NATIONAL RESEARCH FOUNDATION

PRESS RELEASE

25 November 2011

NRF awards 12 more Proof-of-Concept grants to turn research ideas into business reality

- 12 projects receive up to S$250,000 each in the sixth NRF POC grant call
- For future grant calls , principal investigators are encouraged to submit proposals with industry collaboration

1 Fearful of a needle prick? Worried about worsening eyesight? These common concerns are areas being addressed by projects that are awarded the Proof-of-Concept (POC) grant by the National Research Foundation (NRF) today. Twelve POC awards were made on the recommendation of an expert panel assembled to evaluate several dozen proposals submitted by the institutes of higher learning (IHLs). Awardees will receive up to $250,000 each and be given 12 months to turn their ideas into commercialisable prototypes.

2 One example of a project with commercial potential is the development of a microchip that can detect and collect cancer cells from the blood for analysis, thus avoiding the pain and effort of a biopsy. Another project seeks to develop a new daily disposable soft contact lens which could delay the onset of myopia. A third project, if successful, could offer a dressing patch made of aloe vera and extracts of human umbilical cord Wharton's jelly stem cells for healing wounds. In the info-comm technology field, a proposal for 3D headphones consisting of strategically-positioned emitters promise an enhanced gaming and entertainment experience.

3 These project proposals were evaluated on a range of criteria such as project scope, innovativeness, technical soundness, market potential, manufacturability and scalability as well as their potential for spin-offs.

4 The Evaluation Panel recommended that from the next POC grant call, principal investigators would be encouraged to seek endorsement for their proposals from potential customers, investors and/or industry partners. Such endorsements will serve to indicate the degree of innovativeness and the potential for economic and societal benefits of the inventions.

5 This 6th NRF POC grant call was launched on 16 May 2011 and closed on 29 July 2011. After screening by the Technology Transfer Offices (TTOs) of the IHLs. 50 proposals were submitted to NRF for consideration. These proposals, covering a wide spectrum of science and technology areas, were evaluated by the POC panel, which recommended 24 to be were selected for presentation. Twelve were finally

recommended to receive the POC awards. Seven of the 12 awarded projects are in the engineering field, three in medical device technology and one each in info-comm technology and pharmaceutical/biotechnology.

6 Proposals from NUS and NTU continue to form the bulk of submissions but response from the other eligible entities has been encouraging. The National Heart Centre Singapore (NHCS), Singapore Eye Research Institute (SERI) and National Cancer Centre Singapore (NCCS) have submitted their first POC proposals, with one proposal from NHCS receiving the nod from the POC panel.

7 Dr Francis Yeoh, Chief Executive Officer of NRF, said: "The NRF POC grant aims to shorten the path to commercialisation of technologies arising from research done in the universities, polytechnics and medical centres. We are pleased to see a continuing stream of great ideas with commercial potential over the 6 calls made so far. With 15 completed projects from the past calls, the POC scheme has contributed to 6 spin-off companies and 4 licensing deals. We expect to see greater commercialisation success ahead as more projects are completed."

8 Members of NRF's POC evaluation panel are impressed by the quality of the proposals. Dr Lai Kok Fung, CEO of BuzzCity, said: "We have seen some promising projects from this round of the POC. The NRF awards act as a bridge for inventors and investors by facilitating the growth of potential start-ups while at the same time, minimising the risks for investors."

9 Another panellist Mr Scott Anthony, Managing Director, Innosight, said: "Innovation requires people viewing a never-before-solved problem as an opportunity. The POC grants test creative ideas and quicken the process by which ideas translate to impact. It is encouraging to see so much innovation energy throughout Singapore." His view was shared by fellow panellist Mr Johnson Chen, Managing Director of ClearBridge Partners, who was "impressed with "the inter-disciplinary collaborative research efforts between biology, computing and engineering, which has given rise to a diverse range of proposals".

10 The next POC grant call will take place in Jan 2012.

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Annex A – NRF PROOF-OF-CONCEPT (POC) GRANT PANEL MEMBERS
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The National Research Foundation (NRF)

The National Research Foundation (NRF), set up on 1 January 2006, is a department within the Prime Minister's Office. The NRF sets the national direction for research and development (R&D) by developing policies, plans and strategies for research, innovation and enterprise. It also funds strategic initiatives and builds up R&D capabilities and capacities by nurturing local talents and attracting foreign ones. In addition to co-ordinating the research agenda of different agencies to transform Singapore into a knowledge-intensive, innovative and entrepreneurial economy, it also provides secretariat support to the Research, Innovation and Enterprise Council (RIEC), chaired by the Prime Minister. The NRF aims to transform Singapore into a vibrant R&D hub that contributes towards a knowledge-intensive, innovative and entrepreneurial economy; and make Singapore a talent magnet for scientific and innovation excellence. For more information, please visit www.nrf.gov.sg.

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ANNEX A

NRF PROOF-OF-CONCEPT (POC) GRANT PANEL MEMBERS

S/N	Name	Designation and Organisation	Domain Expertise
1	Dr. Lawrence Koe	Director (Projects), NRF	Engineering
2	Mr. Tan Peng Yam	Chief Executive, Defence Science & Technology Agency (DSTA)	
3	Mr. Fong Saik Hay	Chief Technology Officer, ST Engineering	
4	Dr. Lerwen Liu	Founder and Managing Director, NanoGlobe Pte Ltd	
5	Dr. Sze Tiam Lin	Director, IPI Limited	Engineering and ICT/EEE/ECE
6	Ms. Yong Soo Ping	Vice President, Software & IT Services, Walden International	
7	Dr. Frank Levinson	Managing Director, Small World Group	
8	Mr. Klaus Heidinger	Head, Siemens Corporate Technologies Global Center of Sustainable Cities	
9	Mr Chua Joo Hock	Managing Director, Vertex Venture Management	
10	Mr. Pierre Hennes	Managing Partner, Extreme Ventures Pte Ltd	ICT/EEE/ECE
11	Mr. Douglas Abrams	Chief Executive Officer, Expara	
12	Mr. Chow Yen-Lu	Managing Director, WholeTree Technologies	
13	Mr. Rahul Harkawat	Consultant, Mobitila Pte Ltd	
14	Mr. Yishai Klein	Regional Director (Asia), Giza Venture Capital	
15	Mr Scott Anthony	Managing Director, Innosight	
16	Dr Lai Kok Fung	CEO, BuzzCity	
17	Mr Johnson Chen	Managing Partner, ClearBridge Partners	Medical Device Technology
18	Dr. Lionel Lee	COO, Lee Kong Chian School of Medicine, NTU	Medical Device Technology and Pharmaceuticals/ Biotechnology
19	Mr. Damien Lim	General Partner, BioVeda Capital	
20	Dr. Casey Chan	Chief Executive Officer & Co-Founder, WizPatent	
21	Dr. Howard Califano	Director, Innovation Centre, Singapore-MIT Alliance for Research and Technology (SMART)	
22	Dr. Ting Choon Meng	Chairman & Chief Executive Officer, HealthSTATS International Pte Ltd	
23	Dr. Tan Sze Wee	Director, A*STAR Medical Technology Initiatives	

ANNEX B

PROOF-OF-CONCEPT GRANT SCHEME

The S$75 million NRF POC scheme is funded by the National Research Foundation. The grant provides funding to researchers from the universities and polytechnics to enable them to carry out further research on their inventions or ideas, with the aim of coming out with products or commercial applications.

The resulting product or application could then be licensed to interested companies or be marketed by a new company. A successful proof of concept demonstrates not just technical viability but also a high degree of commercial readiness. It would give potential licensees of the technology confidence to take up licensing and encourage inventors to start-up a new company to commercialise the technology.

There are two parts to the POC scheme, both funded by the National Research Foundation (NRF). The NRF administers the POC grant for IHL-linked researchers while SPRING Singapore administers the POC grant for Singapore-based SMEs and individuals in the public sector research institutes under the Technology Enterprise Commercialization Scheme or TECS.

	NRF POC	**TECS POC**
Funding Quantum	Up to S$250,000 per project	
Eligibility for Application	• Staff, researchers and students linked to IHLs	• Start-up companies incorporated and operating in Singapore • Researchers in public sector research institutions
Frequency of Calls	Half-yearly	
Technology Areas	• All areas of science and technology	The following specific areas: • Electronics, Photonics & Device Technologies • Chemicals, Advanced Materials & Micro/Nanotechnology • Information and Communications Technology (excluding Interactive Digital Media) • Biomedical Sciences (excluding Biotechnology)

Evaluation Process	• Researchers submit proposals to the technology transfer offices of their IHLs, who will evaluate all proposals and submit their top 15 to NRF. • A POC Panel will review the proposals, listen to presentations of shortlisted proposals and recommend proposals for grant based on their potential or commercial viability.	• Submitted proposals are evaluated by the respective technical panels for technical merit and feasibility. • Proposals shortlisted by the technical panels will be evaluated for commercial merit and recommended for funding by a POC Grant Panel.

National Framework for Innovation and Enterprise (NFIE)

The POC scheme is part of the National Framework for Innovation and Enterprise (NFIE) announced by the Prime Minister at the 3rd Research, Innovation and Enterprise Council (RIEC) meeting in March 2008.

The NFIE is a comprehensive national programme to grow innovation and entrepreneurship in Singapore, especially through the formation of start-up companies to commercialise cutting-edge technologies developed out of R&D laboratories. Academic entrepreneurship is broadly defined as the involvement of academics, scientists and researchers in innovative activities with economic or societal impact.

For more information on the National Framework for Innovation and Enterprise, refer to: http://www.nrf.gov.sg/nrf/otherProgrammes.aspx?id=1206

ANNEX C

SUMMARY OF AWARDED POC PROJECTS - 1ST, 2ND, 3RD, 4TH, 5TH and 6TH GRANT CALLS

1st Call

S/N	Project Title	Principal Investigator	Host Institution
1	A Hand-Held Digital Lensless Microscope System for MEMS and Micro-Device Inspection and Characterisation	Prof. Anand Asundi	NTU
2	Flexible Pressure Sensors Using Area-Array Nanocomposites	Dr. Zuruzi Abu Samah	NYP
3	Redesign of SEMs for Parallel Energy Detection	Prof. Anjam Khursheed	NUS
4	DISH: Enabling Cooperative Multi-Channel Communication for Wireless Ad Hoc Networks	Prof. Mehul Motani	NUS
5	Creating, Viewing, Publishing, and Sharing Stereoscopic Images/Videos at Anytime Anywhere	Dr. Steven Zhou	NUS
6	An Ultra Low-Power RF Transceiver Chip Towards a New Paradigm of Life Quality	Prof. Yeo Kiat Seng	NTU
7	Ultra-Low Cost Bead-Based Microarrays for Biomolecular Diagnostics	Prof. Dieter Trau	NUS
8	Novel, Less Invasive Mitral Valve Implantation Method Involving a Bayonet Insertion and Release Mechanism	Prof. Theodoros Kofidis	NUS
9	Multi-Layered Surgical Prosthesis with Drug-Releasing Biodegradable Coating for Hernia Repair	Prof. Freddy Boey	NTU

2nd Call

S/N	Project Title	Principal Investigator	Host Institution
1	A Human Monoclonal Biotherapeutic to Target the Dengue NS3 Protein	Prof. Subhash Vasudevan	DUKE-NUS GMS
2	A Semantics-based and Service-oriented Framework for the Virtualization of Sensor Networks	Dr. Lim Hock Beng	NTU
3	Low Cost High Performance Anti-Reflective Coating based on Si Nanocrystals Embedded in SiO_2 Film	Ms. Eunice Goh Shing Mei	NTU
4	New Grid Array Antennas and their Integration Method for an Innovative Solution to 60-GHz Radio Devices	Dr. Zhang Yue Ping	NTU
5	Development and Demonstration of Silicon Carbide (SiC) Based Power Electric Converter for Motor-Generator Control in Hybrid Electric Vehicles	Dr. Tseng King Jet	NTU
6	High Efficiency Electrogenerated Chemiluminescence with Colloidal Quantum Dot Emitters in Ultrathin Cells for Display Applications	Dr. Sun Xiaowei	NTU
7	Photonic MEMS (Microelectromechanical Systems) Tunable Laser	A/Prof. Liu Ai Qun	NTU
8	Spin Wave Based Non-destructive Semiconductor Testing Tools	Dr. Yang Hyunsoo	NUS
9	Single-coil Superconducting Miniundulator – The Next Step Towards High-Brilliance Synchrotron Radiation	Dr. Diao Caozheng (Previously Prof. Herbert O. Moser)	NUS
10	New Compact, Fast, Parallel-processing Fourier-transform Interferometer (FPP FTIR) Enabling Short-pulse Spectroscopy	Prof. Mark B. H. Breese (Previously Prof. Herbert O. Moser)	NUS
11	Development of a New and Precise Alignment System for Micromanipulation	A/Prof. Tan Kok Kiong	NUS

12	A New Endoluminal Device for Duodenal Exclusion in Treatment of Type 2 Diabetes Mellitis and Obesity	Dr. Jimmy So Bok-Yan	NUS
13	Anti-inflammatory Peptide Loaded Micro Emulsion Gel Formulation as Potential Therapeutic for Post-operative Adhesion	Prof. Gopalak-rishnakone Ponnampalam	NUS
14	Processing Full Range of Waste Grease into Renewable Energy	Ms. Song Sin Nee	RP
15	Hedge Funds and Structured Products Advisors (HedgeSPA.com)	Dr. Bernard Lee	SMU
16	Development of a Hand-held Solid Dispenser Using a Motor-Driven Auger	Dr. Ken Lee	SP

3rd Call

S/N	Project Title	Principal Investigator	Host Institution
1	3-Dimensional Micro/Nano-Structures for Energy Harvesting	Dr. Hannah Gardner	NYP
2	Creating a Comprehensive Lexical Index of Documents from the World Wide Web (WWW)	A/Prof. Datta Anindya	NUS
3	Partial Breast Reconstruction using a Nanofibrous Scaffold following Breast-Conserving Surgery	Dr. Chan Ching Wan	NUH
4	Development of Efficient Methods for the Production of Biodiesel from Grease	A/Prof. Li Zhi	NUS
5	Improvement in Yield of Haemotopoietic Stem Cells (HSCs) via Automation and Optimization of the Umbilical Cord Blood (UCB) Collection Process with Further Stem Cells' Characterization	A/Prof. Tan Kok Kiong	NUS
6	Development of a Highly Energy-Efficient Revolving Vane Expander	A/Prof. Ooi Kim Tiow	NTU
7	CDH17 Marker as a Novel Target for Liver and Stomach Cancer Therapies	A/Prof. John Luk	NUS
8	Fluorescent Tagged Antimalarials as Commercial Molecular Probes to Diagnose Drug Resistance and to Study Diseases	Dr. Kevin Tan and Dr. Martin Lear	NUS
9	Development of a Novel Bioabsorbable Drug-Eluting Ventilation Tube for Chronic Middle Ear Infection	A/Prof. Lynne Lim	NUS
10	High Frequency Graphene Transistors	Dr. Yang Hyunsoo	NUS

4th Call

S/N	Project Title	Principal Investigator	Host Institution
1	An Adaptive Ultra-Secure User-Controllable Routing Algorithm for Next-Generation Mobile Ad-hoc Network	Mr. Kan Siew Leong	NYP
2	Rapid Design Verification Platform for Analog/RF Circuits Beyond the Scale of 65nm and 60GHz	Dr. Yu Hao	NTU
3	Automated Neuro-Motor Stroke Rehabilitation Device - A Platform for Functional Recovery of Paralyzed Hand after Stroke	Dr. John Heng	NTU
4	Sol-Gel-Derived Environmentally Stable Nanostructured Single Defogging Layer with Persistent Superhydrophilicity	Ms. Wu Xinghua	NTU
5	Scalable Production of Ultrahigh Purity Single-Walled Carbon Nanotubes	A/Prof. Chen Yuan	NTU
6	Network Animation Factory (NAF)	Prof. Seah Hock Soon	NTU
7	Immersive 3D Audio System for 3D Media	Mr. Tan Ee Leng	NTU
8	A New Glaucoma Drainage Device with Sustained Drug Elution	Prof. Venkatraman Subramanian	NTU
9	Ballast Water Treatment using Ozone Microbubbles	Prof. Ng Kim Choon	NUS
10	Fabrication of High Performance Li Rechargeable Batteries with Superfast Charge Rate and Ultra-high Power Density for Green-Powered City	Prof. Lu Li	NUS
11	Line-scan Focal Modulation Microscope	Dr. Chen Nanguang	NUS
12	Nanoparticle Factories in Flowing Foams: Scalable Continuous Sub-Micron Size Material Synthesis in Multi-Phase Microreactors	Dr. Khan Saif	NUS
13	A Turn-Key Machine For Graphene Production	A/Prof. Loh Kian Ping	NUS
14	Conjugated Polymer-Biomolecule Conjugate as Next Generation Fluorescent Probes for In Vitro Diagnostics	A/Prof. Liu Bin	NUS
15	A Randomized, Double-Blind, and Placebo-Controlled Trial of an Anti-Malarial Drug Artesunate for Chronic Asthma	A/Prof. Wong Wai Shiu Fred	NUS
16	Development of Novel Mesoporous TiO_2 Anode Based Li-ion Battery for Electric Vehicle Application	Dr. Palani Balaya	NUS

5th Call

S/N	Project Title	Principal Investigator	Host Institution
ICT/EEE/ECE Proposals			
1	An Interactive Web-Based Game for Helping Angry Children and Youth	Dr. Daniel FUNG	IMH
2	A Novel Cryo-Preparation Technique for Near-Instantaneous Vitrification of Biological Samples	Dr. Daniel PICKARD	NUS
3	A Body Vein Pattern Verification System for Criminal Investigation	Dr. Adams KONG Wai-kin	NTU
4	Low-Cost Antenna-in-Package for Single-Chip Tri-Band Radio Devices	A/Prof. ZHANG Yue Ping	NTU
Engineering Proposals			
5	Ultrafast-Charging and High-Power Lithium Ion Batteries with Novel Two-Dimension Electrode Materials	Dr. LIU Jiehua	NTU
6	Electrochromic Photonic Crystal Smart-Window Technology	Dr. Alfred TOK	NTU
7	Beyond Lithium Ion Batteries: Novel Fluoride Ion Batteries	Dr. Madhavi SRINIVASAN	NTU
8	Handheld Ultrasonic Bath Analyzer	Dr. Claus-dieter OHL	NTU
9	A Supercapacitive Energy Storage Device Based on Proprietary Nanomaterials	Dr. XIE Xian Ning	NUS
10	Large-Scale Transparent Graphene-Ferroelectric Devices for Touch Screen Applications	Dr. Barbaros ÖZYILMAZ	NUS
11	An Advanced Adsorption Cycle for Desalination: the AD+MED or ADMED Cycle	Prof. NG Kim Choon	NUS
Medical Device Technology Proposals			
12	Drug-Loaded Microparticles Encapsulated into Bioadhesive Films, Locally Delivered by Angioplasty Balloons	Dr. Terry STEELE	NTU

6th Call

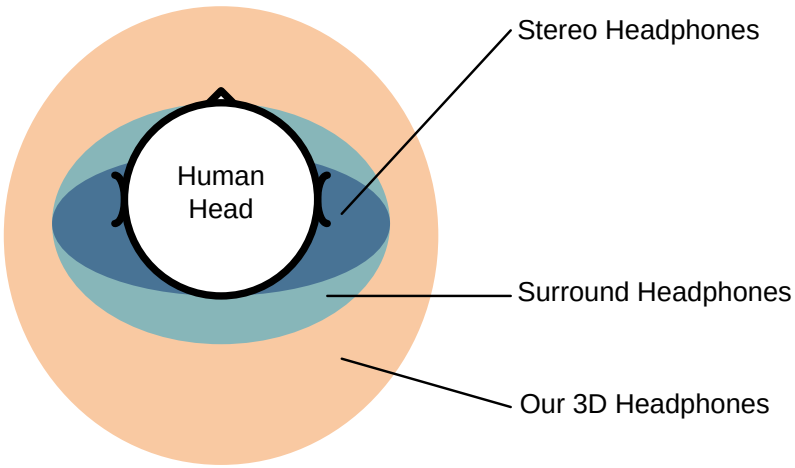
S/N	Project Title	Principal Investigator	Host Institution
ICT/EEE/ECE Proposals			
1	Perspective Audio: Creating 3D Sound Ready for Prime Time	Prof. GAN Woon Seng	NTU
Engineering			
2	A Scalable Technology for Transparent Conducting Oxide Thin Films on Flexible Substrates	Dr. CHENG Hansong	NUS
3	Application of nano-sized adsorbent for arsenic contaminated water treatment	Prof. CHEN Jiaping	NUS
4	SMART Active Nanopores Membrane; integrated Catalytic Disinfectant and Sensory for Air/Water	Dr. HO Ghim Wei	NUS
5	Non-substrate transfer process to prepare large-area graphene films for ITO replacement	Dr. YIN Zongyou	NTU
6	Energy efficient hydrogen production via a hybrid photocatalysis/electrolysis prototype	Dr. CHUA Ernest Kian Jon	NUS
7	Low-Cost High-Performance Catalyst for Hydrogen Generation	Prof. CHAN Siew Hwa	NTU
8	Ready to use semiconducting single walled carbon nanotubes powder and film for a new generation of high performance printed electronics	Prof. CHAN Bee Eng Mary	NTU
Pharmaceutical/Biotechnology Proposals			
9	Development of a ‘wound dressing patch’ made up of an aloe-vera-nanomesh impregnated with human umbilical cord Wharton’s jelly stem cells or its extracts and wound healing	Dr. FONG Chui Yee	NUS
Medical Device Technology Proposals			
10	Diagnosis of Myocardial Ischemia-producing Coronary Stenosis via Curvedness and Curvedness Rate Obtained from Stress Cardiac Magnetic Resonance Imaging Materials	Dr. TAN Ru San	NHCS
11	A novel multiple-zone soft contact lens to slow myopia progression	Prof. SAW Seang-mei	NUS
12	Microfluidics Biochip for Cancer Diagnosis	Prof. LIM Chwee Teck	NUS

ANNEX D

AWARDED RESEARCH PROPOSALS FROM POC 6th CALL

1 Perspective Audio: Creating 3D Sound Ready for Prime Time

We are familiar with 3D TV with its eye-popping 3D video effect. Now, 3D is no longer just for the eye. The team is creating a new type of headphones that can produce immersive 3D sound to complement the 3D video for a truly sensurround experience in gaming and entertainment. With normal headphones, it is not possible to reproduce convincing 3D sound that embeds azimuth, depth, and elevation cues. The team's 3D headphones consist of unique patent-pending structure with strategically-positioned emitters that project sound to different parts of the human ear to more accurately perceive 3D sound. In addition, proprietary 3D audio processing algorithms are programmed onto an embedded processor that is fitted into the headphones. The following illustration shows the effect that can be created from the headphones through its unique structure and proprietary algorithms which reproduce immersive sound field with width, depth, and height.



The main challenge of this POC is to develop a commercially viable 3D headphones prototype that is compact and ergonomically suitable for gaming and entertainment.

Associate Professor Gan Woon Seng
Head, Division of Information Engineering
Head of Division
Division of Information Engineering
School of Electrical & Electronic Engineering
College of Engineering
Nanyang Technological University

Assoc Prof Gan Woon Seng received his BEng (1st Class Hons) and PhD degrees, both in Electrical and Electronic Engineering from the University of Strathclyde, UK in 1989 and 1993 respectively. He joined the School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore, as a Lecturer and Senior Lecturer in 1993 and 1998 respectively. He is currently an Associate Professor as well as the Head of the Information Engineering Division in the School of Electrical and Electronic Engineering at Nanyang Technological University. His research interests include 3D audio signal processing, active noise control, directional sound system, and real-time embedded systems.

Dr. Gan won the Institute of Engineer Singapore (IES) Prestigious Engineering Achievement Award in 2001 for his work on the Audio Beam System. He has published more than 200 international refereed journals and conferences, and has been granted four Singapore and US patents. He also co-authored a book on Digital Signal Processors: Architectures, Implementations, and Applications (Prentice Hall, 2005). He is the leading author of a book on Embedded Signal Processing with the Micro Signal Architecture, (Wiley-IEEE, 2007). A new book on Subband Adaptive Filtering: Theory and Implementation was also published by John Wiley in August 2009. He is currently a Senior Member of IEEE, Member of Audio Engineering Society and Professional Engineers of Singapore. He is also an IEEE Signal Processing Society technical committee member of the Signal Processing Education (SPEd), and Design and Implementation of Signal Processing System (DISPS). He is currently an Associate Editor of the EURASIP Journal on Audio, Speech and Music Processing; Journal of Electrical and Computer Engineering; and an editorial member of the APSIPA Transactions on Signal and Information Processing.

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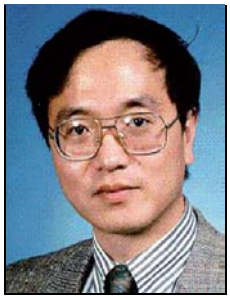
2 A Scalable Technology for Transparent Conducting Oxide Thin Films on Flexible Substrates

Nanostructured transparent conducting oxides (TCOs) are of essential technological importance in optoelectronics. Demand for thin film and device fabrication of TCOs onto flexible substrates for emerging applications such as OLEDs, flat panel display and thin film solar cells has grown rapidly and is expected to reach $6.9B in sales by 2015. Thin, lightweight, unbreakable, malleable and inexpensive are the desirable attributes for these applications, for which plastic substrates are well-suited. A high volume roll-to-roll processing operation would result in 50% lower production costs and 50% less capital expenditures for comparable green field sites.

The patented technology enables large scale, low temperature thin film fabrications of TCOs to be plastered on flexible (including polymeric) substrates with low resistivity and high stability. By turning the negative charges on TCO nanoparticle surfaces into positive charges through a novel chemical process, electron hopping

rate among nanoparticles can be significantly increased, thus greatly reducing nanoparticle resistivity. The stability of the thin film can be greatly enhanced through nanoparticle cross-linking initiated by a novel photochemical process. The entire fabrication processes can be done below the glass transition temperature of the flexible substrates and are highly scalable to enable roll-to-roll thin film fabrications. The technology will open an exciting window of opportunity not only for the OLED, thin film solar cells and flat panel display markets but also for new applications in flexible electronics.



PI: Cheng Hansong
Associate Professor
Department of Chemistry
National University of Singapore

Cheng Hansong received his Ph.D. from Princeton University in 1991 and subsequently joined Air Products and Chemicals, Inc, headquartered in Allentown, Pennsylvania, as a senior scientist. In 2004, he became one of the founding members of the U.S. Department of Energy Hydrogen Sorption Center of Excellence, which included 5 national labs, 9 universities and 1 multinational company, and was a member of its Steering Committee. In recognition of their contribution to the hydrogen programme, he and his team received the 2010 DOE Hydrogen Program Special Recognition Award from the U.S. Department of Energy. In the same year, he joined the faculty of Department of Chemistry, National University of Singapore, as an associate professor. Dr. Cheng has been conducting active research in the area of theoretical chemistry and materials science for over 20 years. He has extensive experience in design and has discovered novel materials for a wide variety of applications. In particular, his work on hydrogen storage and semiconductor surface thin film growths has led to several technologically important commercial processes. He is an author/co-author of over 100 peer-reviewed publications and an inventor of 27 U.S. patents and patent applications. In addition, he has delivered over 80 invited lectures in professional conferences, academic, government and industrial labs worldwide.

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3 Application of Nano-Sized Adsorbent for Treatment of Arsenic Contaminated Water

Arsenic pollution is a serious environmental problem that affects over 160 million people worldwide. Given its high toxidity, it is imperative to develop a robust and cost-effective technology to remove arsenic from polluted water and limit it to a low of 10 ppb in drinking water.

The current technologies for arsenic removal are adsorption by iron oxide, ion exchange, precipitation, and membrane filtration. However, these methods are less-than-efficient and entail high chemical consumption and the need for post-treatment.

In this project, a nano-sized binary metal oxide was in-situ synthesized and tested for its treatment capacity for arsenic through a series of lab-scale studies. It can remove high arsenic species from the contaminated aqueous solutions. It can also remove other toxic heavy metal ions from water.

The technology will be further scaled up from small lab operation to a pilot-scale operation. A complete water treatment system will be designed and optimized based on a series of experimental studies. The technology with the adsorbent in-situ produced will remove arsenic and other contaminants at an efficiency far higher than current technologies. The upshot will be the commercialisation of affordable and environmentally-friendly nano-technology for the treatment of arsenic in water.

Dr J. Paul Chen
Associate Professor, Department of Civil and Environmental Engineering
National University of Singapore

Dr J. Paul Chen is an associate professor in the Department of Civil and Environmental Engineering (CEE) in the National University of Singapore (NUS). He joined NUS in 1998 after he obtained his PhD degree from Georgia Tech, USA. His teaching experiences include: Water Pollution Control Technology, Industrial Effluent Treatment, Environmental Chemistry, Mass Transfer & Separation, and Safety, Health and Environment. His research interests are physicochemical treatment of water and wastewater and mathematical modeling of chemical and environmental processes. His current research activities are adsorption of toxic metal ions (e.g. arsenic, copper and lead), ballast water management system, electrochemical technologies for organic and metal waste treatment, and instrumental and modeling

analysis of environmental processes. He has published 3 books and more than 100 journal papers and book chapters with external citation of above 22 per published paper and H-index of 24. He holds 2 patents on wastewater treatment. He received a research award “Distinguished Overseas Chinese Young Scholar” from National Natural Science Foundation of China and Mr. Yuh-Jie Lee Scholarship from Sun Yat-Sen Culture and Education Foundation. He is recognized as an Author of highly cited papers (Chemistry and Engineering) of ISI Web of Knowledge. Dr Chen has served as a peer research proposal reviewer for international funding agencies including National Science Foundation (USA), Research Council of Norway, Research Grants Council of Hong Kong, and National Natural Science Foundation of China. He has acted as a reviewer for various journals (e.g., EST, Langmuir, JPC, JCIS, and Water Research).

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4 SMART Active Nanopores Membrane; integrated Catalytic Disinfectant and Sensory for Air/Water

The objective is to fabricate a multifunction membrane for enhanced photocatalytic disinfectant, anti-fouling (self-cleaning) and detection. It is noteworthy that most of the commercialized membranes are based on physical or passive filtration. There are some which emphasized on photocatalytic (active) filtration however these lack functionalities such as detection capability and structural integrity. The proposed membrane was designed to have an optimum structural morphology and nanoparticles functionalization for optimized adsorption-desorption sensing and light absorption photocatalytic disinfectant properties.

The project aims to develop multifunction membrane; sensor in combination with filtration system both passive (particulate filtration) and active (disinfectant). The proposed integrated system has the benefits of monitoring and cleaning technologies for broad environmental compatibility, holistically under a single platform. The potential application is for low-cost integrated detection, disinfection and filtration system for improved indoor air quality delivered to homes/public places.

Dr. Ho Ghim Wei
Assistant Professor, Electrical & Computer Engineering
National University of Singapore

Dr Ho Ghim Wei received her Ph. D. Electrical Engineering, from the University of Cambridge in 2006. She is currently an Assistant Professor and holds joint faculty appointments at the Electrical and Computer Engineering department and Engineering Science Programme in National University of Singapore. Her research is focused on wet chemistry materials synthesis and engineering towards fabrication of functional nanostructured materials for sensors and solar cells applications. She is the first in the world to develop novel SiC nanoflowers and multi-coaxial nanowires, which was widely reported by the media such as NBC, ScienCentral and BBC News. She is a Principal Investigator (or Co-Investigator) for research projects funded by MOE, A*STAR and Applied Materials. She has contributed to various book chapters, patents and international peer reviewed publications.

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5 Non-substrate transfer process to prepare large-area graphene films for ITO replacement

The market for transparent conductors (TC) is growing rapidly, and is scheduled to hit $9.4 billion by 2015. Indium tin oxide (ITO) is currently the market standard for most applications. However, the applications of ITO are limited due to its poor flexibility and the limited supply of indium. Graphene, a one-atom-thick carbon sheet, offers several potential advantages over ITO, such as optical transparency, high conductivity, high flexibility and excellent chemical stability. The most promising way to mass-produce graphene thin films is through chemical vapor deposition (CVD). However, as this method entails many steps of substrate transfer and etching, there is only limited improvement in the conductivity, transparency and up-scaling of the graphene films.

The team has developed a process to grow large-area graphene films without substrate transfer and etching. This involves using metal (Cu or Ni) nanofibers instead of common-used foils and liquids instead of common-used gas or solid carbon sources, to grow graphene on the surface of metal nanofibers. The obtained graphene nanofibers can be either directly deposited on rigid transparent substrates (e.g. glass) or dispersed and coated on the flexible substrates (e.g. PET) to form the transparent films. The team will develop the roll-to-roll process to prepare graphene nanofiber-based flexible transparent conductive films, so as to be compatible with current industry production line.

From left to right:
Dr. Yin Zongyou, PI
Research Fellow
Division of Materials Technology
School of Materials Science & Engineering
College of Engineering
Nanyang Technological University

Prof. Ma Jan
Chair, School of Materials Science & Engineering
Director, Temasek Laboratories
School of Materials Science & Engineering
College of Engineering
Nanyang Technological University

Dr. Du Zehui
Senior Research Scientist
Temasek Laboratories
Nanyang Technological University

Dr. Yin Zongyou received his B.S. degree in Jilin University, China and completed his PhD research in Nanyang Technological University (NTU), Singapore. Currently, he is working as the research fellow in the School of Materials Science and Engineering of NTU. His research focuses on the nanomaterials science, nanostructures configuration and functional-devices development with the physical property understanding. Specifically, his research areas covers synthesis of graphene & semiconducting nanomaterials, device fabrication based on the functional nanomaterials to be applied in renewable energy (solar cells, water splitting for hydrogen generation, lithium ion batteries and supercapacitors), resistive switching memory devices (ReRAM, Flash, WORM) and bio-/chemical-sensors which are low-cost, ultrasensitive and eco-friendly.

6 Energy-efficient hydrogen production via a hybrid photocatalysis/electrolysis prototype

Electrolysing water to produce hydrogen is an energy-intensive process. The proposed idea is to hybrid electrolysis with photocatalysis for water splitting to significantly reduce the energy required. Hybridization lowers the cost of energy and the amount of hydrogen generated is significantly more compared to purely electrolysis or photocatalysis.

This project aims to develop a hybrid photocatalysis/electrolysis system that overcomes the disadvantages of conventional electrolysis or photocatalysis. Because of the decrease in the amount of energy needed for electrolysis by incorporating high-performing photocatalyst, bulk hydrogen is manufactured at a lower cost. This technology is a high impact and implementable solution for hydrogen production.

This indigenous hydrogen production technology is a game-changer for energy suppliers. It is highly versatile and scalable and can be deployed to evolve power systems for portable use and use on building rooftops. The immediate impact is the substantial improvement in the performance of commercial electrolysers by incorporating our novel photocatalyst. A new generation of energy-efficient high performing electrolysers can be manufactured.

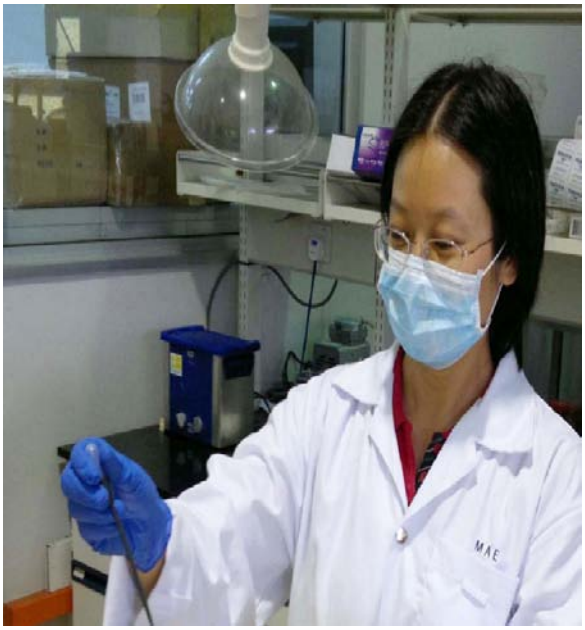
Dr. Chua Kian Jon Ernest
Assistant Professor, Department of Mechanical Engineering
National University of Singapore

Dr Chua Kian Jon Ernest received his Ph. D. and M.Eng in Mechanical Engineering, from the National University of Singapore (NUS) in 1997 and 2001, respectively. He is currently an Assistant Professor at NUS. He holds joint faculty appointments in Mechanical Engineering and Engineering Science Programme. He was awarded the Hitachi Fellowship Award in 2010 to conduct ground-breaking solar-hydrogen water splitting research at Osaka University. Dr Chua's primary research interests include bio-thermal engineering, building energy efficiency and renewable/clean energy technologies. He has been involved as a Principal Investigator (or Co-Investigator) in research projects funded by MOE, Mindef, and A*STAR. His biography is listed in several "Who's Who" compilations. He has published more than 70 technical papers

in international journals and conferences, authored/co-authored 6 book chapters and is also the owner of 2 patents related to renewable technologies.

7 Low-Cost High-Performance Catalyst for Hydrogen Generation

We use many small and portable electronic and electrical devices in our daily life. These gadgets are almost exclusively powered by battery, big or small, depending on the applications. The battery can potentially be replaced by polymer electrolyte fuel cells (PEFC), especially for devices that consume high amounts of charge energy. A fuel cell is an electrochemical device, which converts the chemical energy of a fuel, such as hydrogen, into electricity in a single step. The problem with fuel cells is that they work extremely well with hydrogen gas, which brings forth the issue of hydrogen storage. While hydrogen gas can be compressed and stored in a small canister, it is not an option for small and portable electronic and electrical applications because of safety concerns. Alternatively, hydrogen can be "stored" in chemical form such as sodium borohydride solution, with energy capacity per unit mass or volume many times higher than the lithium-ion battery. To release hydrogen, the solution is allowed to flow through a reactor where a catalyst is loaded to catalyze the reaction. Commercially used catalysts are almost exclusively ruthenium-based, which is an expensive precious metal. These catalysts are normally deposited onto carbon beads or ceramic support, but they can be peeled off from the substrate after 10 hours of operation. The team's goal is to develop a low-cost, highly efficient and robust self-supported cobalt-oxide based catalyst for hydrogen generation using chemical hydride as the source of hydrogen. In addition, the team will explore the formulation of the slurry for mass production of the self-supported catalyst beads using in-house developed gel-casting technique. The team is in discussion with a local fuel cell company regarding licensing the catalyst technology for hydrogen-on-demand application once the project is completed.



Professor Chan Siew Hwa
Division of Thermal and Fluids Engineering
School of Mechanical & Aerospace Engineering
College of Engineering
Nanyang Technological University

Dr Chan joined NTU as a Lecturer in 1991 after obtaining his PhD and subsequently working as a post-doctoral researcher at Imperial College London. He is currently a full professor in the School of Mechanical & Aerospace Engineering and is Co-Director of the Energy Research Institute at NTU (ERI@N).

Dr Chan's PhD and post-doctoral research were on Internal Combustion Engines and he extended his research interest to Fuel Cell and Fuel Reforming since 1997. From April 2006 till March 2008, he held a joint appointment with A*STAR as Director of SERC Fuel Cell Programme. Under this appointment, he led a team of researchers from 4 A*STAR research institutes working closely with industries on fuel cells.

His research has gained him a number of international recognition. In 2000, he received the prestigious George-Stephenson Award (IMechE, UK) for Outstanding Research in Automotive Engineering. More recently in 2007, he received the Outstanding Scientific Achievement in the field of Hydrogen Treatment of Materials and the Great Activities in the World Hydrogen Movement, awarded by the International Association for Hydrogen Energy, USA. Dr. Chan has published 150 refereed journal papers with citations of ~3500 and h-index of 35. His research achievements are also matched by his competency in teaching. In 2000, Dr Chan received the Teacher of the Year Award, NTU.

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8 Ready to use semiconducting single walled carbon nanotubes powder and film for a new generation of high performance printed electronics

Printable electronics have a current market of $3-$6 billion which is expected to grow at a rate of 10%-15% per annum. Printed products can be of large area, foldable, light weight, recycleable, etc. One of the main stumbling blocks of printed electronics is the lack of a high performance printable semiconductor with high stability. But a strong competitor is semiconducting Single Walled Carbon Nanotubes (s-SWNCNTs).

S-SWCNTs have outstanding field effect and carrier mobility of up to20,000 cm2/V-s, which is far superior to the mobility of other printable semiconductor materials such as semiconducting polymers and amorphous silicon (□1 cm2/V-s). However, as-synthesized SWCNTs contain both semiconducting and metallic species and the metallic species must be removed for SWCNTs to be used in transistors, logic circuits and devices. Thus far, semiconducting SWCNTs are commercially available only from one company and the price of pure s-SWCNTs is very high because the yield from separating the s-SWCNTs using current technology is low (< 5%).

In this project, the team scale up a separation process to achieve pure s-SWCNTs by using its selective chemistry technologies which have been shown to achieve high yield (>25%) and high purity (>95%).

Professor Mary Chan Bee Eng
Acting Chair, School of Chemical and Biomedical Engineering
School of Chemical and Biomedical Engineering
College of Engineering

Professor Mary Chan is a Professor of Chemical and Biomolecular Engineering in the School of Chemical and Biomedical Engineering. Professor Mary Chan joined the University in 2001, bringing with her extensive experience from the chemical industry. She obtained her B.Eng (Chem) and PH.D from NUS and MIT respectively. Her main research interests are in polymers in nanoscience and biotechnology, and she has published extensively, with more than 140 papers in top-tier journals. She has been the PI and co-PI of several major projects in these areas with total project worth of more than $18M. Since 2008, she is the lead PI of a multi-PI NRF Competitive Research Programme ($10 million) on Manufacturability of Carbon-Nanotube Printed Electronics.

She is currently pioneering work in the area of Nanotechnology and Biomedical engineering, which offers a broad range of promising applications across disciplines such as flexible circuits, large area display, antimicrobial coatings and solutions, composites, etc. Her work over the past 10 years has garnered more than 1200 citations and led to about 20 patents/patent applications. Professor Mary Chan contributes actively to the industry and sits on a number of committees and boards. Her most recent involvements are the Science and Engineering Research Council Public Sector Funding Panel (FY2011) where she is a member, and the American Chemical Society Applied Materials and Interfaces Journal where she is on the editorial board. Professor Mary Chan is also a pioneer of the Chemical and Biomolecular Engineering degree programme at NTU and has been instrumental in the setup of the PHD degree programme within her School.

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9 Development of a 'wound dressing patch' made up of an aloe-vera-nanomesh impregnated with human umbilical cord Wharton's jelly stem cells or its extracts for wound healing

Non-healing wounds cause excruciating pain to patients suffering from diabetes, kidney failure, burns and bed sores. Diabetic wounds lead to foot ulcers which can result in foot amputation. Some individuals are susceptible to abnormal wound healing that can cause ugly scars. Current methods to improve wound-healing have met with limited success. With an aging global population, especially one with a rising number of diabetes and obesity sufferers, the market for treatment of chronic wounds can be expected to reach US$25 billion.

The research team studied a novel stem cell from the gelatinous material within the human umbilical cord that has certain unique properties and releases special factors that is applicable to wound-healing. The team will use these released factors found in the stem cell extracts to prepare a 'wound dressing patch'. This patch will be made up of a biodegradable Aloe vera-nanofibre mesh impregnated with the extracts for the special factors to bring about the processes that will result in good healing. The team is multidisciplinary, comprising renowned medical scientists, doctors, bioengineers and nanotechnology experts. The upshot is a marketable product from a unique stem cell that is safe, can be harvested in abundance, and releases ingredients that are the building blocks for tissue repair. This patch can potentially be applied to patients undergoing surgery, sufferers of slow-healing diabetic and non-diabetic wounds, bed sores, burns as well as the animal care industry.

Dr Fong Chui Yee
Assistant Professor, Department of Obstetrics and Gynaecology, Yong Loo Lin School of Medicine
National University Health System

Dr Fong Chui Yee is currently an Assistant Professor in the Department of Obstetrics and Gynaecology, National University of Singapore and was the Chief Embryologist of the National University Hospital IVF program. She obtained her MSc and PhD under Professor Ariff Bongso. She pioneered the zona-free blastocyst transfer technique for improved success in IVF programs and is a renowned stem cell scientist. She received the Outstanding Researcher award from NUS in 1997. Her current research interests focus on developing novel stem cells for the treatment of incurable diseases.

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10 Diagnosis of Myocardial Ischemia-producing Coronary Stenosis via Curvedness and Curvedness Rate Obtained from Stress Cardiac Magnetic Resonance Imaging

The team is developing an automated software algorithm for detection of abnormal heart wall function during stress heart imaging. Non-invasive heart stress imaging tests are frequently used on patients at intermediate risk of coronary artery disease to triage them for invasive angiography. Conventional interpretation of stress heart images rely on detection of stress-induced impairment of heart muscle wall thickening in areas of heart supplied by disease heart arteries. This requires expert input and is often operator-dependent and not easily amenable to efficient computational manipulation.

The proposed solution is to diagnose regional heart muscle dysfunction during stress imaging using a novel parameter curvedness. We have previously published work on automated methods to calculate local curvedness over the entire heart surface from magnetic resonance heart images. Impaired curvedness was observed in regions of heart that are damaged by heart attack. We believe the curvedness parameter can be adapted to available 3D heart imaging for diagnosis of heart artery disease. With this grant funding, it is possible to refine the software and test-bed it on heart patients undergoing stress magnetic resonance imaging, and compare the accuracy against invasive coronary angiography.

A/P Dr Tan Ru San
Department of Cardiology
National Heart Centre Singapore

Dr Tan Ru San is Senior Consultant Cardiologist of the National Heart Centre Singapore (NHCS) as well as Adjunct Associate Professor of Duke-NUS Graduate Medical School. He specializes in non-invasive heart imaging, possessing extensive clinical experience in cardiovascular magnetic resonance, echocardiography and nuclear cardiology. An avid researcher, he directs NHCS' Clinical Trials as well as the Cardiac Mechanics, Engineering and Physiology units. His research interests include cardiac imaging in heart failure, cardiac biomechanics, clinical cardiology, etc. He is an editorial board member of the Journal of Cardiovascular Magnetic Resonance. He has co-authored more than forty peer-reviewed research articles, several of which were the results of successful collaboration with engineers and computer scientists.

11 A novel multiple-zone soft contact lens to slow myopia progression

Myopia or short-sightedness is a huge public health problem in East Asian countries, especially Singapore. Hence, it is important to identify effective interventions to slow down myopia progression. To date, there are no effective and safe control measures for myopia. The latest animal and human experiments have demonstrated 2 new concepts of more hyperopic peripheries in myopic children and the role of myopic defocus to prevent myopia. The objective is to develop a new daily disposable soft contact lens (CL) which corrects myopia with (i) clear alternating zones taking into account more hyperopic peripheries and (ii) concentric treatment zones with lesser myopic power that induce simultaneous myopic defocus. Our proposed CLs fabrication method will use the injection moulding and manufacturing process. CLs are also preferred to spectacle lenses, because of the inevitable ocular movement associated with changing gaze fixation. Young myopic children aged 5 to 16 years of all ethnicities are our target patients. There is a large market as there are 40 million myopic children in Asia and 8 million in the United States.

Professor Saw Seang Mei
Professor Saw Swee Hock School of Public Health
National University of Singapore

Prof Saw Seang Mei received her MBBS degree from the National University of Singapore, and MPH and PhD from the Johns Hopkins Bloomberg School of Public Health. Her research interests include the epidemiology, clinical interventions and genetics of myopia. She has published more than 250 peer-reviewed international journals, including Lancet and JAMA, and is currently PI /co-PI of grants totalling over $15 million from the NMRC, NRF, NIH and NHMRC (Australia). She is an Editorial Board member of Investigative Ophthalmology and Visual Science, Ophthalmic and Physiologic Optics, the Annals Academy of Medicine (Singapore) and the Asia-Pacific Journal of Ophthalmology. She is the recipient of the Edward Clarence Dyason Universitis 21 Award, Garland W. Clay Award, Great Women of

our Times Award (Science and Technology), Singapore, American Academy of Ophthalmology Achievement Award and the Faculty Research Excellence Award.

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12 Microfluidics Biochip for Cancer Diagnosis

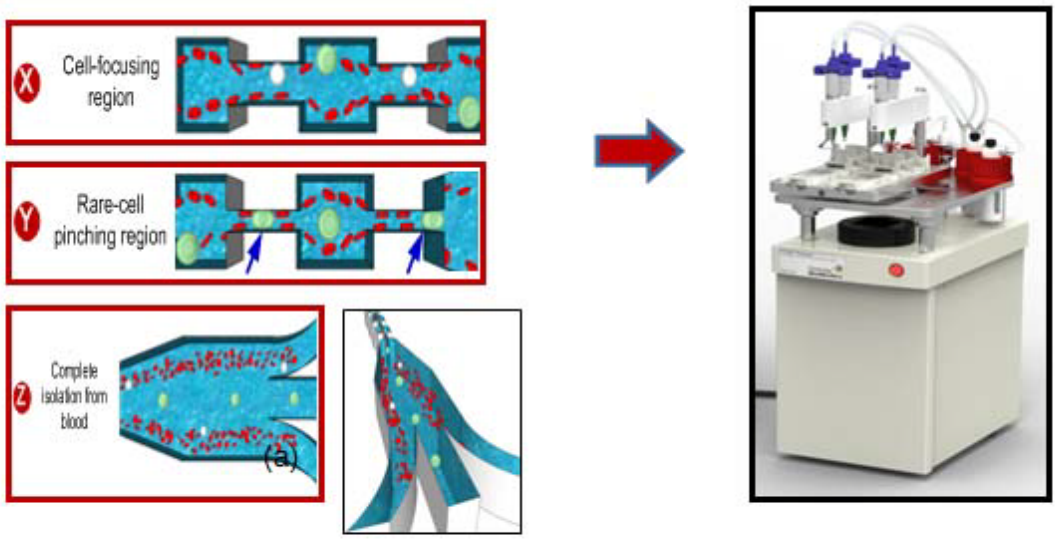
Cancer accounts for over 7.6 million deaths annually but early diagnosis and treatment can drastically reduce its mortality rate. Circulating tumor cells (CTCs) are cancer cells that have been shed from the primary tumour to travel to distant sites to form secondary tumours during metastasis. The presence of CTCs in peripheral blood of cancer patients can act as important markers for early detection, cancer staging and even the monitoring of cancer treatment. Also, access to these CTCs can allow pharmaceutical companies to identify important molecular targets for the development of anti-cancer drugs.

However, the number of CTCs in blood is extremely low (as few as 1 per billion red blood cells or just 5 cells per 1ml of blood) making their enumeration and isolation from blood technologically challenging. Current techniques use antibodies and biomarkers to target specific surface proteins on CTCs to identify and capture these cancer cells.

However, as the expression of surface proteins is not uniform across all CTCs, such methods are not effective as they can only capture a subpopulation of CTCs that expresses the selected specific protein. Also, the use of antibodies means it may not be able to retrieve viable or live cancer cells.

The team has recently developed an ultra-high throughput size-based separation method to isolate and separate live CTCs from blood in a microfluidic deviceby using inertial microfluidics principles (Fig. 1).

The technique, which does not use biomarkers or antibodies, makes use of the large difference in cell size and stiffness between CTCs and other blood components to separate CTCs from blood cells as blood travels through a specially designed long microfluidic channel (see Fig.1 (a) regions X & Y). This biochip offers high-throughput sorting and collection allowing easy retrieval of the larger and stiffer live cancer cells (see Fig. 1 (a) region Z) for downstream studies such as single cell and genetic analysis.



(a) (b)

Fig. 1 (a) Layout of patent pending microfluidic biochip showing flow of blood cells with CTCs (in green) being isolated into centre outlet in region Z, and (b) platform to operate biochip (courtesy of Clearbridge Biomedics).

This innovative yet easy-to-use device can be the next generation of non-invasive 'liquid biopsy' as cancer cells can now be collected from blood for analysis rather than through the painful process of needle biopsy. In this project, we intend to validate the biochip with clinical samples and develop a pre-clinical prototype towards commercialization by partnering with Clearbridge BioMedics, a Singapore based early stage onco-diagnostic company.

Professor Lim Chwee Teck
Mechanobiology Institute
Department of Bioengineering & Department of Mechanical Engineering
National University of Singapore

Professor Lim Chwee Teck is a Professor at the Departments of Bioengineering and Mechanical Engineering at NUS. He is also a Principal Investigator of the Mechanobiology Institute. Prof Lim heads the Nano Biomechanics Lab which conducts research in cell and molecular biomechanics and mechanobiology of human diseases as well as the development of cell mechanics-based microfluidic devices for disease detection and diagnosis.

Prof Lim has authored or co-authored more than 180 journal papers (including 30 invited/review articles), 17 book chapters and also delivered over 175 talks. He is currently on the editorial boards of 11 international journals. Prof Lim has recently been elected as a Council Member of the World Council for Biomechanics. He has won several research awards including the President's Technology Award, Faculty Research Award, IES Prestigious Engineering Achievement Award, highly-cited author and paper awards as well as Best Paper awards in international conferences. His research was cited by the MIT Technology Review magazine as one of the top 10 emerging technologies of 2006 that will "have a significant impact on business, medicine or culture".

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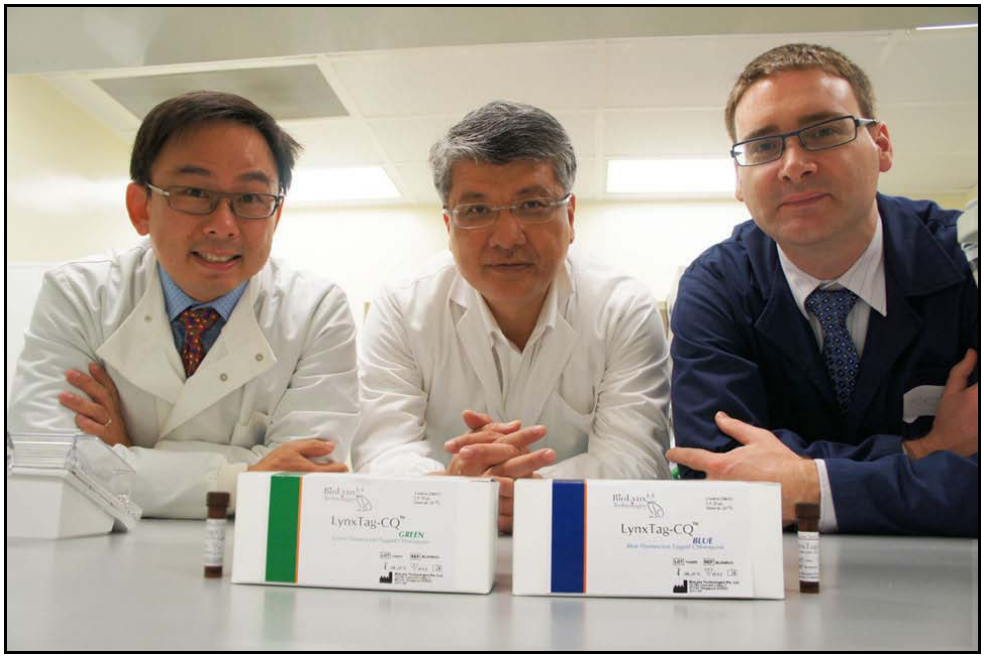
ANNEX E

THREE COMERCIALISED POC PROJECTS

1 Shimmering with promise



From Left to Right: Dr. Kevin Tan, Scientific Director, Biology;
Mr. Theodore Tan, Managing Director; Dr. Martin Lear, Scientific Director, Chemistry.

It's not often that you describe a scientific invention as shimmering with promise but LynxTag-CQ™ is quite literally that. For LynxTag-CQ™ is the fluorescent-labelled chloroquine molecule that Drs Martin Lear and Kevin Tan have created to help researchers in the fight against malaria. Chloroquine is a drug that has been used in the treatment of malaria since 1947 and now when attached to a fluorescent marker to generate LynxTag-CQ, researchers can use it to visualise intracellular drug-cell interactions more easily.

But malaria researchers are not the only ones who will find LynxTag-CQ™ useful. Given that chloroquine is also used to treat immune diseases, cancer and other viral infections, there is potential for using LynxTag-CQ™ to study the mechanisms of other diseases at a cellular level as well. As recipients of NRF's 3rd Proof-of-Concept (POC) grant call, Dr Martin Lear and Dr Kevin Tan, both of NUS, have taken a further step to commercialise the LynxTag technology via the launch of a biotech company, BioLynx Technologies Pte Ltd, at TechVenture 2011 in October. BioLynx will focus on further development and commercialisation of the LynxTag technology platform to other drugs and diseases including cancer as well as microbial and viral diseases.

Since its inception, BioLynx Technologies has been distributing free samples of LynxTag products to the international malaria community. Large-scale production is underway and the company expects to sell its products by January 2012.

Through the incubator system at The Biofactory at Singapore Polytechnic, the company has identified and targeted key players in the malaria community to champion its products internationally. Initial packaging and commercialization tasks are thus largely complete.

The team is further developing the next generation of malaria products for research-use through a strategic research collaboration agreement (RCA) with the Industry Liaison Office (ILO) at NUS. The BioLynx team, a strong mix of NUS-graduated chemists, biologist and bioengineers, is working hard and looking forward to a fruitful 2012.

2 Plugging the biologics supply gap

(From Left to Right) Dr. Mariano A. Garcia-Blanco, Founder, Mr. Rene Jaeggi, Managing Director and Dr. Vasudevan Subhash, Founder of SABio. Photo Creative by Larry Lim, Marco Studio

Researchers in Singapore used to tear their hair off at the 5-6 weeks' delay in overseas supply of biologics needed for their experiments. Not anymore. With the launch of local biotech company, Singapore Advanced Biologics (SABio), the way is open for high-quality and affordable reagents to be delivered to their doorsteps fuss-free, and most importantly, on time. Indeed, the tardiness of overseas providers is the impetus behind the establishment of SABio. As explained by its co-founder Professor Mariano Garcia-Blanco, "If Singapore wants to be a top-notch biomedical hub, we should not lose out on the waiting time incurred from the procurement process".

Professor Garcia-Blanco and SABio's other founder Associate Professor Subhash Vasudevan, are researchers at Duke-NUS Graduate Medical School and both firmly believe that the timely supply of "Made in Singapore" biologics will make a critical difference to local scientists in their discovery process.

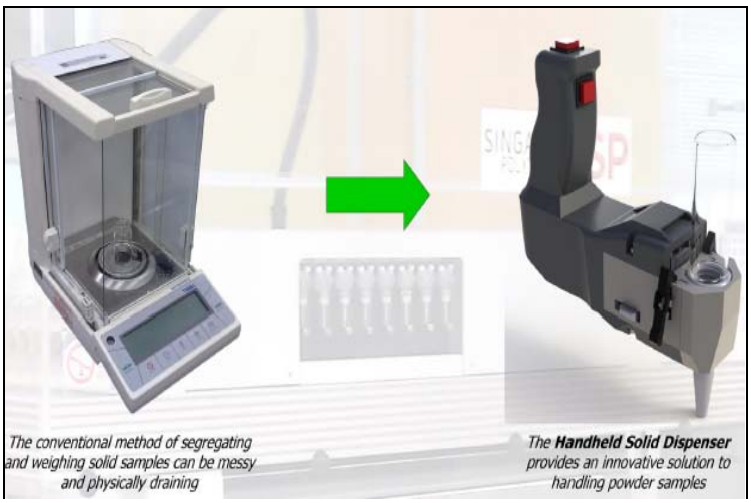
Launched on 12 April 2011, SABio also plans to sell its products to the region by offering the shortest turnaround of R&D reagents. For a start, it will focus on the design, synthesis and validation of specialised biologics, with particular emphasis on siRNA, DNA and antibodies.

Thanks to the support of Duke-NUS, BioVeda Capital and SingHealth, the company is on solid ground. The deans at Duke-NUS provided SABio with the clinicians

network for collaborative opportunities while SABio also benefited from an investment from BV Healthcare II, a life science fund managed by BioVeda Capital, as well as an equity investment from SingHealth.

Besides plugging the biologics supply gap, SABio hopes its success will have a knock-on effect on other start-ups in Singapore. Said Dr Rene Jaeggi, SABio's managing director: "We want SABio to not only support the vision of making Singapore a research and biomedicine hub, but also capture the 'multiplier' for R&D expenditure in the biomedical sciences".

3 Light, handy, accurate



Principal Investigator Dr Ken Lee (centre, front row) with his team

Imagine the daily hassle researchers go through putting solids of equal mass into multiple containers at a lab. But that'll soon be a thing of the past – thanks to the Handheld Solid Dispenser, which Dr Ken Lee's team from Singapore Polytechnic has developed from the National Research Foundation Proof-of-Concept (NRF POC)'s 2nd grant call in 2010.

Using a motor-driven Auger (shaft), the portable handheld dispenser not only takes the tedium out of dispensing, but also enables researchers to handle hazardous solid chemicals in a safe way.

Dr Lee's team has put the prototype through numerous tests and achieved an impressive solid dispensing error of 5% or less. In addition, its ergonomic design allows users to avoid contamination of materials while its smart detachment design facilitates the weighing of different solid materials.

The project's success has wide implications. Being portable, it can be used in numerous places – from laboratories and hospitals to pharmacies and traditional Chinese medicine clinics. As a first step to eventual commercialisation, the team conducted demonstrations at various research institutes and institutes of higher learning. Further strides were made when it signed a licensing agreement with Xentiq Partners, who has the expertise and resources to further develop the Dispenser into a refined product ready for production and market launch.

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