LIST OF PSTA WINNERS FROM NUS

I) President's Science Award (PSA)

Team comprising:
Prof Patrick Tan
Cancer and Stem Cell Biology
Duke-NUS Graduate Medical School Singapore, and
*A*STAR's Genome Institute of Singapore*

Prof Teh Bin Tean
Cancer and Stem Cell Biology
Duke-NUS Graduate Medical School Singapore, and
Division of Medical Sciences, National Cancer Centre Singapore

Prof Steven Rozen
Cancer and Stem Cell Biology & Centre for Computational Biology
Duke-NUS Graduate Medical School Singapore

II) President's Technology Award (PTA)

Prof Neal Tai-Shung Chung
Department of Chemical & Biomolecular Engineering
National University of Singapore

LIST OF YSA WINNERS FROM NUS

I) Asst Prof Goki Eda
Department of Physics and Chemistry
Centre for Advanced 2D Materials
Faculty of Science
National University of Singapore

II) Asst Prof Yvonne Tay
President's Assistant Professor
Department of Biochemistry
National University of Singapore, and
Principal Investigator, Cancer Science Institute

PRESIDENT'S SCIENCE AWARD 2015

Professor Patrick Tan[1, 2], Professor Teh Bin Tean[1,3], and Professor Steven Rozen[1, 4]
[1] Cancer and Stem Cell Biology, Duke-NUS Graduate Medical School Singapore
[2] Genome Institute of Singapore, A*STAR
[3] Division of Medical Sciences, National Cancer Centre Singapore
[4] Centre for Computational Biology, Duke-NUS Graduate Medical School Singapore

"For outstanding integrative and translational research in Asian cancer genomics"

Professors Patrick Tan, Teh Bin Tean, and Steven Rozen are recognised for their discoveries of new genes and molecular pathways in various types of Asian cancers. Over the past eight years, these scientists have pursued multidisciplinary and collaborative "team-science". Using innovative genomic platforms and biological approaches including next-generation sequencing, they have interrogated the genomes of Asian cancers, identifying novel targets for improved therapeutics and diagnostics.

Asian cancers represent a vast unmet clinical need. The World Health Organisation estimates that in 2012, there were 14 million new cancer cases worldwide and 8.2 million cancer-related deaths. These numbers will rise dramatically over the next two decades and will particularly impact Asia. By 2030, 70% of the world's cancer deaths will occur in Asia and developing countries. Importantly, because different cancers can display tremendous geographic variation, many cancers endemic to Asia are different from those in Western countries, and comparatively little is known about their underlying molecular genetics. Thus, Asian cancers are an urgent area to which scientific and medical attention should be focused to develop novel therapeutic, diagnostic, and preventive strategies.

The Tan/Teh/Rozen team has addressed this problem through an integrated biological research program spanning basic science, translational research, and clinical studies. Focusing on four Asian malignancies (stomach, biliary tract, urinary tract, and breast fibroepithelial tumors), the team identified novel genetic alterations, investigated relationships between these alterations and environmental factors, and mapped how these contribute to disease. Their results have led to strategies for the improved diagnosis, treatment, and prevention of such cancers.

The Tan/Teh/Rozen "team-science" approach, reflected in their outstanding record of joint publications and trainee co-supervision, has resulted in a steady stream of notable scientific breakthroughs documented by multiple publications in high-impact journals including *Nature Genetics, Cancer Discovery, and Science Translational Medicine*. Some of the team's key discoveries include:

a) Discovery of specific molecular signatures associated with exposure to aristolochic acid (AA), a carcinogen found in certain herbal remedies, and its role in liver and bladder cancer.

b) Identification of genes mutated in breast fibroepithelial tumors, including the *MED12* gene that is mutated in 60% of breast fibroadenomas, a condition found in 10% of women worldwide

c) Demonstration of the role of chromatin modifier genes such as *ARID1A* and *BAP1* in stomach and biliary tract cancers.

The team's work has also garnered substantial translational impact and attracted significant industry funding of close to S$4 million for collaborative research projects with multiple pharmaceutical companies such as Roche, GSK, Bayer, Novartis, and Principia Biopharma.

The team is also internationally recognised as a leader in the field of Asian cancer genomics, by being invited to participate in the International Cancer Genome Consortium to lead programs in biliary tract cancers and T-cell lymphomas. Team members Tan and Teh have also been elected to the American Society of Clinical Investigation, a prestigious honor society of physician-scientists.

The team's research has been performed in their capacity as faculty members of Duke-NUS Graduate Medical School Singapore, in collaboration with other national institutes. Professors Tan and Teh carry joint appointments with the Genome Institute of Singapore and National Cancer Centre Singapore respectively, and the team is also affiliated with the Cancer Science Institute of Singapore and the Institute of Molecular and Cell Biology.

For their outstanding research on Asian cancer genomics, Professors Patrick Tan, Teh Bin Tean, and Steven Rozen are awarded the 2015 President's Science Award.

PRESIDENT'S TECHNOLOGY AWARD 2015

Professor Neal Tai-Shung Chung
Department of Chemical & Biomolecular Engineering
National University of Singapore

"For his outstanding research work on various novel membrane technologies, especially for water treatment, that have shown significant potential to make desalination more energy efficient and environmentally friendly, and that have helped to establish Singapore as a leading research centre for water research."

Professor Neal Chung has made major contributions to the field of membrane science. Not only has he furthered the fundamental understanding of membranes, but he has also been responsible for the development of numerous novel membrane designs that have been recognised by academics for their innovativeness, and adopted by industry for clean water and clean energy applications.

As a consultant to Hyflux, Prof Chung built and led its membrane R&D team from 2004-2008. There, he co-invented the Kristal™ 600 hollow fiber ultrafiltration membrane with Hyflux researchers, which has since been commercialised worldwide. This product was developed with Singapore's specific water treatment needs in mind by protecting public health through the use of stringent filtration methods to remove viruses and other contaminants. Today, the technology is so successful that it is not only used in Singapore's water recycling plants, but also globally as a pre-treatment in large seawater reverse osmosis (SWRO) plants. Prof Chung and his team at NUS developed numerous novel membrane materials with various clean water and energy applications. One of these inventions is a double-repulsion nanofiltration (NF) membrane that effectively removes both positive and negative charged multivalent ions from industrial effluents. This technology allows for improved filtration of toxic heavy metal ions, such as arsenic, from industrial wastewaters. Two companies have already licensed this technology for commercialisation.

Prof Chung and his team successfully developed a novel process for advanced high flux forward osmosis (FO) membranes which surpasses the performance of most conventional NF processes, achieving a 99.5 per cent rejection rate for heavy metal ions. FO membranes with high oil rejections have also been developed to treat oil or water mixtures. Whilst these FO membranes primarily address the recycling of industrial wastewater, they have the potential to address wider problems such as water shortages in water scarce regions or groundwater contamination from pollutants.

Prof Chung also pioneered the design of biomimetic membranes by utilising aquaporin, a type of protein that allows fast transmission of water molecules, but blocks the passage of larger molecules and salts. These technological advancements increase the feasibility of fast desalination for fresh water reclamation.

Prof Chung and his team have also created innovative pressure retarded osmosis (PRO) membranes which have been noted for displaying the highest power density and mechanical strength ever recorded in scientific literature. These membranes could significantly lower energy consumption and production costs for seawater desalination if integrated with osmotic power generators and RO plants. Such an approach would also reduce or eliminate the need for complicated methods of RO brine disposal, creating a more streamlined and environmentally-friendly desalination process.

Prof Chung was awarded grants in three rounds of the Competitive Research Program funded by the National Research Foundation. He and the team he built at NUS have published extensively and hold numerous patents. As an acknowledgement of his contributions to the field of water research, Lux Research USA, a consulting firm providing strategic data on emerging technologies, ranked NUS in 2013 as the global leader in water research, specifically citing Prof Chung's work on membranes for clean water.

As a faculty member of the National University of Singapore, Prof Chung is also passionate about nurturing students so that they may one day contribute to global efforts undertaken for cleaner water at lower cost. Prof Chung has trained 55 doctoral students, 18 Masters students and more than 70 post-doctorate fellows, who have gone on to become professors as well as entrepreneurs. Some of his students have also been recruited by major transnational corporations.

For his outstanding research and innovative work on membranes, particularly in the field of water, Professor Neal Chung is accorded the 2015 President's Technology Award.

YOUNG SCIENTIST AWARD 2015

Physical, Information & Engineering Sciences

Assistant Professor Goki Eda
Department of Physics and Chemistry
Centre for Advanced 2D Materials
Faculty of Science
National University of Singapore

"For his research on the fundamental properties of two-dimensional materials"

Dr Eda is known for his several pioneering work in the emerging field of two-dimensional (2D) materials, which are crystalline, sheet-like materials with thicknesses of no more than a few atoms. Since he joined NUS as an NRF Research Fellow in 2011, he has actively worked on both the fundamental and applied aspects of nanomaterials synthesis, characterisation and device fabrication. He and his collaborators have found intriguing electrical, optical and electrochemical phenomena exhibited by 2D semiconductors. His studies on the versatile multi-phase structure of 2D MoS2 and WS2 sheets have inspired numerous research efforts in the past few years. Dr Eda's research team has also demonstrated unique and strong interaction between 2D semiconductors with light. He aims to realise novel optoelectronic devices based on the unusual ability of 2D semiconductors to capture and manipulate the electromagnetic energies.

Dr Eda's interdisciplinary work focusing on the unique physical and chemical properties of 2D materials has been highly recognised by the scientific community. He has given over 20 invited and plenary talks at international conferences, and his papers have received over 10,000 citations. He is a recipient of the IPS Omicron Nanotechnology Award, NUS Young Scientist and Young Researcher Awards. He is an alumnus of Newton International Fellowship of the Royal Society.

YOUNG SCIENTIST AWARD 2015

Biological & Biomedical Sciences

Assistant Professor Yvonne Tay
President's Assistant Professor
Department of Biochemistry,
National University of Singapore, and
Principal Investigator, Cancer Science Institute

"For her research on non-coding RNA networks in cancer"

Dr Tay's research focuses on the study of novel interactions between different classes of RNA, and how the dysregulation of these interactions can lead to cancer. Her work has led to important contributions in the understanding of the mechanisms of microRNA function. She was amongst the first to demonstrate functional microRNA targeting in the coding regions of transcripts, significantly expanding the sphere of microRNA activity beyond the conventional 3'UTRdependent model. Furthermore, Dr Tay's research has also led to the discovery that protein-coding transcripts can co-regulate the tumor suppressor PTEN by competing for shared microRNAs, thus acting as competing endogenous RNAs. Competing endogenous RNAs have since been shown to play critical roles in the pathogenesis of multiple cancers, and represent an additional layer of posttranscriptional regulation, which has profound implications for both basic cancer biology and potential therapeutic applications.

Dr Tay has 7 publications in journals such as Nature and Cell, several of which have been recommended by the Faculty of 1000, and her works have been cited over 3700 times. She is a recipient of the Agency for Science, Technology and Research (A*STAR) Graduate Scholarship (2004), A*STAR Philip Yeo Prize for Outstanding Achievement in Research (2009), Leukemia & Lymphoma Society Special Fellowship (2011), Singapore National Research Foundation (NRF) Fellowship (2014), and NUS President's Assistant Professorship (2014).