

2010 PSTA WINNER CITATIONS

PRESIDENT'S SCIENCE AND TECHNOLOGY MEDAL 2010



Professor Chong Tow Chong Provost, Singapore University of Technology and Design

“For his distinguished, strategic and far-sighted contributions to Singapore’s science and engineering landscape, particularly in spearheading the development of the data storage industry, driving research integration in Fusionopolis, and shaping R&D in Singapore”

Professor Chong Tow Chong, the Provost of the Singapore University of Technology and Design, is one of the pioneers who have played a vital role in developing the science and engineering landscape in Singapore. A brilliant researcher and a research leader, Prof Chong has, throughout his career, contributed significantly towards building up the science and engineering research capabilities in the A*STAR research institutes, developing the data storage industry, and anchoring some of the leading multi-national data storage companies here in Singapore.

He was also actively involved in cultivating a vibrant public sector science and engineering R&D environment in Singapore that led to important industry collaborations, bridging the gap between the laboratory and industry, and between the public and private sectors. Developing Data Storage Research and Industry Prof Chong Tow Chong’s early major contributions to the R&D landscape in Singapore were in the area of data storage research through his work and leadership roles in Data Storage Institute (DSI).

He was Technical Director of DSI from 1995 to 1996, the Deputy Director from 1997 to 1998, and the Executive Director from 1998 to June 2010. During his 15 years at DSI, Prof Chong was instrumental in leading the fledgling institute to achieve worldwide recognition as a research institute of excellence in data storage technologies. Today, DSI is a member of the United States-based Information Storage Industry Consortium (INSIC), where it is actively involved in the development of long-range technology application, and in pre-competitive collaborative research projects with key industry players and academic institutions such as Seagate, Hitachi Global Storage Technologies (GST) and Carnegie Mellon University. DSI has also been recognized locally for its excellent achievements in research by winning the National Technology Awards (the precursor of the President’s Technology Award) for three consecutive years in 2004, 2005 and 2006.

Under Prof Chong’s leadership, DSI grew by leaps and bounds, contributing substantially towards the growth of the data storage industry in Singapore. In the early days of DSI in the 1990s, one in two disk-drives worldwide was made in Singapore. Over time, when the production of such disk-drives began to move to lower cost countries, Prof Chong led DSI to respond to the needs of the times and

developed new research capabilities which supported the shift of the data storage industries towards higher value-added activities. Today, eight out of 10 higher value-added high-end enterprise drives and nearly five out of 10 hard disk media are manufactured in Singapore. Indeed, much of the success of the data storage industry in Singapore, which persuaded key industry players such as Seagate, Fujitsu, EMC, Seiko and Nitto Denko to establish corporate R&D laboratories in Singapore, can be attributed to Prof Chong. By the time Prof Chong passed the reins to his successor, he has already put measures in place for DSI to continue to look ahead to build capabilities to support the key industry players on developing next-generation products such as cost-competitive Non-Volatile Memory devices, network storage technology and high density magnetic storage at 10 Terabits per square-inch.

Spearheading Singapore's Science and Technology Plans Prof Chong's contributions to R&D extended beyond the boundaries of DSI. In 2002 he was concurrently appointed Deputy Executive Director (DED) of the Science and Engineering Research Council (SERC), and subsequently Executive Director (ED) of SERC from Nov 2003 to Jan 2010. In his role as Executive Director of SERC, Prof Chong oversaw the implementation of the recommendations of the Science & Technology Plan (S&T) 2005 plan, and led the technology scanning and planning exercise to develop recommendations for the SERC component of the S&T2010 Plan.

As part of the implementation of the S&T2010 Plan, SERC established programmes which led to the development of strategic research capabilities spanning nanoelectronics, UWB, polymer and molecular electronics; initiated multidisciplinary research programmes in energy and technologies for the Home of the Future; and established key industry consortia programmes for the aerospace and automotive industry sectors. Under Prof Chong's leadership, SERC also established strong capabilities across the broad spectrum of physical sciences and engineering areas and are well-positioned to lead multidisciplinary research for the next phase.

Establishing Fusionopolis as the Science and Engineering Research Hub Prof Chong played a key role in the conceptualisation of Fusionopolis as the physical sciences and technology hub to bring together scientists, research engineers and technology experts from a variety of physical science and engineering disciplines to a single location to tackle complex challenges facing industry, and develop innovative solutions meeting new technological opportunities and challenges. He chaired the Fusionopolis Working Committee, which was responsible for planning for Fusionopolis Phase 1. He was also a member of the Fusionopolis Steering Committee, leading the planning for Fusionopolis Phase 2.

Fostering collaborations with industry to advance industry development Prof Chong also led in the development of a framework, through which the science and engineering research institutes of A*STAR were positioned to advance industry development. This led the way for SERC research institutes to partner and collaborate with MNCs in developing new technologies and anchoring research and manufacturing facilities in Singapore. The HP Labs and Fujitsu are two cases in point. HP Labs' successful Shared Services Platform (SSP) collaboration with A*STAR on grid computing and service automation contributed to HP Labs' decision to set up a full-scale research lab in Fusionopolis, its first in Southeast Asia, to look into future concepts in data centre and cloud computing. HP was committed to investing S\$50 million (US\$35.6 million) into the new local facility over five years.

In the same vein, the Fujitsu-High Performance Computer Lab was also set up for Fujitsu and A*STAR to jointly develop advanced applications technologies for the next generation of scientific computing known as petascale computing. Another of Prof Chong's innovative industry concepts was the Lab-in-RI programme. The Lab-in-RI scheme allows MNCs, without a prior physical R&D presence in Singapore, to quickly jumpstart their R&D activities by locating its R&D lab in an A*STAR research

institute. Mitsui, through such an initiative at ICES, subsequently decided to locate its first R&D lab outside of Japan in Singapore.

A more recent example would be DyStar Singapore Pte Ltd (DyStar), the local branch of DyStar Textilfarben GmbH & Co. Deutschland KG, a leading German provider of products and services for the textile and leather industry. In addition, key industry consortia programmes were initiated and launched. A*STAR initiated the Aerospace Programme in 2007 to help companies grow R&D activities and build up technical capabilities for the future.

In all, 18 companies including industry giants such as Boeing, EADS, Pratt & Whitley and Rolls Royce; the local Globally Competitive Companies such as SIA Engineering Company; and local Small and Medium Enterprises (SMEs) such as IDI Laser and Tru-Marine are collaborating with A*STAR's research institutes in the pre-competitive R&D. The end-goal is to develop and move the aerospace industry up the value chain, including anchoring manufacturing & design activities in Singapore. In recognition of A*STAR's role in establishing the Aerospace Programme, A*STAR was awarded the Frost & Sullivan Asia Pacific Aerospace & Defense Award for Aerospace R&D Institution of the Year in 2009.

The success of the Aerospace Programme paved the way for the formation of similar research consortium such as the 3-Dimensional (3D) Through-Silicon Via (TSV) consortium in September 2009 to boost next generation wafer stacking manufacturing capability for Singapore semiconductor industry to meet technology and product needs, and the MEMS Consortium in April 2010 to bring together eight MNCs and local enterprises from the MEMS supply chain in public-private sector research collaboration to grow the MEMS industry in Singapore.

Under Prof Chong's charge, SERC also implemented the Growing Enterprises through Technology Upgrade (GET-Up) programme in 2003 to boost the global competitiveness of local technology-intensive enterprises and equip them for the knowledge-based economy. Under the GET-Up programme, A*STAR would assist SMEs to move up the value chain through the secondment of A*STAR researchers to SMEs for up to two years, with funding support from EDB and SPRING. In addition, A*STAR would provide assistance to the SMEs through operations and technology roadmapping, and technology advisory assistance. Since its inception, more than 200 SMEs have benefited from the GET-up initiative. Apart from his achievements as a research leader, Prof Chong is a remarkable researcher in his own rights.

Throughout his career, he authored and co-authored more than 350 publications in international refereed journals, presented more than 25 invited talks and registered 23 patents. He has also groomed and mentored promising R&D talent that passed through his laboratory. Prof Chong has recently been appointed as the Provost of the Singapore University of Technology and Design on 1 June 2010 where he will continue to contribute towards the R&D landscape in Singapore by grooming a new generation of technically grounded innovators, entrepreneurs and leaders.

For his distinguished, strategic and far-sighted contributions to Singapore's science and engineering landscape, particularly in spearheading the development of the data storage industry, driving research integration in Fusionopolis, and shaping R&D in Singapore, Professor Chong Tow Chong is awarded the 2010 President's Science and Technology Medal.

PRESIDENT'S SCIENCE AWARD 2010



Professor Yoshiaki Ito
Cancer Science Institute of Singapore
Institute of Molecular and Cell Biology, A*STAR

“For his breakthrough discovery of the tumor suppressor roles of RUNX3 in gastric and colon cancers”

Prior to his move to Singapore, Professor Yoshiaki Ito was hailed as one of the famed discoverers of the RUNX “family” of genes in 1993. His team identified RUNX genes as developmental regulator genes deeply involved in carcinogenesis because the malfunction of such genes often induced cancer. In particular, RUNX1 was identified as having the function to protect hematopoietic stem cells from oncogenic insult and leukemogenesis, and RUNX2 as an essential gene for skeletal development.

Professor Ito’s research on RUNX genes continued to yield much fruit even after his move from Kyoto to Singapore in 2002. Building on his earlier findings, Professor Ito identified RUNX3 as a gatekeeper in colon and gastric cancer, and showed that the disruption of RUNX3 in gastrointestinal tract could induce a pre-cancerous state in the intestine and stomach. This landmark discovery proved that RUNX3 was an attenuator of Wnt signaling pathway, which was a well-known major oncogenic pathway that drove colon cancer development. As the mechanism of the attenuation, Professor Ito found that RUNX3 inhibited the DNA binding of TCF4/ β -catenin complex. The TCF4/ β -catenin complex was regulated by Wnt signaling and usually bound to DNA to activate its target genes to stimulate cell growth. His admirable work in cancer research has put Singapore firmly on the map.

Even so, Professor Ito’s contributions to cancer research in Singapore and the development of the country’s biomedical research scene are no less significant. His work in Oncology Research Institute (ORI) in National University of Singapore (NUS) Yong Loo Lin School of Medicine as the founding director helped to lay a solid foundation for the establishment of Cancer Science Institute of Singapore (CSI), a Research Centre of Excellence (RCE). Professor Ito also played an important role as one of the programme leaders in the Singapore Gastric Cancer Consortium, which was awarded the Translational and Clinical Research (TCR) Flagship Programme.

For his breakthrough discovery of the tumor suppressor roles of RUNX3 in gastric and colon cancers, Professor Yoshiaki Ito from the Cancer Science Institute of Singapore and Institute of Molecular and Cell Biology, A*STAR, is awarded the 2010 President’s Science Award.



Professor Wong Tien Yin
Singapore Eye Research Institute, Singapore National Eye Centre
National University Health System

“For the development and use of novel retinal imaging to understand pathways in cardiovascular and metabolic diseases”

Professor Wong Tien Yin’s pioneering research over the past 10 years has resulted in the development of a suite of advanced computing imaging software and diagnostic platforms, which allows scientists, doctors and clinicians to assess a patient’s cardiovascular disease and diabetes risk through a simple retinal photograph. This simple eye scan is a unique and non-invasive way to understand, screen and detect early cardiovascular and metabolic diseases. This has great public health significance for Singapore and other countries where cardiovascular disease and diabetes are the leading causes of death and morbidity. Prof Wong has since tested it on more than 25,000 subjects and established a large database of ocular images with matching clinical data.

Professor Wong’s research, which brings together medical technology and clinical medicine for applications in diverse fields that span eye diseases, cardiovascular disease, neurology and diabetes, has influenced clinical practice internationally. He is currently working with the countries around the world on imaging high risk subjects to detect diseases. Professor Wong has also begun research collaborations with industry. He established Singapore Advanced Imaging Laboratory for Ocular Imaging (SAILOR), the first translational clinical facility in Fusionopolis, which currently has ongoing collaborations to grade eye images for clinical trials in Asian sites, as well as other collaborations in clinical trials from UK, Australia and New Zealand. He has also started a pilot trial for tele-ophthalmology to test the use of retinal imaging to screen patients who are at higher risk of cardiovascular disease.

Professor Wong’s work is widely recognized internationally and he is among the most widely cited for his work on retinal vessels. He has published more than 500 peer-reviewed papers, in such top tier journals such as the New England Journal of Medicine and the Lancet. He has received awards not only in ophthalmology, but also in the fields of cardiovascular disease and diabetes. He is the only ophthalmologist worldwide to receive the Sandra Doherty Award from the American Heart Association for cardiovascular research and only the 2nd ophthalmologist to receive the Novartis Prize in Diabetes Global Award. He is the only person to have won the Outstanding Researcher Award at NUS twice. In 2008, he received the inaugural Singapore Translational Researcher (STaR) award, which provided him with the funding support to embark on a major multi-disciplinary research effort involving local and overseas partners, and industry partners, to further translate his research into clinical care and potential commercial applications. In 2010, he received the National Outstanding Clinician Scientist Award. He recently became the youngest member of the Academia

Ophthalmologic Internationalis, an international organization which has only 70 world-wide members.

Professor Wong is currently the Director for the Singapore Eye Research Institute and concurrently holds the positions of Professor and Senior Consultant at the Singapore National Eye Centre and the National University Health System.

For his outstanding contributions in translational research and the development of a novel research platform linking eye imaging to diagnosing human vascular and metabolic disease, Professor Wong Tien Yin from the Singapore Eye Research Institute, Singapore National Eye Centre and National University Hospital System, is awarded the 2010 President's Science Award.

PRESIDENT'S TECHNOLOGY AWARDS 2010



(from front to back; left to right)

Dr Patrick Lo Guo-Qiang

Dr Liow Tsung-Yang

Dr Ang Kah Wee

Dr Yu Mingbin

Institute of Microelectronics, A*STAR

“For their outstanding contributions in advancing Singapore’s semiconductor technology and industry development through cutting edge research on silicon photonics”

The research on silicon photonics by Dr Patrick Lo and his team from the Institute of Microelectronics (IME) has enabled them to successfully realise a modulator that can transmit optical signals at an ultra fast speed. This was designed to work in tandem with one of the highest gain-bandwidth photodetectors, the Ge/Si avalanche photodetector, also developed by the team. With this silicon photonics technology, extra transmission distance of up to 30km could be achieved. In addition, the ultra low energy per bit Ge electro-adsorption modulator with the smallest device foot-print would also offer a green solution to photonics applications. This development by the team, which helps to transmit data at an ultra high-speed with lower power usage, is set to revolutionise the way we communicate. In carrying out research in a high growth area where research is only emerging, the team is solving a problem that people around the world are trying hard to solve. The research also presents the team with opportunities to stretch the performance boundaries imposed by Moore’s law.

The key differentiator in the team’s silicon photonics research can be found in the silicon photonics devices themselves. Crucially, the team came up with fabrication solutions and designs which are industry-viable and can be fully integrated with existing technology. The highly sensitive

photodetector and high performance modulator are built with CMOS-compatible fabrication processes to enable cutting edge products to be readily manufactured with standard manufacturing techniques that are largely available in the electronics industry. Hence, CMOS-compatible processes allow ready integration into the industry processes without companies having to invest in costly new equipment.

While other research teams in the world have kept their research proprietary, the team has chosen to share its findings through its partnership with a foundry, presenting industry with not only a technical solution, but a business model. The innovation presents the industry with a huge opportunity to upgrade to a next generation platform. The team has also completed a library of both active and passive devices for the industry to tap on. This will help to seed an entire technological process in a way which had not been done before.

The team has published more than 50 papers in top prestigious journals, leading IME to earn a reputation as a world leading cost-effective solutions provider for ultra high data-rate low cost optical communications. The team has also developed high performance and low cost silicon photonics devices with industry-viable fabrication solutions and designs, which enable industry partners to accelerate innovation of their products and allowing the companies to gain a foothold in the upcoming optoelectronics market. The silicon photonics research at IME has already begun to bring in potential investors to consider Singapore as a launch pad for their operations and services to the world. Fortune 500 companies and a number of innovative start-ups from the United States have pumped in millions of dollars to leverage on these capabilities. These developments will have positive ramifications on Singapore's economy and will lead to new job opportunities in Singapore.

For their outstanding contributions in advancing Singapore's semiconductor technology and industry development through their leading edge research on silicon photonics, the team, made up of Dr Patrick Lo Guo-Qiang, Dr Yu Mingbin, Dr Ang Kah Wee, Dr Liow Tsung-Yang from the Institute of Microelectronics, A*STAR, is awarded the 2010 President's Technology Award.