

2011 PSTA WINNER CITATIONS

PRESIDENT'S SCIENCE AND TECHNOLOGY MEDAL 2011



Professor Soo Khee Chee

Director, National Cancer Centre Singapore

“For his distinguished, strategic and far-sighted contributions to Singapore’s clinical services and healthcare landscape, particularly in spearheading research led improvements in clinical care, and catalysing research in the public healthcare environment”

Professor Soo Khee Chee is the founding Director of the National Cancer Centre Singapore (NCCS), which is now a leading cancer institution renowned both locally and internationally for being at the cutting edge of cancer research. Under his strong leadership and foresight, the NCCS led in pursuing and promulgating the now widely accepted multi-disciplinary and holistic approach to cancer management in order to achieve the highest standards in cancer prevention, diagnosis and treatment. NCCS’ integrated structure and intense clinical practice have enabled it to bridge the chasm between pre-clinical research and clinical practice. Notable examples are its groundbreaking research that has established chemo-radiation as the new standard for nasopharyngeal cancer treatment, and NCCS’ international status in cell-based cancer immunotherapy. Both these research-directed advances in cancer care are the accomplishments of multi-disciplinary teams led by NCCS’ clinician scientists. As a result of its clinical and translational research, the NCCS has developed new and advanced protocols in cancer treatments, with six of its doctors winning outstanding awards from the prestigious American Society of Clinical Oncology (ASCO). In recognition of his outstanding service and contribution to the nation, Professor Soo was awarded the Public Administration Medal (Gold) in the 2003 National Day Awards.

Establishing The National Cancer Centre Singapore

Professor Soo has grown the NCCS since its establishment in 1997, from a department within the Singapore General Hospital (SGH) to an autonomous internationally recognised tertiary centre known for being at the leading edge of cancer treatment and research. Due to his foresight, NCCS now exhibits the hallmarks of a US National Cancer Institute (NCI)-designated comprehensive cancer centre programme: namely, demonstrated commitment to rapid translation of basic research findings into clinical applications; critical mass of high-quality, interactive clinician and laboratory researchers; and a group of opinion leaders dedicated to mentoring the next generation of cancer researchers.

Through Professor Soo’s initiatives, the NCCS developed key research capabilities that have become essential in the translation of basic findings into clinical applications that can benefit the patient. The NCCS is at the forefront of research in areas such as head and neck cancers, nasopharyngeal cancer, liver cancer, lung cancer and lymphoma. NCCS has one of the largest numbers of clinical

trials within a Singaporean medical institution. In 2010 alone, there were more than 140 planned, active, and completed Phase I-IV clinical trials. This is a ten-fold increase in the volume of trials since 1999. Due to the high number of clinical trials and patient throughput, the NCCS has become the lead investigator in a number of multinational & multicentre clinical trials in cancer. Its Asia-Pacific Hepatocellular Cancer Consortium has completed five international trials while another four are ongoing. It leads an international trial on head and neck cancer, involving 26 cancer centres in 15 different countries, and another phase III trial on colorectal cancer ready to recruit more than 2,000 patients.

Reflecting the importance and commitment to research, a quarter of NCCS' annual turnover is dedicated to research, as are more than a quarter of the staff. As a result, within the short span of 10 years since its inception, the NCCS produced over 1,000 peer reviewed papers, of which more than 30% are above the benchmark Journal Impact Factor (JIF) of 5. This has made the NCCS most productive in terms of research dollars spent.

Establishing Clinician Scientists

Despite Professor Soo's heavy national and cluster level commitments, he is devoted to grooming and developing clinician scientists. He has personally mentored a successful cadre of at least nine clinicians and seven clinician scientists, and continues to support the new generation of talents. He motivates his scientists to acquire research training that equips them to address clinically relevant needs and to engage in collaborative investigations that advance basic, pre-clinical research to clinical cancer care. In recognition of this exceptional work, Professor Soo was awarded the National Outstanding Clinician Mentor Award in 2008. Indeed, through his constant encouragement, NCCS arguably has Singapore's highest proportion of clinician scientists among its clinical faculty.

Establishing the Duke-NUS Graduate School of Medicine

Professor Soo was instrumental in his role of establishing academic medicine in the Outram campus, recognising the need for a strong academic foundation for medical excellence and research. Professor Soo was among the prime movers in obtaining the Government's support for the establishment of a new world-renowned medical school in the Outram campus. He was the chairman of the Graduate Medical School Protem Committee (2003-2006), working tirelessly towards this objective, which culminated in the Government's decision to establish the Duke-NUS Graduate Medical School (GMS) in Singapore. The presence of this new medical school and the close collaboration that has now been established with SingHealth has significantly transformed SingHealth's institutional milieu. Professor Soo and his team are currently in the midst of formulating academic clinical departments and programmes necessary for the proper institutional structures for academic research to be established from the clinical departments on the campus. Within the next two years, there will be at least 10 such academic clinical programmes established in collaboration with Duke-NUS GMS.

For his efforts in establishing Duke-NUS GMS, Professor Soo was appointed its Vice Dean of Clinical and Faculty Affairs. He holds the distinction as the first recipient of the Duke-NUS Graduate Medical School Benjamin Sheares Professorship in Academic Medicine, in recognition of his pioneering contributions to research, scholarship and clinical service which have significantly impacted the practice of medicine in Singapore.

Establishing the Research Framework in SingHealth

Professor Soo has played a significant role in championing and leading biomedical research efforts in Singapore's healthcare institutions. As Deputy CEO for Research and Education in SingHealth, he has led in the strategic centralisation of several R&D resources from individual healthcare institutions to the SingHealth cluster-level to catalyse research. Under his leadership, SingHealth established the SingHealth Experimental Medicine Centre (SEMC) – the first AAALAC accredited facility in Singapore; the SingHealth Tissue Repository (STR) – which is currently the largest tissue repository in Singapore, with a collection of more than 100,000 tissue samples and biospecimens; and the Centralised Institutional Review Board (CIRB).

In addition, Professor Soo was a key player in the decision to establish the Investigational Medicine Unit (IMU) at SingHealth, which was one of the two national early-phase clinical trial units established in 2009 with capabilities in micro-dosing and first-in-man studies to test novel drugs, devices, biologics, and diagnostics. The IMU is now able to carry out the first-in-man Phase I and Phase II clinical trials. He has thus been instrumental in the creation of a whole research eco-system of tremendous value to pharmaceutical companies. These efforts to centralise and establish these core facilities at SingHealth are essential to facilitating research collaborations across institutions, and enabling clinicians to do research. As a result, there are significant on-going research collaborations with multinational pharmaceutical companies such as Bayer, GlaxoSmithKline and AstraZeneca.

Establishing Keystone Industrial Collaborations

Professor Soo serves as a member of the EDB-chaired Biomedical Sciences Industry Strategy Group. He contributes to and provides guidance on national strategies to engage big pharmaceutical companies, championing the role of the clinician scientists in such collaborations. Professor Soo's vision and personal leadership were instrumental in the inking of the recent Economic Development Board (EDB) - led \$100 million research investment-cum-collaboration with Roche. This collaboration is significant as it places Roche scientists side-by-side with Singaporean scientists in an equal partnership that allows intellectual cross-fertilisation and the directed efforts to solve industry-relevant and clinically significant problems. This collaboration will develop new research competencies in Singapore through the setting up of a translational medicine hub in SingHealth in areas such as radiochemistry and exploratory pathology, as well as establish a new model of research collaboration between industry and the public sector. For his significant role in the Roche collaboration, he is now the Chairman of the Roche-Singapore Joint Steering Committee.

For his distinguished, strategic and far-sighted contributions to Singapore's clinical services and healthcare landscape, particularly in spearheading research led improvements in clinical care, and catalysing research in the public healthcare environment, Professor Soo is awarded the President's Science and Technology Medal 2011.

PRESIDENT'S SCIENCE AWARD 2011



(from left to right)

Dr Lim Bing

Dr Lawrence Stanton

Dr Paul Robson

Dr Ng Huck Hui

Genome Institute of Singapore

Agency for Science, Technology and Research

“For their ground breaking work on the regulatory pathways controlling embryonic stem cell pluripotency and cell fate decisions”

Over the past nine years, Dr Lim Bing and his team members have comprehensively assessed genes required for stem cell function, and helped to define the specific functions of these genes through cutting edge genetic technologies, such as genome-wide sequencing. These efforts have led to the discovery and definition of novel regulatory factors required for the functions of embryonic stem (ES) and other stem cells.

The team’s work has advanced the capability to maintain and expand ES cells, and to direct their differentiation to create specialised cell types. This knowledge is critical for the successful application of stem cells allowing them to provide industry, clinicians, or researchers with any cell they need for any applications. Their work has demonstrated the creation of stem cells from skin cells which not only enable cell replacement therapies from a patient’s own cells, but also provide a greater scope of opportunities for in vitro disease modelling and drug screening. The ability to direct stem cell differentiation and to create “patient-specific” stem cells together greatly facilitates the important work in personalised regenerative medicine and drug discovery.

The team’s present revolution in the understanding, control, and exploitation of stem cells represents not only a theoretical advance in stem cell biology but it has also opened new opportunities for innovation by other researchers and Singapore. Their work has placed Singapore prominently on the global map for stem cell research, and has been published in prestigious journals, in addition to receiving recognition internationally from the stem cell community. Their discoveries in basic biology and translational applications of ES cells and reprogrammed stem cells have attracted interest from research groups in both academia and industry from across North America, Europe and Asia. The team has also been active in training the next generation of stem cell scientists in Singapore.

For their outstanding contributions in stem cell research on the regulatory pathways controlling embryonic stem cell pluripotency and cell fate decisions, the team from Genome Institute of

Singapore comprising Dr Lim Bing, Dr Lawrence Stanton, Dr Ng Huck Hui and Dr Paul Robson is awarded the 2011 President's Science Award.



Professor Ooi Beng Chin
Professor Tan Kian Lee
School of Computing
National University of Singapore

“For their outstanding contributions to database systems research for managing “big data” in large-scale parallel and distributed systems”

Professor Ooi Beng Chin and Professor Tan Kian Lee have, in the past 20 years, helped to shape the development of various forms of non-centralised database systems, namely distributed database systems, parallel database systems, heterogeneous database systems, peer-to-peer data management systems and cloud-based data management systems. The two-man team has pioneered the use of peer-to-peer data management for managing “big data” in large-scale parallel and distributed systems. Their work broke new grounds in the science and implementation of database management systems, becoming the first to demonstrate the practicality and usability of peer-to-peer data management systems.

It has been traditionally accepted that finding practical and highly decentralised solutions to manage distributed data requires solving several hard and challenging problems. It is costly to maintain and manage data distributed across autonomous nodes, and even more arduous to keep up with an acceptable performance as the system scales.

The team designed and developed a series of highly efficient mechanisms that tackle these notorious challenges. The solutions include: (a) a novel self-configurable distributed system, comprising autonomous database-enabled nodes, which facilitates data sharing without the need for explicit knowledge of the structure of the data content; (b) a distributed data structure and overlay for routing and discovering data that not only has a theoretical guaranteed worst-case bound but also performs several times faster than any known schemes in practice; (c) a query processing mechanism that significantly reduces the overhead of maintaining routing information and thus rendering large-scale distributed systems practical and feasible. Many other techniques and systems have also been developed by the team to support a wide variety of applications.

The work of Professor Ooi and Professor Tan has also provided the basis of data integration and analytics solution for enterprises. A good example is the integration of healthcare data belonging to individual autonomous clinics to a national network. The system allows clinics to share data from their existing systems, while retaining ownership of their data, through a peer-to-peer arrangement.

A company, BestPeer has been spun off from their project, targeting businesses that are naturally geographically distributed.

For their outstanding contributions to database systems research for managing “big data” in large-scale parallel and distributed systems, the two-man team, Professor Ooi Beng Chin and Professor Tan Kian Lee, from the National University of Singapore is awarded the 2011 President’s Science Award.

PRESIDENT’S TECHNOLOGY AWARDS 2011



Professor Lim Chwee Teck
Department of Bioengineering and Department of Mechanical Engineering
National University of Singapore

“For the development and use of novel micro biochips in the detection and diagnosis of human diseases”

Professor Lim Chwee Teck’s pioneering research in the multidisciplinary area of human disease mechanics and mechanobiology has been hailed as highly original and creative. He is a leading researcher valued for his contributions in cell and molecular biomechanics which allow a better understanding of human diseases such as cancer and malaria. To this extent, his research was cited by the MIT Technology Review magazine as one of the top ten emerging technologies in 2006 that will “have a significant impact on business, medicine or culture”. Professor Lim was elected as Council Member of the World Council of Biomechanics in 2010. With only 40 such members worldwide, an elected membership by his peers is clear recognition of his status as a world expert in his area of research.

As a much sought-after speaker globally, Professor Lim has delivered more than 175 invited lectures around the world. He has also authored more than 400 technical publications with more than 180 of them being peer-reviewed journal papers, including 30 invited review articles. Professor Lim has also won numerous awards such as the Institute of Engineers Singapore (IES) Prestigious Engineering Achievement Award in 2010, the National Research Foundation (NRF) Technology Incubation Scheme Award in 2009.

Having co-founded three companies to commercialise the technologies developed in his lab, Professor Lim has an entrepreneurial streak. His latest invention of a micro biochip that uses cell mechanics principles to detect and retrieve rare cancer cells from blood has received much international attention. Utilising human disease mechanics to develop a technology for translation into clinical application is commendable. This biochip has since been commercialised and is being

clinically tested at top cancer centres both locally and overseas. For this invention, his team has won the Tan Kah Kee Young Inventors' Award in 2009.

Professor Lim currently holds the position of Professor at the Department of Bioengineering and Department of Mechanical Engineering and is also a Principal Investigator at the Mechanobiology Institute at the National University of Singapore.

For his outstanding contributions in developing novel micro biochips in the detection and diagnosis of human diseases, Professor Lim Chwee Teck from the National University of Singapore, is awarded the 2011 President's Technology Award.