years, the Abacus engine has been licensed to more than 15 leading international companies to enable many innovative products. In particular, the Abacus engine was adopted in 2012 to power the Lenovo A586, the world's first voiceprint smartphone. The team also contributed to ITU-T F.745 and H.625 international standards for network-based speech to speech translation in 2010.

For their outstanding contributions to human language technology that have empowered the industry and benefited the Asian society, Professor Li Haizhou, Dr Ma Bin, Ms Aw Ai Ti and Dr Su Jian from the Institute for Infocomm Research are awarded the 2013 President's Technology Award.

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**FACTSHEET ON PRESIDENT'S SCIENCE AND TECHNOLOGY AWARD
SELECTION COMMITTEES**

Judging Process

Nominations for the awards start from January every year, and ends with judging and endorsement of the awards in August. The nominations undergo a rigorous process of selection before being short listed for judging.

Award Selection Committees

The award selection panels comprised key representatives from the industry, academia, defence and research institutes. The main selection committee was chaired by Mrs Ow Foong Pheng, Permanent Secretary, Ministry of Trade and Industry.

Professor Lee Eng Hin, Professor and Emeritus Consultant, National University Health System, and Mr. Jen Kwong Hwa, Director, Ascendas, chaired the selection committees for the Presidential Science Award and Presidential Technology Award respectively.

INFORMATION SHEET ON YOUNG SCIENTIST AWARD

List of Young Scientist Award Winners

- **Assistant Professor Chi Yonggui Robin**
Division of Chemistry and Biological Chemistry, School of Physical and Mathematical Sciences, National Technological University (NTU)
- **Assistant Professor Qiu Cheng Wei**
Department of Electrical & Computer Engineering, Faculty of Engineering, National University of Singapore
- **Dr Khor Chiea Chuen**
*Genome Institute of Singapore (GIS),
Agency for Science, Technology and Research (A*STAR)*

Young Scientist Award

The Young Scientist Awards recognise young researchers, aged 35 years and below, who are actively engaged in R&D in Singapore, and who have shown great potential to be world-class researchers in their fields of expertise. This award is organised by the Singapore National Academy of Science and supported by A*STAR. Recipients will receive a trophy, a certificate of commendation and a prize of \$10,000.

National Archives of Singapore

Young Scientist Award Selection Committee

The judging committee for the Young Scientist Awards is chaired by Professor Andrew Wee, Dean, Faculty of Science, National University of Singapore.

CITATIONS OF YOUNG SCIENTIST AWARD WINNERS

Young Scientist Award 2013

Assistant Professor CHI Yonggui Robin
Division of Chemistry and Biological Chemistry
School of Physical and Mathematical Sciences
Nanyang Technological University

“For his research on fundamental and application advancements of organocatalysis and organic synthesis”

Dr Robin Chi's research focuses on the development of fundamentally novel chemical activation modes *via* organocatalysts (such as N-Heterocyclic Carbene organocatalysts), and applications of these activation modes for rapid and sustainable synthesis/manufacturing of pharmaceuticals, bioactive compounds, fine chemicals, and functional polymer materials. Recent breakthroughs from the Chi lab include organocatalytic activation of sustainable carbohydrate biomass for synthesis, HOMO/LUMO activation of readily available and inexpensive carboxylic esters, unprecedented β -carbon activation of saturated esters as nucleophiles, and organocatalytic functionalization of inert sp^3 -CH and carbon-carbon single bonds. Immediate applications of these methods include concise and green synthesis of bioactive non-natural amino acids and selective functionalization of Chinese medicines; part of this research is co-supported by industry for further developments and commercialization. Dr. Chi's research is documented in leading journals, such as *Nature Chemistry*, *Journal of the American Chemical Society*, *Angewandte Chemie-International Edition* and in multiple international patents. Dr Chi's research has created a new sub-area in organocatalysis and organic synthesis. He is a winner of the GSK-EDB Award on Sustainable Pharmaceutical Manufacturing, Thieme Chemistry Journal Award, Singapore NRF Fellowship, and Abbott Laboratories Fellowship, among others. In addition to research, Dr Chi is committed to education – for example, he has won a teaching excellence award in 2012.

Young Scientist Award 2013

Assistant Professor QIU Cheng Wei
Department of Electrical & Computer Engineering,
Faculty of Engineering
National University of Singapore

“For his research on complex light-matter interaction and optical micromanipulation”

Dr Qiu's research focuses on complex electromagnetic systems and light-matter interactions involving nanofabrication and optical characterization, and their applications to empower unprecedented optical micromanipulations of particles. He has established nanoscale and macroscale roadmaps to structure complex optical lights and assemble functional artificial materials. These enable non-invasive super-resolution imaging, advanced imaging systems with designed focusing trajectory, and efficient linear or angular momentum transfer to manipulate micro-particles, so as to develop an integrated optical platform with novel and cutting-edge functionalities. In particular, he is one of the pioneers in the development of tractor beam, providing negative pulling force to reel in particles toward the laser source.

Dr Qiu's achievements have gained international recognitions from scientific communities as well as the media. He has authored over 80 papers in top international journals, such as Nature Photonics, Physical Review Letters, Nature Communications, Advanced Functional Materials, Energy & Environmental Sciences, etc. His works have been featured by the Institution of Engineering & Technology, Science, SPIE Newsroom, Nanowerk, Straits Times, Lianhe Zaobao, Daily Mail, Le Monde, and so on. The major awards Dr Qiu has received include URSI Young Scientist Award (2008), NUS Young Investigator Award (2011), and TR35@Singapore Award by MIT Technology Review (2012). He holds several patents in light path re-routing and super-resolution nanoscope. He is currently an Associate Editor of the Advanced Electromagnetics journal and an Editorial Board Member of the European Journal of Physics. He is an active member of his department's outreach team to promote the new findings in engineering & science to junior college and high school students.

Young Scientist Award 2013

Dr Khor Chiea Chuen

Genome Institute of Singapore, A*STAR

Departments of Ophthalmology and Pediatrics, National University Health System

Saw Swee Hock School of Public Health, National University of Singapore.

Singapore Eye Research Institute, SingHealth

“For his research on genetics and heredity”

Dr Khor Chiea Chuen's research is focused on defining genetic factors that influence susceptibility to common, Asian-centric human diseases. As a postdoctoral trainee, he has discovered a series of DNA sequence variations which show very strong association with severe infectious conditions, such as Dengue shock and Kawasaki disease. These findings have revolutionized the manner in which both diseases are perceived, with potential implications on the identification of treatment targets and patient stratification.

Dr Khor currently leads an independent research group at the Genome Institute of Singapore. Together with partners at the Singapore Eye Research Institute, his research leverages on the knowledge of the Singaporean genealogy, using whole-genome analysis and familial pedigree information to dissect the heritable basis of age-related macular degeneration, primary angle closure glaucoma, and extreme shortsightedness. These are eye diseases which are very common in Singapore and Asia, and, if detected early, could prevent a substantial proportion of blindness in this region. Knowledge gained from the Singaporean genealogy will also create a genetic resource which is scalable to benefit other local disease research domains such as cancer and metabolic diseases.

He has published over 55 papers, of which 13 of them were in journals of broad visibility and high impact (New England Journal of Medicine and Nature Genetics). With his clinical training, he developed a passion to work on research topics of clinical relevance for the benefit of patients. In 2001, Dr Khor was one of the pioneers to receive the inaugural A*STAR National Science Scholarship under the MBBS-PhD scheme. He received his DPhil from the University of Oxford and was trained in NUS for his MBBS degree. He also holds joint appointments as an Assistant Professor with the Departments of Ophthalmology and Pediatrics at the National University Health System, as well as at the Saw Swee Hock School of Public Health in NUS.