



FUSION

THE POTENTIAL OF
TECHNOLOGY AND DESIGN



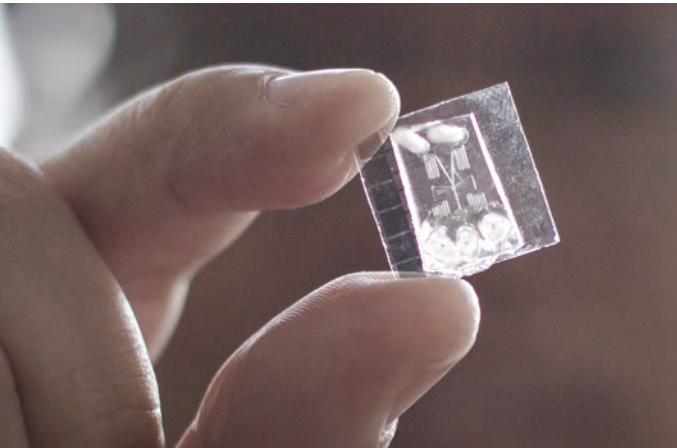
SINGAPORE UNIVERSITY OF
TECHNOLOGY AND DESIGN

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HYDRA - LARGEST 3D PRINTED
BIODEGRADABLE STRUCTURE
IN THE WORLD

LAUNCH OF SUTD HONOURS & RESEARCH PROGRAMME (SHARP)



Aspiring research scientists, engineers and innovators can now take up a structured research-oriented programme right from the undergraduate level. Known as the SUTD Honours and Research Programme (SHARP), students will receive close supervision and mentorship from faculty members, and be schooled in research disciplines that deepen their critical thinking and problem solving skills that promote innovation and original ideas or solutions to benefit industries and society at large.

Targeting to accept up to 20 students for the initial intake, SHARP students will each receive a research grant of \$15,000. \$7,500 is a research project allowance, and the other \$7,500 covers research-related expenses, such as conference presentation, research attachments and others. This research grant is on top of any scholarships that SHARP students may be awarded.

Students will graduate with a Bachelor of Engineering or Bachelor of Science, with the option to pursue a graduate degree such as a Doctor of Philosophy (PhD) in either Engineering or Architecture or Master in Engineering by research at SUTD.

SUTD President, Professor Chong Tow Chong said: “Since Day One, SUTD has encouraged a strong research culture and we have always allowed students to try their hand at research through our Undergraduate Research Opportunity Programme (UROP). As we see increasing interest from students to do research at the undergraduate level, it is timely to offer this premier research programme. SHARP aims to equip students with deep critical thinking and problem solving skills that help them ‘think out-of-the-box’ to come up with original solutions or ideas. SHARP students will not only work closely with a multi-disciplinary research group to fully experience the entire lifecycle of research but also gain the opportunity to collaborate with international researchers and corporations.”

PROF TONY QUEK’S HAT TRICK IN GLOBAL HIGHLY CITED RESEARCHERS LIST



Prof Tony Quek listed in annual Highly Cited Researchers List for the third consecutive year

This is the third time SUTD’s Associate Professor Tony Quek has been named in the annual Highly Cited Researchers List. Now in its fifth year, the citation analysis identifies influential researchers as determined by their peers around the globe - those who have consistently won recognition for high citation counts over a decade.

Associate Prof Tony Quek, Acting Head of the Information Systems Technology and Design pillar, was listed in the Highly Cited Researchers List for the area of Computer Science from 2016 to 2018.

Associate Prof Tony Quek said: “I am very pleased to be named in the Highly Cited Researchers list for the third consecutive year. I am happy that many other scientists and researchers find value in my research and I hope that it will enable them to also make their own breakthroughs.”

Placement on the list has been recognised as a significant achievement for those named. The Web of Science serves as the basis for regular listings of researchers whose citation records position them in the top 1% by citations for their field and year.

Annette Thomas, CEO of the Scientific & Academic Research group at Clarivate Analytics commended the researchers on their appearance in this year’s list: “Congratulations to your distinguished researcher, Associate Prof Tony Quek from SUTD. The advancement of scientific endeavor represents a critical activity for individual research institutions and entire nations. The Highly Cited Researchers 2018 list helps to identify the researchers who are having the greatest impact on the research community as measured by the rate at which their work is being cited by others and that contributes so greatly to extending the frontier and gaining knowledge and innovations for society - contributions that make the world healthier, safer, richer, and more sustainable.”

SUTD EXTENDS PARTNERSHIPS IN FINLAND

AALTO UNIVERSITY



SUTD President, Prof Chong Tow Chong (left), signing the agreement with President of Aalto University, Prof Ilkka Niemelä

SUTD deepened its strategic partnership with Aalto University on 3 December by signing a broad multi-year collaboration agreement.

The collaboration with Aalto University will include student and faculty exchange and mobility, joint teaching, joint research projects and concerted efforts in advancing innovation and entrepreneurship. SUTD will also host Aalto University’s faculty for visiting professorships.

Professor Ilkka Niemelä, President of Aalto University, said:

“We are delighted to begin a deep collaboration with our colleagues at the Singapore University of Technology and Design. We share a lot of similarities in how we incorporate design, science and technology into cross-disciplinary research and education. We look forward to offering our students and faculty unique opportunities with one of the top rising global academic communities in Singapore.”

Professor Chong Tow Chong, SUTD President, said:

“SUTD seeks to better the world by design and technology by providing global exposure to our students and faculty. This enables them to understand the needs, challenges and explore the myriad possible solutions in the world. SUTD is pleased to deepen our partnership with Aalto University across extensive areas that benefit students, faculty and research of both universities. By collaborating, we expand the realms of design possibilities and solutions for mankind across different cultures from Europe to Asia. We look forward to a deep and fruitful collaboration over the years.”

SLUSH ACADEMY

SUTD also formed a new academic partnership with Slush Academy, which aims to provide a modern global education programme for entrepreneurship.

With the Slush programme, students will be able to receive intense entrepreneurship training that will involve performing internships in top VCs and growth companies, and mentoring from established founders of start-ups. The first batch of mentors includes notable names from the European tech scene: Atomico, Klarna, Supercell and Unity Technologies.

“SUTD is very pleased to be an academic partner of Slush Academy. There is much synergy in this partnership as the SUTD education environment embodies many aspects of the start-up culture through its multi-disciplinary, hands-on, design-centric curriculum. We also have a degree programme - SUTD Technology Entrepreneurship Programme (STEP) - aimed at nurturing a new generation of entrepreneurial leaders and innovators, and I believe our students will benefit greatly from participating in Slush Academy’s programmes,” said Professor Chong Tow Chong, SUTD President.

“There is no better way to learn the skills required for building a high growth company than working in one. This, coupled with hands-on experience with the most high-quality academic education from top institutes in the world, should lead to a high potential group of future founders solving the most pressing challenges of our era,” said Slush CEO Andreas Saari.



Prof Chong Tow Chong and Prof Ilkka Niemelä at Slush 2018

Slush is the world’s leading start-up and technology event. In 2018, Slush was organised in Helsinki on 4 and 5 December that gathered 20 000 attendees. Slush operates in 29 countries and hosts more than 70 events annually.

CROWN PRINCE OF BRUNEI VISITS SUTD



(From left) SUTD President, Senior Minister of State, Ministry of Defence & Ministry of Foreign Affairs, Dr Mohamad Maliki Bin Osman, Minister for Education, Mr Ong Ye Kung, His Royal Highness Prince Haji Al-Muhtadee Billah

His Royal Highness Prince Haji Al-Muhtadee Billah, the Crown Prince and Senior Minister at the Prime Minister's Office of Brunei Darussalam, visited SUTD on 31 October. He was hosted by Minister for Education, Mr Ong Ye Kung and SUTD President, Professor Chong Tow Chong.

SUTD shared about its unique multi-disciplinary hands-on curriculum centred on design and how this develops well-rounded students to be workforce ready.

The Crown Prince also toured SUTD's facilities and saw many innovations by students and faculty, such as drones, eco-car and many others.

CHILEAN PRESIDENT VISITS SUTD'S ITRUST

BY MARK GOH

On 15 November, SUTD President Professor Chong Tow Chong hosted President of Chile, Sebastián Piñera, and his delegation of Chilean officials and media during their visit to SUTD. As they were keen to learn about Singapore's cyber protection strategies, they made a request to visit iTrust, Centre for Research in Cyber Security, and in particular, the testbeds that are used for research, experimentation and training.

After a brief introduction to SUTD and iTrust by Prof Chong and Dr Robert Kooij, Principal Research Scientist at iTrust, the delegation proceeded with a tour of the Secure Water Treatment (SWaT) and Water Distribution (WADI) testbeds. Mr Piñera also got his feet and hands wet when he was invited to key in a command to launch a cyber attack on the SWaT testbed, and witnessed first-hand the attack taking place, the adverse effects it can cause and how iTrust's multi-layer defence technologies

can detect such attacks. Mr Piñera also gamely tried on a virtual reality (VR) headset which portrayed a virtual representation of the SWaT testbed. Developed by iTrust, the VR headset trains an operator in simulated dangerous and emergency scenarios and allows him/her to see the effects of any remediation effort.

At the Electric Power & Intelligent Control (EPIC) testbed, Mr Piñera was shown how EPIC's supply of power to SWaT and WADI testbeds can support iTrust's research into cascading effects of cyber attacks. With some experience under his belt, Mr Piñera was then invited to launch a distributed denial of service (DDOS) attack using IP cameras that were pre-infected by a malware.

"(From our visits) we have learned a lot from new technologies, (and) we have established collaborative relationships with these technological centres," said Mr Sebastián Piñera, President of Chile.



Chilean President, Mr Sebastián Piñera (in the middle seat), learning more about SUTD and iTrust



Mr Piñera trying out the VR headset which portrayed a virtual representation of the SWAT testbed

TEAM SUTD @ AUTONOMOUS AERIAL VEHICLE CHALLENGE

In November, nine SUTD students in two teams participated in the Autonomous Aerial Vehicle Challenge 2018 (AAVC) that was held in Chiang Mai, Thailand.

The objective of this year's challenge was that of search and rescue, where teams had to scour a specified area for a casualty who was injured due to an airborne training incident. They would then need to air-drop a payload of medical supplies onto the location before returning to the base. The students were required to complete all these tasks autonomously within 15 minutes.

Although the two teams participated in challenging conditions (unfamiliar environment, climate, weather conditions, etc.), they managed to complete the tasks using custom made aerial platforms designed over the course of two months. Out of 18 international teams, one of the SUTD teams clinched the Best Design Award for a highly innovative modular designed tilt rotor. This is the second consecutive year that SUTD has received this award.



Team 2: (From left) Adam Haziq, Ryan Lim, Glenn Chia and Amos Sim



Team 1: (From left) Wei Heng, Christopher Lim, Kenneth Chow, Malcom Neo and Jin Yuan

Here is a short interview with the team leaders, Malcom Neo of Team 1 (Veterans, this is the second time they participated in AAVC) and Ryan Lim of Team 2 (Rookies, first-timers at the AAVC):

Q: Was this the first time you participated in this Challenge?

A: This year we had two teams, a team of veterans and another with rookies.

Q: What are the unique features of your AAV?

A: Both teams have each successfully created a drone that is able to autonomously complete the mission

Team 1 (Veterans):
My team's design concept was a tilt rotor that enabled our drone to hover and transit into a plane to increase efficiency as the mission required it to travel a long distance. In addition to the mission aspect, the drone was designed to be modular to facilitate transportation. It could be easily dismantled into two main sections; the body that houses all the electronics, and the propulsion system that allows it to fit in a single luggage.

Team 2 (Rookies):
With little experience in designing a drone from scratch, our team decided to pursue a mechanically simple design, with an emphasis on weight reduction. Weighing just under 6 kg inclusive of payload, our drone was easily capable of sustained flight for more than 20 minutes. Its compact dimensions were also an asset during transportation, where it could easily fit inside a fully-laden car.

Q: Why do you think your team won?

A: Team 1:
We are enthusiastic in designing and building away from conventional drone concepts which makes our drone stand out from other competitors'.

Q: What did you learn from this experience?

A: Team 1:
We learnt the importance of balancing schoolwork with external commitments, as the competition took up more time than we expected.

Team 2:
We learnt the importance of logistical planning and improvisation, as we only had access to tools and spares brought over from Singapore. Pre-flight checks were also essential to ensure the proper operation of our craft. Being prepared and meticulous was what allowed our team to complete the mission.

Unmanned aerial vehicles (UAVs) or drones are used widely as teaching, research and entrepreneurial tools in SUTD. It is used as a platform where students implement advanced feedback controllers in hands-on design activities and collaborate with researchers to formulate, execute and analyse simulations and experiments in drone flight. SUTD also actively collaborates with government and private entities on the development of customised aerial systems for a wide variety of tasks. These opportunities provide crucial and invaluable supplemental experiences which enable students to acquire highly unique skillsets that cannot be conveyed or honed through textbooks and design activities.

2019 CHINESE NEW YEAR LIGHT-UP – YEAR OF THE PIG

SUTD undergraduate students partnered the Chinatown Chinese New Year (CNY) organising committee and the Singapore Tourism Board to design this year’s CNY street light-up. This is the eighth consecutive year SUTD students have designed the Chinatown CNY street light-up.

Guided by Assistant Professor Michael Budig from the Architecture and Sustainable Design pillar, the team of freshmen, sophomore and junior students started on their conceptual design last July. They did extensive research on the historical and cultural connotations of the Chinese New Year, including the Pig zodiac animal, auspicious symbols and colours, etc. Besides focusing on the overarching theme of ‘Abundance’, the students also explored incorporating the pig’s association with wealth, celebration and knowledge.

Throughout the four months of intensive work, the team had to continuously refine their designs, taking into account practicability issues such as weight and visual density of the lanterns. A few rounds of iterations were made after discussions with the organising committee before finalising the designs. Thereafter, the students also worked closely with a group of 42 lantern craftsmen from Sichuan province, China, to facilitate the fabrication of the lanterns.



Hand-crafted pig lanterns at this year’s Chinatown Chinese New Year street light-up

In total, 2,688 lanterns (comprising 180 handcrafted pig lanterns and hundreds of gold coin and flower lanterns, etc.) lined 600m of Eu Tong Sen Street and New Bridge Road and 255m of the South Bridge Road. This is the biggest lantern display in the history of Chinatown’s Chinese New Year light-ups.

USING A VIRUS TO SPEED UP MODERN COMPUTERS

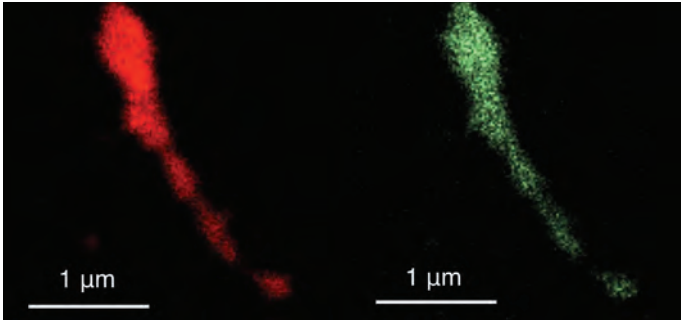
BY DESMOND LOKE

Researchers from a collaboration of institutions including SUTD and the Massachusetts Institute of Technology have successfully developed a method to “genetically” engineer a better type of memory using a virus. This could potentially lead to unprecedented advances in computer speed and efficiency.

The study explains that a key way to achieve faster computers is through the reduction of the millisecond time delays that usually come from the transfer and storage of information between a traditional random access memory (RAM) chip – which is fast but expensive and volatile (this means it requires a power supply to retain information), and hard drive—which is nonvolatile but relatively slow.

This is where phase-change memory comes into play. Phase-change memory can be as fast as a RAM chip and contain even more storage capacity than a hard drive. This memory technology uses a material that can reversibly switch between amorphous and crystalline states. However, up until this study, its use faced considerable constraints.

A binary-type material, for example, gallium antimonide, could be used to make a better version of phase-change memory, but the use of this material can increase power consumption and it can undergo material separation at around 620 kelvins (K). Hence, it is difficult to incorporate a binary-type material into current integrated circuits, because it can separate at typical manufacturing temperatures of about 670K.



Energy dispersive X-ray spectroscopy images of the sample of a solution with virus. Colour coding of atomic species: germanium, red; tin, green.

“Our research team has found a way to overcome this major roadblock using tiny wire technology”, said SUTD Science and Math Cluster Assistant Professor Desmond Loke.

The traditional process of making tiny wires can reach a temperature of around 720K, a heat level that causes binary-type materials to separate. For the first time in history, the researchers have shown that by using the M13 bacteriophage, more commonly known as a virus, a low-temperature construction of tiny germanium-tin-oxide wires and memory can be achieved. This possibility leads the way to the “elimination of the millisecond storage and transfer delays needed to progress modern computing”, according to Loke. It appears that the lightning quick supercomputers of tomorrow are closer than ever before.

SUTD 3D PRINTS THE LARGEST BIODEGRADABLE STRUCTURE IN THE WORLD

Common natural materials like shell and plant used to produce large 3D printed objects in a sustainable way

Since its invention, plastic has become central in our way of life. In the 1950s, 0.5 million tons of plastic was produced yearly, and this has rocketed to 300 million tons today. However, only 3% of it is recovered and the remaining 97% accumulates in landfills and the sea. Recent research by Austrian scientists from the Medical University of Vienna also found the presence of plastics in the human digestive system. It is thus becoming more critical for manufacturers to find sustainable or biodegradable alternatives to plastic.

SUTD Assistant Professors Javier Fernandez (Engineering Product Development) and Stylianos Dritsas (Architecture & Sustainable Design) have demonstrated that more sustainable ways of production is possible. By using unmodified biological materials that are not only ubiquitous but also part of the ecosystem where they are used, these biodegradable materials are integrated into ecological cycles when they decompose and need not be recovered.



Aerial view of Hydra



Hydra, a five-metre tall 3D-printed large scale structure made out of FLAM

Enter FLAM (fungal-like adhesive material), a fully biodegradable and ecologically sustainable material made from cellulose and chitin, the two most common natural polymers and industrial byproducts on Earth. The cost of FLAM is less than \$2/kg, similar to commodity plastics and is 10 times lower than the cost of common filaments for 3D printing. This material can also be used to 3D print large structures.

The images here show Hydra, the largest 3D-printed object in Singapore, and the world’s largest biological object ever printed. It is 5m tall, with a diameter of 0.5m at the base and 1m at the top and is made entirely of FLAM. It weighs 100kg and took about 50 hours to 3D print. Being made of the two most ubiquitous organic polymers on Earth, the Hydra can be produced -and degraded- anywhere using local natural resources, without the need to ship materials to build it, or to recover and use special facilities to compost it.

PRESIDENT’S DESIGN AWARDS & SG MARK EXHIBITION AT SUTD

Winning entries from the 2018 President’s Design Awards (P*DA) and the Singapore Good Design (SG) Mark were exhibited at SUTD’s Campus Centre from 5 November to 10 December.

The President’s Design Award is Singapore’s highest honour for designers and designs across all disciplines. It recognises the achievements of an extraordinary group of people making a difference to the lives of Singaporeans and the global community through excellent design.

One of the winning exhibits on display was ‘The Future of Us’ Pavilion which was designed by SUTD’s Advanced Architecture Laboratory, founded by Architecture and Sustainable Design Professor Thomas Schroepfer.

From the jury citation:

“The Future of Us Pavilion is a bold move in the Singapore design landscape. The successful form-finding exercise as a means of determining an intrinsically efficient structural and load-resisting form is commendable.

Through the parametric and algorithmic approach, the designers have created a futuristic structure that has pushed the boundaries of design, fabrication and construction methods. The high level of integration between digital technology and building processes

allowed for the rapid production of a large number of individual micro-forms that make up the overall structure. The pavilion form also optimises material usage and minimises the embodied carbon footprint. This makes the pavilion a forerunner to many impressive current and future buildings... In 2017, the pavilion became a permanent landmark in the Gardens by the Bay. It plays host to important public festivals and events, and continues to be well-loved by visitors. This makes it a valuable public asset that contributes to advancing Singapore community and culture.”



The Future of Us Pavilion received the Singapore President’s Design Award 2018 (Design of the Year)

SINGAPORE GOOD DESIGN (SG) MARK EXHIBITION


Design Business Chamber Singapore (DBCS) launched SG Mark in 2013 in partnership with the Japan Institute of Design Promotion that founded the prestigious Good Mark. SG Mark was established to set the benchmark for design quality that impacts businesses and communities in Singapore and beyond.

SUTD clinched nine awards at the 2018 SG Mark. Among the nine winners, four were from the Industry category, three from the Life category and two from the Social category. Here is a brief description of the nine winning projects.

Special Mention

Potato Pirates


This strategic tabletop card game teaches anyone, aged six and above, over 10 hours’ worth of programming concepts in 30 minutes in a fun, accessible and interactive way - all without a computer or screen time. Having raised more than S\$250,000 from over 5,000 backers worldwide, it is available in 21 languages.



SG Mark

Pocket Money

Pocket Money is a pocket-sized digital wallet, payment card, savings account and education in financial literacy. It bridges physical and digital money with a user interface that unifies elements of coin, card and mobile payment. The design preserves the students’ ability to recognise and appreciate the value of money, even as they move into digital payments.



sTetro: A Modular Reconfigurable Staircase Cleaning Robot

A major shortcoming of current floor-cleaning robots is their inability to access staircases. sTetro extends cleaning efficiency by autonomously switching between floor and staircase cleaning modes, so both surfaces can be cleaned without any user intervention. Its body has three cuboids connected with two sliders attached to each side of the middle cuboid.



SWIRL: Surveyor with Intelligence Rotating Lens

This is a smart, unmanned aerial vehicle designed to detect and classify defects in tunnels. Customised and optimised for autonomous operation, SWIRL can capture high quality images with its 360° rotating camera system that supports undistorted imaging of the tunnel’s inner surface with only one camera. The images taken are combined to create a composite, panoramic-like picture.



THOR: Transformable Hovering Rotorcraft

This hybrid unmanned aerial vehicle combines the range and speed of a horizontal fixed-wing platform with the hovering and manoeuvrability of a rotor-wing. Highly structurally efficient, all aerodynamic surfaces and propulsion systems are fully used in both flight configurations. It can fly like an airplane or flip its wings to mimic the autorotation of two-bladed samara seeds.



TIM: Tree Inspection Microdrone

This lightweight and low-risk micro unmanned aerial vehicle makes tree inspections safer, more efficient and friendly to both users and the public. Its unique ducted propeller guard design balances its aerodynamic performance while protecting the propellers from tree leaves and debris as the drone moves deep into the canopy.



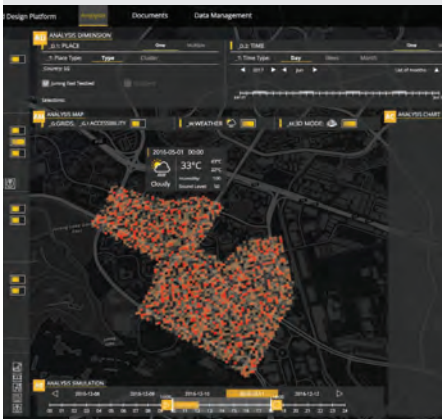
Instability Desk

The aluminium structure of this desk is faceted into a set of triangulated planes, forming a hull between its legs and top. The wedge-shaped design enhances sustainability by allowing two tops to be cut from one piece of plywood – resulting in material savings and ergonomics for comfort and optimised seating arrangement.



Informed Design Platform

To enhance the functionality and usability of public spaces, the Informed Design Platform offers designers and planners a deep understanding of the usage patterns of pedestrian public spaces and user sentiment in a dense urban environment. It presents 2D maps, 3D models and information visualisations, and integrates multi-source, multi-scale and multi-time data.



Shrilk and the revolution of Bioinspired Materials

Unlike plastics, which are mostly derived from a non-renewable source and create major waste management and environmental problems, Shrilk is a material that is transparent and biodegradable with an ultimate strength in the same range as aluminum alloys, but at half their density. It is sustainably made with silk proteins and waste material from the fishing industry.



SG Mark images courtesy of Design Business Chamber Singapore

SUTD SIGNS MOU WITH PSA TO DEVELOP TALENT FOR TUAS PORT



(From left) Dr Wong Woon Kwong, Director of research and industry collaboration at SUTD; Prof Chong Tow Chong, SUTD President; Mr Ong Kim Pong, PSA's Regional Chief Executive for South-east Asia; and Mr Ng Kok Cheong, PSA's Head of human resource

SUTD and PSA Corporation Limited (PSA) signed a memorandum of understanding on 10 December to collaborate on cultivating a new generation of Data Science, Info-comms and Engineering professionals for Singapore's future port in Tuas.

To build the competencies required to manage the complex ecosystems that the new port will employ to raise terminal productivity and service quality, PSA will provide internships

and co-develop port-related curriculum with SUTD to advance students' knowledge and experience in smart technologies and systems used in port operations. This will also help to build a talent pipeline to support PSA's extensive network of ICT infrastructure.

SUTD President Professor Chong Tow Chong, said: "Currently, SUTD already collaborates with PSA on port-related undergraduate projects and internships. In addition, we are also exploring with PSA on developing Data Science or maritime related courses as well as R&D in next generation ports and terminals."

Mr Ong Kim Pong, Regional CEO South-east Asia, PSA International, said: "PSA has adapted quickly to embark on a journey of embracing evolving technologies including digitalisation, complex designs, and total system thinking efforts that are motivating the rapid changes in the maritime industry. Jobs are being redesigned, and we are building the competencies needed to reinforce our digital readiness. PSA values SUTD's strength in combining design thinking and technology, and nurturing technically-grounded innovators. This timely partnership allows both parties to capitalise on each other's strengths and PSA is pleased to provide SUTD students with opportunities for practical industry experience and the chance to pursue exciting careers in PSA."

Prof Chong added: "Together, we look forward to forging new frontiers for the maritime sector and innovating new processes applicable to the industry's needs."

SUTD WINS GOLD MEDAL AT ASEAN ICT AWARDS 2018



Winners of the ASEAN ICT Awards together with Dr Janil Puthucheary, Senior Minister of State at Ministry of Communications and Information (third from the left)

Judges from the 10 ASEAN countries awarded SUTD the Gold medal (Research and Development category) for the technology "ICS:BlockOps" at the ASEAN ICT Awards 2018 (AICTA) on 5 December.

Developed by iTrust, SUTD's cybersecurity research lab, ICS:BlockOps uses blockchain technology and redundancy capabilities to ensure operational and network traffic data stored in an industrial control system (ICS) is secure and can be trusted.

By constantly validating the data integrity in the background, it is able to generate an alert when data has been tampered (modified or deleted), and enable its recovery. All these functions can be managed through a simple graphical user interface.

The ICS:BlockOpS technology can also be easily integrated into existing ICS and work alongside the historian without affecting the data flow in the plant.

An end-to-end prototype of the ICS:BlockOpS has been implemented on a physical plant – iTrust's Secure Water Treatment (SWaT) testbed – and a patent has been filed for the technology.

"This award is a recognition that SUTD is moving in the same direction as our motto: 'A Better World by Design'. We are trying to bring to market a technology that can help improve the safety and security of critical infrastructure, and this award is a boost towards that goal," said Mark Goh, senior manager at iTrust who presented the technology at the AICTA.

AICTA is a project that is in-line with one of the six Strategic Thrusts, Innovations as stated in the ASEAN ICT Masterplan (AIM) 2015 under the initiative to 'Promote Innovation and collaborations amongst government, businesses, citizens and other institution'. The awards aim to recognise the best ICT achievement among entrepreneurs across the ASEAN region.

SUTD-JTC I³ CENTRE

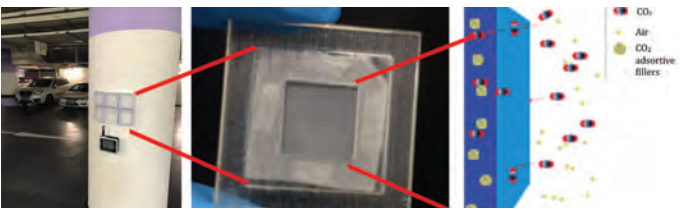
In 2014, SUTD and JTC Corporation (JTC) established the SUTD-JTC Industrial Infrastructure Innovation (SUTD-JTC I³) Centre to promote the development of innovative and sustainable industrial infrastructure solutions. Co-located and managed by the Lee Kuan Yew Centre for Innovative Cities (LKYCIC), it spearheads collaborative research efforts in three Research Thrusts: Urban Innovation, Integrated Architecture and Engineering, and Design and Technology. Here is a list of projects and programmes under the I³ Centre:

DESIGN OF NESTED RECONFIGURABLE GLASS FAÇADE CLEANING ROBOTS FOR HIGH-RISE BUILDINGS

This project aims to develop and deploy robotic systems for cleaning vertical glass façades in skyscrapers. This new class of nested reconfigurable glass façade cleaning robots, V-Tetros, utilises individual robots with distinctive reconfiguration characteristics capable of combining with other homogeneous/heterogeneous robots.

GIGABIT WIRELESS WIDEBAND COMMUNICATION SYSTEM FOR SMART CITIES

In this project, a new wireless communication system using a 60GHz millimeter-wave band will be designed and implemented for smart cities. This will be the world's first gigabit wireless communication system that can transmit and receive data over a long distance (up to 1,000m); existing networks can thus be upgraded without building renovation or external network laying.



Modular panels that capture ambient CO₂

CO₂ CAPTURE MODULES – REDUCING THE CARBON FOOTPRINT OF UNDERGROUND SPACES

The proposed platform will fabricate CO₂ capture membranes (CCMs) in an adaptive and modular design that can be merged with new or existing products and infrastructure. Specific applications include integrating CCMs into underground garage façades to sequester the CO₂ from vehicle exhaust emissions.

CO₂ MEMBRANES FOR HIGH PERFORMANCE LOW CARBON FOOTPRINT BUILDING MATERIALS

This programme focuses on the development of ceramic or hybrid membranes, working with collaborators to design, fabricate and test these CO₂ membranes for various applications.

SME TRANSFORMATION

The programme explores new models of collaborations and projects that focus on using technologies and business processes to raise SMEs' competitiveness and labour productivity.

SUTD'S ICONIC VOICES FROM MIT LECTURE FEATURING PROFESSOR SUSUMU TONEGAWA



Q&A with Prof Susumu Tonegawa, moderated by SUTD's Prof Kristin Wood, Associate Provost for Graduate Studies

BY SHAUN PHUA

Sole recipient of the 1987 Noble Prize for Physiology or Medicine for his discovery of the genetic mechanism that produces antibody diversity, Professor Susumu Tonegawa, gave the "Iconic Voices from MIT" lecture at SUTD on 14 August 2018. During his presentation, Prof Tonegawa highlighted the various changes in body mechanics for people diagnosed with Alzheimer's disease

and challenged the audience to look for solutions to cure memory impairment with this newly discovered information. At the start of his presentation, Prof Tonegawa shared about the concept of the self and what makes a human, human. His definition of the self was related to memories and how it would change the person if he or she were to lose it. He then went on to briefly introduce the anatomy of the brain and how neurons communicate with one another to store and retrieve memories. After laying out the foundation, he then proceeded to explain more about his current research in identifying memory engram and to prove that memories are stored in the hippocampus through optogenetics. Optogenetics is a technique employed by Prof Tonegawa's research team, where they use the gene expression of Channelrhodopsin ChR2 to label engram cells in a mouse, so that if a trained or implanted memory is "triggered", the mouse would produce a "blue light".

This experiment proved Prof Tonegawa's hypothesis – memories are stored in the hippocampus – to be true. With this groundwork in place, the team is then able to draw more relationships between diseases that are related to memory such as Alzheimer's disease and depression, and maybe find a cure for them in the near future.

Prof Tonegawa's thought-provoking research was inspiring to the academics, scientists and engineers in the audience. He not only presented his scientific results and analysis but also included the humanities and social science aspect associated with his research. I felt very privileged to learn from a man who was at the forefront of physiology and medicine and who continues to make a difference, even today, by continuing his research in other fields.



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