PRESS RELEASE

25 January 2010

ELEVEN MORE TOP YOUNG SCIENTISTS AWARDED NRF RESEARCH FELLOWSHIPS TO CONDUCT CUTTING-EDGE RESEARCH IN SINGAPORE

- 11 *outstanding young scientists selected for the prestigious NRF Research Fellowship Award, out of 221 applications received from around the world*
- *Latest batch brings total number of NRF Research Fellows to 29*

1 On the recommendation of its Scientific Advisory Board (SAB) (see **Annex A** for list of members), 11 young scientists have been named National Research Foundation (NRF) Research Fellows. These Research Fellows will join the ranks of 18 others since the prestigious award was started in 2007.

2 The aim of the NRF Research Fellowship is to build a pool of young, brilliant, passionate researchers in various fields of science and technology to add to Singapore's growing research talent pool. The NRF Research Fellowship will provide each Research Fellow with up to US$1.5 million in research funding support over three years to perform cutting-edge research in Singapore, with the possibility of receiving a second round of three-year funding (see **Annex B** for a write-up on the NRF Research Fellowship programme).

3 The NRF received a total of 221 applications from researchers of various nationalities from all over the world, including applicants from as far away as South America. These scientists are currently doing research as post-doctoral fellows in top universities such as Harvard, Cambridge, Caltech and Keio. After two rounds of stringent evaluation, 21 candidates were short-listed to come to Singapore for technical presentations and an interview by the NRF Scientific Advisory Board. Eleven were finally selected as recipients of the NRF Research Fellowship (see **Annex C** for a brief write-up on the awarded Research Fellows).

4 Mr Teo Ming Kian, Permanent Secretary (National Research & Development) said: "The NRF Research Fellowship is an important initiative that the NRF has put in place since 2006 to advance research, innovation and enterprise in Singapore. The Fellowship provides an excellent opportunity for bright young researchers to pursue their passion in scientific research in Singapore. They will be able to lead a research team as principal investigator and be part of the vibrant R&D environment here. They will also help build a vibrant research culture here and encourage more local students to take on a research career. I am pleased that as the programme enters its third year, we are seeing a significant increase in the number and calibre of applicants. The two earlier batches of 18 NRF Research Fellows have all started their research and are already showing promising results. I am sure we will see similar levels of research excellence with this third batch of awardees."

5 Nobel Laureate Prof Aaron Ciechanover, of the Technion-Israel Institute of Technology and a member of NRF's SAB said: "We are very impressed with the quality of the candidates we interviewed for the NRF Fellowship – they are easily as good as any candidates the SAB could have interviewed for the best leading universities and research institutes worldwide. I am quite sure we're going to see some very excellent scientific research coming out from their work in the coming years."

6 Dr Christian Nijhuis, who is from the Netherlands and currently a postdoctoral research fellow at Harvard University said: "To be selected for the NRF Research Fellowship programme makes it possible to perform challenging and cutting edge research. This award is the best opportunity a young investigator can wish for to pursue his ideas and to make a difference."

7 Dr Teo Yik Ying, who is from Singapore and currently a postdoctoral genetic statistician at the Wellcome Trust Centre for Human Genetics said: "It is a great privilege to be awarded the prestigious NRF Research Fellowship. This will provide vital resources for building a team with analytical expertise in the genetics and genomics of common human diseases and infectious diseases, particularly in research areas where Singapore has strategic advantages given its location in South-East Asia and the multi-racial demography."

8 This is the third group of scientists that are awarded the NRF Research Fellowship. They will begin their research shortly in their respective host universities in Singapore. The first two groups of Research Fellows have settled well into the research environment and are already producing promising results. An example is Dr Barbaros Oezylimaz, an Assistant Professor at the NUS Physics department and a NRF Research Fellow from the pioneer batch. Dr Oezylimaz has successfully demonstrated the proof-of-concept viability of using graphene as a memory device. This is an important first step towards manufacturing memory that is significantly denser and faster than the magnetic memory used in today's hard drives. This research in Singapore placed him as one of the top innovators in the world under 35 years[1].

9 Another research project, led by Dr Gijsbert Grotenbreg of NUS, aims to develop a library of MHC (Major Histocompatibility Complexes) reagents specific to the South East Asian population, which hitherto, had not been extensively studied. With his NRF Fellowship grant, Dr Grotenbreg has developed 9 MHC reagents specific to Singapore in collaboration with the hospitals. This has direct implication on the development of drugs and vaccines for major diseases like SARS, Hepatitis-B and Dengue for the Asian population.

(see **Annex D** for an update of Research Fellows)

[1] As identified by the MIT Technology Review Magazine in 2009

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, funds strategic initiatives, builds up R&D capabilities and capacities through nurturing our own and attracting foreign talent, and coordinates the research agenda of different agencies to transform Singapore into a knowledge-intensive, innovative and entrepreneurial economy. It provides secretariat support to the Research, Innovation and Enterprise Council (RIEC), chaired by the Prime Minister. A five-year budget of S$5 billion has been allocated to the NRF in 2006 to achieve this mission.

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

Selection Panel for the NRF Research Fellowship 3rd Call

Members	
1.	**Dr Curtis R Carlson (Co-chairman)** President and CEO, SRI International
2.	**Prof Ulrich Suter (Co-chairman)** Emeritus Professor Swiss Federal Institute of Technology Zurich
3.	**Prof Rita Colwell** Distinguished University Professor, University of Maryland College Park and Johns Hopkins University Bloomberg School of Public Health, USA
4.	**Prof James Foley** Stephen Fleming Chair in Telecommunications and Professor, Interim Dean, College of Computing, Georgia Institute of Technology, USA
5.	**Prof Dr Louis-François Pau** Professor, RSM Erasmus University, Netherlands and Copenhagen Business School, Denmark
6.	**Prof Robert H Grubbs** Professor of Chemistry, Caltech Noble Laureate in Chemistry (2005)
7.	**Prof Sir Roy Anderson** Chair of Infectious Disease Epidemiology, Faculty of Medicine Imperial College, London
8.	**Michael Idelchik** Vice-President, Advanced Technologies GE Global Research
9.	**Dr Anthony Tether** Distinguished Fellow Council on Competitiveness (COMPETE)
10.	**Prof Sir Richard Friend** Cavendish Professor of Physics University of Cambridge
11.	**Prof Shankar S. Sastry** Dean, College of Engineering UC Berkeley
12.	**Prof Aaron Ciechanover** Distinguished Research Professor The Rappaport Faculty of Medicine and Research Institute Technion-Israel Institute of Technology Noble Laureate in Chemistry (2004)

Annex B

Fact sheet on the NRF Research Fellowship

Aim

To attract promising young scientists from all over the world to conduct independent research in Singapore.

Background

The NRF Research Fellowship is a globally competitive scheme that seeks to build up a pool of bright, passionate researchers in various fields of science and technology to augment Singapore's burgeoning research talent pool. It provides attractive funding to brilliant, young scientists to carry out independent, cutting edge research in Singapore. Appointees will be offered concurrent faculty positions at local universities or other research organisations.

Terms of the NRF Research Fellowship

1. The NRF Research Fellowship is open to all areas of science and technology with no quota on specific disciplines.
2. The NRF Research Fellowship, targeted at young talented postdoctoral fellows/researchers below the age of 40, is open to all nationalities.
3. Appointed Fellows will be given complete independence and freedom to pursue their own research directions.
4. Appointed Fellows will be free to choose the local host organisations to work in.
5. Each appointed Fellow will be provided with a research grant of up to US$1.5 million over three years with the option of a second round of three-year funding provided at the discretion of NRF to support projects that exhibit a high likelihood of a research breakthrough.
6. The salary of an appointed Fellow will be covered over and above the research grant, pegged to that of an Assistant Professor at a local university.

Identification and Selection Processes

NRF will invite applications once a year through open advertisements in prestigious scientific publications, as well as tap on local research organisations and other contacts to identify potential candidates.

A Local Evaluation Panel comprising representations of local research organisations and universities will shortlist applicants who qualify. Short-listed candidates will be invited to Singapore to present their proposals and visit local research organisations to identify potential hosts. The NRF Scientific Advisory Board will interview the short-listed candidates and make the final selection of applicants for the awards.

Annex C

Dr Christian NIJHUIS

Dr Christian Nijhuis received his Masters degree in Chemistry from the University of Groningen in 2002, and Ph.D. degree from the University of Twente in 2006 with stipendium “cum laude” (top 5%). Under the direction of Professor David N. Reinhoudt, his doctoral thesis included studies on the surface chemistry of supramolecular assemblies and their use in bottom-up nanofabrication. He is currently a postdoctoral research fellow at Harvard University. His present research interests include nanotechnology, surface chemistry, self-assembly, and molecular electronics.

Dr Nijhuis developed a fabrication technique that made it possible to study charge transport across self-assembled monolayers that are only one molecule thick. He discovered a molecule that could behave as a diode, or as a memory element. These molecular electronic components are only 1-2 nm long, and make it possible to increase the density of data storage. These molecules change the mechanism of charge transport at opposite bias, which, in turn, causes large rectification of currents, or switching. This change in the mechanism of charge transport has not been observed before, or predicted by theory, and can be used to construct two-terminal devices with a variety of electronic functions.

For his research in Singapore, Dr Nijhuis proposes to develop a simple, flexible platform by exploiting the possibilities of self-assembly and supramolecular chemistry in bottom-up nanofabrication to obtain nano-scale devices that are organized at the molecular level. This platform, based on a thin film of metal with magnetic nanostructures self-assembled on it, would allow investigations of the mechanisms of charge transport across molecular structures, and the molecule-induced Kondo-effects by these structures in the thin metal films. These devices would make it possible to study longstanding issues, such as, molecule-electrode interface-effects, or the in real-time formation of Kondo-clouds, but also to study their possible electronic applications in, i.e., switching, spintronics, or rectification.

Dr Fuchou TANG

Dr Tang is a postdoctoral research associate in Professor Azim Surani's lab at Wellcome Trust/CRC Gurdon Institute, University of Cambridge. He has worked on understanding the genetic and epigenetic regulation of pluripotency, totipotency, and reprogramming.

His main research interest is to understand pluripotency- the ability of an individual mammalian cell to differentiate into all two hundred types of cells in an organism. He has naturally reprogrammed post-implantation epiblast cells back to pluripotent embryonic stem cells without any of the four Yamanaka reprogramming factors and traced the dynamics of the key epigenetic events during the reprogramming process. He also developed two universal functional screening approaches: (1) deep-sequencing-based single cell mRNA-Seq transcriptome analysis technique and (2) single cell microRNA expression profiling technique, both of which can be used to any cell types and any stage of embryonic development with as tiny amount of materials as an individual cell.

For his research programme in Singapore, Dr Tang plans to address the following related topics:

(1) Epigenetic regulation of reprogramming of post-implantation Epiblast cells and Epi-stem cells back to authentic pluripotent ES cells;
(2) Relation between pluripotency and self-renewal ability (the ability of an ES cell to unlimitedly proliferate whereas keeping pluripotency at the same time) of mouse ES cells;
(3) Transition from totipotency (the ability of an individual cell to form an whole organism) to pluripotency during the development of mature oocyte (and zygote) to ICM in blastocysts.

This will potentially help to improve the efficiency of reprogramming of somatic cells to iPS cells, make the transgene-free iPS cells and help to derive epigenetically 'normal' iPS cells. It will also help to set up authentic pluripotent human ES cells as equivalent of mouse ES cells. This will improve the stem cell research in Singapore and will potentially lead to patents related to non-genetic manipulated iPS technology.

Dr Ronen ZAIDEL-BAR

Dr Ronen Zaidel-Bar completed his B.A. with high honors during his vacations from army service, and in 2000 enrolled at the Weizmann Institute of Science, where he joined the lab of Prof. Benjamin Geiger. In 2005, he completed his PhD, which addressed how force regulates cell-matrix adhesions. Dr Zaidel-Bar wanted to continue exploring the molecules and mechanics of cell adhesion, but in the context of a whole organism. He chose to spend his postdoc training to learn the ins and outs of the model organism *C. elegans*. In 2006 he joined the lab of Prof. Jeff Hardin at the University of Wisconsin – Madison, where he has been applying genetics, as well as live embryo imaging, to the study of cell-cell junction regulation in development.

Dr Zaidel-Bar's interest lies in the cytoskeleton (the cell's "skeleton"), cell adhesion, and the complex structures that connect the two (focal adhesions and adherens junctions). In particular, he is interested in how these networks are regulated to allow a cell to respond to its environment and promote cell shape changes and migration. Working with Prof. Geiger and Prof. Zvi Kam he discovered important stages in the assembly of focal adhesions and uncovered the roles of force and tyrosine phosphorylation in this process. Pioneering high resolution live cell imaging under shear flow he elucidated novel molecular mechanisms involved in mechanotransduction. Finally, in collaborations with students from Prof. Uri Alon's lab, he undertook a more holistic approach to adhesion, constructing and analyzing the "adhesome", a systems biology view of cell-matrix adhesion.

Dr. Zaidel-Bar's work was published in prestigious journals (JCS, NCB, JCB) and was presented in numerous international meetings. For his postdoctoral training he obtained fellowships from the U.S. National Institute of Health and the Machiah Foundation.

Dr. Zaidel-Bar's interest in "the big picture" continued during his postdoc, when he published papers on the evolution of complexity and on switches in the adhesome. Since 2009 he is a contributing member of 'Faculty of 1000' in the cell adhesion section.

Dr Yik Ying TEO

Dr Teo received his DPhil in Statistics in 2006 from the University of Oxford. Over the past 3 years, he has been a postdoctoral genetic statistician at the Wellcome Trust Centre for Human Genetics, focusing on the development and application of statistical methodologies in understanding the genetic etiology of common human diseases and complex traits. During this time, he was also a member of two international consortiums: the Wellcome Trust Case Control Consortium (WTCCC) and the Malaria Genomic Epidemiology Network (MalariaGEN) Consortium. He is currently also the Chair of the Analysis Group for the Singapore Genome Variation Project (SGVP), a collaborative effort between NUS and A*STAR established to survey the genetic differences between the Chinese, Malay and Indian ethnic groups in Singapore.

As a member of the WTCCC, Dr Teo co-developed a novel method for the purpose of calling genotypes from intensity data which ultimately led to the Consortium flagship publication in Nature. He was also approached by the Sanger Institute to establish a novel approach for another genotyping technology by Illumina, which led to the wide-spread use of the ensuing algorithm in major centers of genomics research, including the Sanger Institute and the Broad Institute. A significant aspect of his work has been to investigate the consequences of human diversity in genetic studies, which stems from his interest in understanding variations in the patterns of correlation in the human genome, as well as the genetic differences between people from different populations. This led to the successful establishment of the Singapore Genome Variation Project, as well as the development of several novel statistical approaches to investigate inter-population genomic differences. In particular, he was the lead author and analyst for a landmark publication in Nature Genetics exploring the application of sophisticated statistical techniques with trans-population data for identifying the genetic factors that influence susceptibility to severe malaria.

For his research in Singapore, he will be developing two methods: for exploring the phenomenon of natural selection that has occurred very recently in human and pathogens; and for establishing the biological mechanisms underpinning the genetics of diseases and traits. The former is particularly relevant for understanding the molecular basis of drug- and treatment-resistance in pathogens, and for establishing the genetic basis of human adaptation to hostile environments and climates. The latter method will address the current roadblock in disease genetics by identifying the exact positions in the human genome that are causally responsible for higher susceptibility to diseases and traits.

Dr Sang Hyun LEE

Dr. Lee received his bachelor's degree in 1997 from the Korea University-Seoul and Ph.D. degree in 2002 from the University of Missouri-Columbia, U.S.A., majoring in biochemistry. After his doctoral research, he joined Professor Frank McCormick's laboratory at the University of California-San Francisco (UCSF) Comprehensive Cancer Center. He is currently at the Keio University School of Medicine in Tokyo, Japan, as a visiting scientist, to conduct his collaborative research in the molecular mechanisms of mitotic progress and checkpoint signaling in human cancers.

During his postdoctoral research at UCSF-Cancer Center, Dr Lee elucidated the mechanisms of how the molecular machineries in various aspects of cellular processes, including cell cycle checkpoints, gene transcription, protein synthesis and degradation are involved in regulation of cell proliferation, and how deregulation of such processes would lead to uncontrolled cell growth in human cancers. He has also been involved in the discovery and development of biomarkers to support preclinical and clinical development of a novel anti-cancer drug in an extensive collaboration with Daiichi-Sankyo Co, Ltd, Tokyo, Japan. His research discoveries have been published in a number of distinguished international journals, and were presented at international conferences, including the 2007 American Association for Cancer Research (AACR), and internationally reputable universities and institutes. He was also nominated for the 2007 Dean's postdoctoral prize lecture at the UCSF and awarded with the Carol Franc Buck Fellowship.

Dr. Lee's research in Singapore aims at understanding the molecular mechanisms of tumorigenesis and developing novel therapeutic intervention strategies. Abnormal chromosome content, also known as aneuploidy, is the most common characteristic of human solid tumors. A major cause of such abnormality is by erroneous chromosome segregation during the mitotic cell division. Of clinical importance, interrupting a mitotic progress of tumor cells using anti-microtubule toxins (e. g. taxol, the best-selling cancer drug ever manufactured) is one of the most successful strategies to treat human cancers, and has become the front-line anti-cancer therapy. However, drug resistance and undesirable toxicity are common to this class of drugs, limiting their clinical efficacy and highlighting the need for developing a new generation of molecularly targeted drugs that inhibit specific proteins functioning essentially in mitosis. In this respect, his recent research has uncovered a potential anti-mitotic target, and he is currently developing a strategy to selectively inhibit such mitotic protein. Ultimately, his proposed research goal is to evaluate the effect on tumor suppression in combination with current anti-microtubule and -mitotic drugs to improve their anti-cancer therapeutic efficacies in clinic.

Dr Adam D SWITZER

Dr Adam Switzer is a sedimentologist with interests in coastal geomorphology, palaeoenvironments and natural hazards and 10 years research experience. The overarching driver of his research is a desire to use geomorphological and sedimentological techniques to solve contemporary problems at local, regional and international scales. His main research interest lies in using coastal stratigraphy to define the recurrence interval of catastrophic marine inundation events (tsunami or large storms). After obtaining a BSc and PhD in Geosciences from the University of Wollongong, Australia he accepted an Endeavour Australia Cheung Kong fellowship to study at The University of Hong Kong where he held positions as Post-Doctoral Fellow and Centenary Research Assistant Professor successfully gaining more than $HK1.5M in funding as a P-I and more than $HK7.5M in funding as a Co-I. He has recently taken up a position as Principal Investigator at The Earth Observatory of Singapore.

The P-I is an internationally recognized expert in tsunami and storm deposits and associated sedimentation. His most significant contributions to the field include the first study of modern storm deposits from the Australian southeast coast; the recognition that immature heavy mineral suites in coastal sandsheets may indicate tsunami deposition rather than storm deposition in coastal settings; the recognition of an erosional signature of large scale washover of coastal dunes using Ground Penetrating Radar; initial evaluation of the sedimentary processes associated with the 2004 Indian Ocean tsunami on the southeast coast of India and a definitive review and re-analysis of large boulder accumulations in coastal settings on the southeast Australian coast.

Dr Switzer's research program is focused in Asia and currently involves collaborations with 7 Asian nations. Globally, studies of the sedimentation and geomorphic affects of tsunami and storm surge have gained increasing popularity since the Indian Ocean tsunami of December 2004 and Hurricane Katrina in 2005. Recent research by the P-I and others on overwash deposits from many coastlines in Asia show that looking at the recurrence interval of such events is inherently complex. Such work is logistically difficult, time consuming, labour intensive and costly. Singapore is one of few places in Asia where the resources are available to make this research possible within the timeframe suggested.

Dr Yanli ZHAO

Yanli Zhao joined Professor J Fraser Stoddart research group at University of California, Los Angeles (UCLA) as a postdoctoral scholar in October 2005, after he received his PhD degree in Physical Chemistry from Nankai University, P R China in July 2005. He is currently a joint postdoctoral scholar in Professor J Fraser Stoddart research group at Northwestern University and in Professor Jeffrey I Zink research group at UCLA, holding the NanoPacific Holdings fellowship.

During his postdoctoral studies at UCLA and Northwestern University, he conducted research in the broad areas of organic chemistry and nanomaterials, with an emphasis on biocompatible mechanized nanoparticles for drug delivery, mechanically interlocked molecule-based nanomaterials, novel metal-organic frameworks, and noncovalent functionalization and device fabrication in the domains of single-walled carbon nanotubes. He has made several significant contributions during his research. This includes opening a new access for the application of mechanically interlocked molecules into drug delivery systems and designing and fabricating mechanized silica nanoparticles that are able to retain drug molecules and then release them in response to external stimuli, in order to achieve controlled and on-demand release of anticancer drugs into cancer cells. He has published more than 40 peer-reviewed papers in scientific journals such as *Science*, *Journal of the American Chemical Society*, *Accounts of Chemical Research*, *Angewandte Chemie*, *Advanced Materials*, etc.

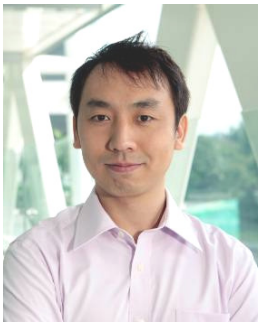
The research program aims to address some of the technological needs of today's society, such as general approaches for controlled drug delivery, responsive nanomaterials, and sensing devices for medical diagnostics and gene-chip technologies. An interdisciplinary approach to investigate the emerging problems at the forefront of organic chemistry will be used and will branch out into the related fields of biological, materials, and medicinal chemistry. Through the research, the experimental investigation and the practical application will come together in a unique way to provide a better and fundamental understanding of molecular movement and recognition processes in chemical and biological systems.

Dr Joanne YEW

Dr Yew's graduate and post-doctoral research focuses on identifying the molecular and neural substrates underlying behavior. She received her Ph.D. in Neuroscience in 2003 from the University of Wisconsin-Madison (USA). During this time, she developed several mass spectrometry (MS)-based methods that enabled the discovery of novel neuropeptides involved in the locomotion behavior of a nematode, *Ascaris suum*. As a post-doctoral fellow in the laboratory of Prof. Edward Kravitz (Harvard Medical School, Boston, MA, USA) from 2004 - 2009, she used a combination of novel MS-based methods and genetic tools in order to identify and characterize neuropeptides and pheromones mediating complex social behaviors of the fruit fly, *Drosophila melanogaster*. This work led to the development of two new methods for rapid and high sensitivity pheromone profiling of insects and to the discovery of a new *Drosophila* male sex pheromone. Dr Yew is currently a visiting scientist at the University of Münster (Germany). In collaboration with laser mass spectrometry researchers, she is applying different MS-based methods to examine the pheromone profiles of *Drosophila* mutants and other *Drosophila* species. She is also exploring technology that will enable high resolution molecular imaging of pheromones from the surface of insects and pheromone analysis of living insects.

Her research interests focus on the role of chemical communication in social behavior and evolution. In many species of insects, pheromones mediate complex interactions such as kin-recognition, mate-finding, and aggression. She is intrigued by the possibility of integrating cutting-edge mass spectrometry technology with behavioral studies in order to provide real-time detection of pheromones from awake, behaving animals. Understanding what pheromones do and how they are detected can be a way to identify neural pathways that underlie social behavior. Comparing pheromone expression across related species of insects will provide understanding into how chemical communication can contribute to the formation of new species.

Three major goals of Dr Yew's research are to (i) discover novel pheromones used by fruit flies and mosquitoes (*Aedes aegypti)*; (ii) identify the neural circuits underlying pheromone perception; and (iii) identify the biochemical pathways controlling the production and transport of pheromones. The development of MS-based chemical detection technology for rapid pheromone analysis of insects is central to these goals. These studies could potentially have significant value for Singapore by contributing to the development of species-specific methods for population control of agricultural pests and mosquitoes.



Dr YU Ting

Dr Yu has been working on the Nanoscience and Nanotechnology in the past decade. From 2000 to 2003, he was working on Raman spectroscopy of ferroelectric and ferromagnetic nanomaterials in Raman Lab, Physics department, National University of Singapore. In the following two years, Dr Yu was working on fabrication, characterization and manipulation of metal oxide nanostructures in Colloidal Lab, Physics department, National University of Singapore. In 2005, Dr Yu joined Na nyang Technological University and set up his own Nano Lab. Since then, he has been continuing his work on metal oxide nanostructures and extended his interest on graphene.

Dr Yu's research focuses on the fabrication of metal oxide nanostructures and graphene, investigation of their physical and bio/chemical properties as well as the development of nanodevices. Dr Yu developed a method for the synthesis of metal oxide nanostructures which has the advantages of being substrate-friendly, applicable on a large-scale, morphology-controllable and of low-cost. This has been widely adopted. For the first time, Dr Yu has demonstrated the ability of optical tweezers in the manipulation of nanowires. Based on this strategy, a powerful probe has been developed for the study of nanophotonics. Dr Yu has received many "firsts" in graphene. The studies on uniaxial/local strain and hydrogen plasma effects on graphene have facilitated the development of new approaches for engineering the structure and properties of graphene. Dr Yu's achievements have gained international recognition in the nanoscience and nanotechnology community. He has published more than 95 papers in top international journals, and these have been cited over 930 times (H=17). He has also contributed to two book chapters and has been awarded one patent. Dr Yu and his works have been highlighted by many medias. He received many awards including the Singapore Millennium Fellowship (Singapore), Excellent Award for Research and Innovation (NTU), National Young Scientist Award (Singapore).

Dr Yu will exploit new methodologies for controllable fabrication of novel nanomaterials; investigate fundamental properties of nanostructures; and develop nanoelectronics, nanophotonics and nanophononics based on such nanomaterials. In addition, Dr Yu's research team is currently working on the controllable fabrication of high quality and large yield of metal oxide nanostructures and graphene for energy harvesting, which include Lithium ion batteries, supercapacitors and electrodes for dye-sensitized solar cells.

Dr Swaine CHEN

Since 2004, Dr Chen has been working in the lab of Scott Hultgren, Ph.D. at Washington University School of Medicine in St. Louis, studying urinary tract infections (UTIs). UTIs are extremely common bacterial infections and are mostly caused by strains of *Escherichia coli*.

Dr Chen's work on UTI, *E. coli*, and FimH has demonstrated that looking at evolutionary patterns is a powerful way to understand how bacteria cause disease. It complements existing methods (such as genetics and structural biology), it can be done completely with computer analysis, and it leverages and focuses recent increases in the ability to collect DNA sequences. He plans to combine the UTI system with the resources of the Genome Institute of Singapore (GIS) to create a full computational toolbox that performs an evolutionary analysis on entire genome sequences. New evolutionary methods will be needed to understand the importance of regulation of FimH expression during infection. Furthermore, the newly discovered function of FimH will be targeted to improve current treatment of UTIs. Finally, he will explore whether these new evolutionary methods can accelerate our understanding of other infectious diseases caused by bacteria, viruses, and other pathogens.

The daily activities of numerous sequencing centers throughout the world prove that collecting vast sequence data sets is trivial. Substantially more challenging is to improve the understanding of disease by using this sequence efficiently. Realizing the promise of technological advances (such as DNA sequencing) for human health is imperative and will require new approaches and perspectives. Singapore and the GIS provide a unique environment combining both superb technology and analytical young scientists; Singapore is thus an ideal place to lead the world in this next phase of modern, post-genomic biology.

Dr GAO Yonggui

Dr Gao received his Ph.D in biochemical engineering, Zhejiang University, China. He subsequently moved to the Faculty of Advanced Life Science, Hokkaido University and his research topic was on transcription and translation initiation control. He is currently doing his postdoctoral research on the structure and function of ribosome in the Medical Research Council Laboratory of Molecular Biology, Cambridge, UK.

Dr Gao is interested in the field of DNA/RNA-protein interactions, particularly in the structural and functional research of translation initiation control and protein synthesis by ribosome. He recently discovered a new crystal form from ribosome lacking the subunit L9, that allows crystallization of the ribosome in the presence of GTPase factors. Based on this, the crystal structures of the 70S ribosome with EF-G trapped by fusidic acid in the post-translocational state, and with EF-Tu and aminoacyl-tRNA were solved, respectively. Both structures reveal many significant aspects of ribosome functions at atomic level with regard to elongation, the heart of translation. These results were published in Science and Cell magazine.

For his research project, he proposes to focus on the structure and function of translational factors with ribosome in Singapore, with a further understanding of EF-G function in translation as well as in the post-termination complex with ribosome recycling factor (RRF). In addition to EF-G, the crystal structures of IF2 and RF3 (RF3 displays much sequence similarity to EF-G) bound to ribosome, which can explore molecular details of the two factors with ribosome in both initiation and termination, will be targeted. Understanding the detailed mechanism of ribosome function is important not only as a fundamental problem in biology, but also because many clinically relevant antibiotics target the ribosome.

Annex D

NRF Research Fellows (2008 & 2009)

S/N	Research Fellow	Research Topic	Host Institution
1	Dr Eugene Makeyev	Understanding molecular mechanisms of post-transcriptional control in neuronal differentiation: a link between microRNAs, alternative pre-mRNA splicing and mRNA quality control	Nanyang Technological University
2	Dr Hong Soon Hyeok	Aqueous [2+2+2] Cyclotrimerization of Alkynes as a more versatile "click" reaction	Nanyang Technological University
3	Dr Christos Panagopoulos	Novel Quantum phases on the border of Magnetism	Nanyang Technological University
4	Dr Zhou Jianrong	Asymmetric catalytic [4+1] Cycloadditions between Dienes and Carbene Precursors	Nanyang Technological University
5	Dr Gijsbert Grotenbreg	Conditional ligands for class 1 MHC products; application to epitope discovery for Dengue and respiratory syncytial virus-specific CD8+ T-cells	National University of Singapore
6	Dr He Yingxin	Morphological and molecular characterization of a bi-lobed structure required for organelle biogenesis and cytokinesis in Trypansoma brucei	National University of Singapore
7	Dr Barbaros Ozyilmaz	Phase coherent charge and spin transport in nanostructured Graphene and ferromagnet hybrid devices	National University of Singapore
8	Dr Yeo Yee Chia	Strain engineering for nextgeneration semi-conductor manufacturing	National University of Singapore

9	Dr Jose Dinenny	Dissecting transcriptional networks controlling cell-type specific responses to salt stress in the root of Arabidopsis	Temasek Life Sciences Laboratory
10	Dr. Chi Yonggui, Robin	Understanding molecular mechanisms of post-transcriptional control in neuronal differentiation: a link between microRNAs, alternative pre-mRNA splicing and mRNA quality control	Nanyang Technological University
11	Dr. Chen Xiaodong	Aqueous [2+2+2] Cyclotrimerization of Alkynes as a more versatile “click” reaction	Nanyang Technological University
12	Prof. Wang Hongyan	Novel Quantum phases on the border of Magnetism	Duke-NUS Graduate Medical School
13	Dr. Lok Shee Mei	Asymmetric catalytic [4+1] Cycloadditions between Dienes and Carbene Precursors	Duke-NUS Graduate Medical School
14	Dr. Naohiko Yoshikai	Conditional ligands for class 1 MHC products; application to epitope discovery for Dengue and respiratory syncytial virus-specific CD8+ T-cells	Nanyang Technological University
15	Dr. Xiong Qihua	Morphological and molecular characterization of a bi-lobed structure required for organelle biogenesis and cytokinesis in Trypansoma brucei	Nanyang Technological University
16	Prof. Frederique Oggier	Phase coherent charge and spin transport in nanostructured Graphene and ferromagnet hybrid devices	Nanyang Technological University
17	Dr. Edith Elkind	Strain engineering for next-generation semi-conductor manufacturing	Nanyang Technological University
18	Dr. Hilmi Volkan Demir	Dissecting transcriptional networks controlling cell-type specific responses to salt stress in the root of Arabidopsis	Nanyang Technological University

NRF RFs (2008): 1-9
NRF RFs (2009): 10-18