9th Annual
AUSTRALIA - CHINA
Symposium

22 - 24 July 2012

ON HEALTHY AGEING:

New Approaches from Genomics, Stem Cells and Smart Technologies

Australian Academy of Science

ATSE
Australian Academy of Technological Sciences and Engineering (ATSE)

Australian Government
Department of Industry Innovation, Science, Research and Tertiary Education

CHINESE ACADEMY OF SCIENCES

Welcome message

The Australian Academy of Science and the Australian Academy of Technological Sciences and Engineering are pleased to welcome the delegation from the Chinese Academy of Sciences that will participate in the **9th Australia-China Symposium - Healthy Ageing: New approaches from genomics, stem cells and smart technologies**, in Canberra, 22-24 July 2012.

The Chinese delegation is being led by Professor Chunli Bai, President of the Chinese Academy of Sciences. The Academies value Professor Bai's involvement and support for these joint Academies' symposia, which have been held annually since 2004 in China and Australia, on topics of national importance such as energy, water, biotechnology, and sustainability.

At the symposium, Chinese and Australian researchers will consider the burden of disease and present new advances in infectious diseases; stem cells and regenerative medicine; genomics and personalised medicine; and medical bionics and nanotechnology.

Healthy ageing is a societal challenge common to both our economies. People around the world are living longer, and looking to have healthier, more active and independent lives while ageing. There is considerable potential for China and Australia to lead the region in providing innovative responses to this challenge and to reduce the economic and social burden on families, communities and nations.

This symposium will lead to clearer understandings of the interests and capabilities of Australia and China in areas of healthy ageing. The conclusions reached by the participants will provide a platform for enhancing collaboration between the two countries through innovative science, technological and engineering solutions.

The Australian Academies are delighted to be hosting this meeting and wish to thank the Australian Department of Innovation, Industry, Science, Research and Tertiary Education as well as the Chinese Academy of Sciences for their continued support, and, in particular, for funding this event. We also wish to acknowledge the strong support of the Chinese Embassy in Canberra.

Professor Suzanne Cory AC PresAA FRS
President
Australian Academy of Science

Professor Robin Batterham AO FREng FAA FTSE
President
Australian Academy of Technological Sciences and Engineering

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Sunday, 22 July 2012

1545	Arrival of Symposium participants
1600 – 1630	**Official opening and welcome by the Presidents of the Academies:** **Professor Suzanne Cory** President of the Australian Academy of Science **Professor Mary O'Kane** Vice President of the Australian Academy of Technological Sciences and Engineering **Professor Chunli Bai** President of the Chinese Academy of Sciences
1630 – 1700	**Plenary address:** **Professor Chung-I Wu** Beijing Institute of Genomics, Beijing *Neutrality vs natural selection in the diversification of hepatocellular carcinomas*
1700 – 1730	**Plenary address:** **Professor Anne Kelso** WHO Collaborating Centre for Reference and Research on Influenza, Melbourne *Influenza pandemics in the 21st century*
1730 – 1800	**Drinks and canapés** Shine Dome, Gordon Street, Canberra
1800 – 2100	**Official welcome dinner** Shine Dome, Gordon Street, Canberra

Program

Monday, 23 July 2012

Session 1: The burden of disease and new strategies (Chair: Professor Lei Jiang)

0800 – 0815 **Official opening of Symposium**

0815 – 0840 **Professor Anushka Patel**
The George Institute, Sydney
Frugal innovation and chronic diseases in ageing populations

0840 – 0905 **Professor Xinxin Li**
Shanghai Institute of Microsystem and Information Technology, Shanghai
Resonant MEMS sensing platform for health/environment monitoring

0905 – 0930 **Dr Leif Hanlen**
National ICT Australia (NICTA), Canberra
Removing the "e" from eHealth

0930 – 0955 **Professor Yuan-Ting Zhang**
Shenzen Institutes of Advanced Technology, Hong Kong
Perspectives of health informatics

0955 – 1020 **Professor Nigel Lovell**
Bionic Vision Australia, Sydney
Medical device technologies for managing disease and wellness

1020 – 1045 **Professor Shouyan Wang**
Suzhou Institute of Biomedical Engineering and Technology, Suzhou
Invasively modulating and decoding the human brain

1045 – 1050 **Summing up by Chair**

1050 – 1110 **Morning tea**

Program

Session 2: Infectious diseases (Chair: Professor Ian Frazer)

1110 – 1135 **Professor Ian Frazer**
Translational Research Institute Pty Ltd, Brisbane

Translation of basic knowledge into clinical practice: Solutions for the 21st Century

1135 – 1200 **Professor Hong Tang**
Wuhan Institutes of Virology, Wuhan

The innate function of T cells in the control of inflammation

1200 – 1225 **Dr Xueting Liu**
Institute of Microbiology, Beijing

Bioprospecting natural products for potential anti-infective drugs

1225 – 1250 **Professor Louis Schofield**
Walter and Eliza Hall Institute of Medical Research, Melbourne

1250 – 1315 **Professor George Gao**
Institute of Microbiology, Beijing

2009 pandemic influenza virus: What is special for its NA?

1315 – 1340 **Associate Professor Heidi Drummer**
Burnet Institute, Melbourne

Developing a prophylactic vaccine for Hepatitis C Virus

1340 – 1345 **Summing up by Chair**

1345 – 1445 **Lunch**

Program

Session 3: Stem cells and regenerative medicine (Chair: Professor Bob Williamson)

1445 – 1510 **Professor Nadia Rosenthal**
Monash University, Melbourne

Immune modulation of vertebrate regeneration

1510 – 1535 **Professor Yue Ma**
Institute of Biophysics, Beijing

Atrial and ventricular specification during human embryonic stem cell differentiation

1535 – 1600 **Professor Martin Pera**
The University of Melbourne, Melbourne

Pluripotent stem cell states and fates

1600 – 1625 **Professor Qi Zhou**
Institute of Zoology, Beijing

Progress of stem cell research and potential application in regenerative medicine

1625 – 1650 **Professor Perry Bartlett**
Queensland Brain Institute, Brisbane

Activation of different neurogenic precursor populations in the hippocampus: Potential for dementia and depression therapy

1650 – 1715 **Professor Duanqing Pei**
Guangzhou Institutes of Biomedicine, Guangzhou

Jhdm1a/1b enhance somatic reprogramming in a vitamin C dependent manner

1715 – 1720 **Summing up by Chair**

1900 – 2200 **Dinner at Courgette Restaurant**
54 Marcus Clarke Street, Canberra

http://www.courgette.com.au/cougette/index.html

Program

Tuesday, 24 July 2012

Session 4: Genomics and personalised medicine (Chair: Dr Sue Forrest)

0900 – 0925 **Professor Matt Brown**
University of Queensland Diamantina Institute, Brisbane

Transethnic gene-mapping studies - experience in Han Chinese

0925 – 0950 **Professor Guangbiao Zhou**
Institute of Zoology, Beijing

Targeted therapy: The new lease on life for acute myeloid leukemia, and beyond

0950 – 1015 **Associate Professor Christine Wells**
University of Queensland, Brisbane

Systems approaches to stem cell biology

1015 – 1040 **Professor Peter Hudson**
Cooperative Research Centre for Mental Health, Melbourne

Healthy ageing and the epidemic of Dementia: The CRC for Mental Health (CRC-MH)

1040 – 1105 **Professor Jun Yu**
Beijing Institute of Genomics, Beijing

Systematic annotation of human genomes and genes

1105 – 1110 **Summing up by Chair**

1110 – 1130 **Morning tea**

Program

Session 5: Medical bionics and nanotechnology (Chair: Professor Greg Tegart)

1130 – 1155	**Professor Frank Caruso** The University of Melbourne, Melbourne *Engineered particles for biomedical applications: From materials chemistry to assembly and in-vivo application*
1155 – 1220	**Professor Zhiyong Tang** National Center for Nanoscience and Technology, Beijing *Fabrication and application of inorganic nanoparticle superstructures*
1220 – 1245	**Professor Michael Monteiro** University of Queensland, Brisbane *Polymers in biomedical applications*
1245 – 1310	**Professor Lei Jiang** Institute of Chemistry, Beijing *Bio-inspired, smart, multiscale interfacial materials*
1310 – 1335	**Professor Chunhai Fan** Shanghai Institute of Applied Physics, Shanghai *Emerging DNA nanotechnology for diagnostic and therapeutic applications*
1335 – 1400	**Professor Rob Shepherd** Bionic Ear Institute, Melbourne *Medical bionics: An Australian perspective*
1400 – 1405	**Summing up by Chair**
1405 – 1415	**Formal close of Symposium**
1415 – 1515	**Lunch**
1530	**Depart for airport and for site visit program in Melbourne**

Presidents

Professor Suzanne Cory AC PresAA FRS

President, Australian Academy of Science

Professor Suzanne Cory is one of Australia's most distinguished molecular biologists. She was born in Melbourne, Australia and graduated in biochemistry from The University of Melbourne. She gained her PhD from the University of Cambridge, England and then continued studies at the University of Geneva before returning to Melbourne in 1971, to a research position at The Walter and Eliza Hall Institute of Medical Research. From 1996 to 2009 she was Director of The Walter and Eliza Hall Institute and Professor of Medical Biology of The University of Melbourne. She is currently a Vice-Chancellor's Fellow at the University of Melbourne and Honorary Professorial Fellow at the Walter and Eliza Hall Institute, Her research has had a major impact in the fields of immunology and cancer and her scientific achievements have attracted numerous honours and awards. In 2010 she was elected President of the Australian Academy of Science.

Professor Robin J Batterham AO FREng FAA FTSE

President, Australian Academy of Technological Sciences and Engineering

Professor Batterham is Kernot Professor of Engineering at the University of Melbourne. He is also President of the Australian Academy of Technological Sciences and Engineering and until recently was Group Chief Scientist, Rio Tinto Limited. He has had a distinguished career in research and technology, in the public and private sectors in areas such as mining, mineral processing, mineral agglomeration processes, and iron making. He is inventor on over 20 patent families.

Professor Robin Batterham was Chief Scientist to the Australian Federal Government from 1999 to 2005.

He has been President of the Institution of Chemical Engineers and the International Network for Acid Prevention and is President of the International Mineral Processing Congress as well as chairing the Australia India Collaborative Research Fund. He chairs the International Energy Agency Expert Group on Science for Energy. He is an elected Fellow (or Foreign Fellow) of the Royal Academy of Engineering, the National Academy of Engineering, the Swiss Academy of Technological Sciences, the Australian Academy of Science, the Australian Academy of Technological Sciences and Engineering as well as Fellow of several learned societies.

Professor Chunli Bai

President, Chinese Academy of Sciences

Professor Chunli Bai, a well-known chemist and leading scientist in nano-science, is the President of the Chinese Academy of Sciences (CAS).

Professor Chunli Bai has been Executive Vice-President of CAS since 2004. He has also served as Vice-President of the China Association for Science and Technology (CAST), President of the Graduate University of CAS (GUCAS), Director of the Academic Division of Chemistry and Member of the Executive Committee of the Presidium of the Academic Divisions of CAS.

Prof. Bai graduated from the Department of Chemistry, Peking University in 1978 and received his M.Sc. and Ph.D. degrees from the CAS Institute of Chemistry in 1981 and 1985 respectively.

From1985-1987, he worked with the California Institute of Technology, U.S.A., in the field of physical chemistry as a post-doctorate associate and visiting scholar. After he returned to China in 1987, he continued his research at the CAS Institute of Chemistry. From 1991 to 1992, he worked as a visiting professor at Tohoku University in Japan.

His research areas include the structure and properties of polymer catalysts, X-ray crystallography of organic compounds, molecular mechanics and EXAFS research on electro-conducting polymers. In the mid-1980s, he shifted his research to the fields of scanning tunneling microscopy and molecular nanotechnology.

Prof. Bai has a long list of scientific publications and has won more than twenty prestigious awards and prizes for his academic achievements. Because of his academic achievements, he was elected a Member of CAS and Fellow of the Academy of Sciences for the Developing World (TWAS) in 1997. He is also a Foreign Associate of the US National Academy of Sciences (NAS) and Foreign Member of Russian Academy of Sciences (RAS), Honorary Fellow of the Royal Society of Chemistry and Honorary Fellow of the Indian Academy of Sciences (IAS), and honorary doctor or professor of several foreign universities. Prof. Bai also serves as the Chief Scientist for the National Steering Committee for Nanoscience and Technology and was the Founding Director of China National Center for Nanoscience and Technology.

Prof. Bai is also the Vice President of TWAS, Member of the Executive Committee of IUPAC (2008-2009), and Member of the International Editorial Advisory Board of JACS, Angewandte Chemie, Advanced Materials and Chemical Physics Letters.

Symposium Chairs

Dr Sue Forrest

Chief Executive Officer
Australian Genome Research Facility

Email: sue.forrest@agrf.org.au

Sue Forrest is CEO of the Australian Genome Research Facility Ltd. Her role as CEO of AGRF has expanded her scientific skills into strategic management of an entity with over 75 staff located at five sites that provides access to state of the art genetic technologies. Her appointment has facilitated greater interaction with the scientific and commercial communities. She has a passion for developing interactive teams and worked closely with the biotechnology community to assist its coming of age.

She has over 25 years experience in genetics and molecular biology including research into both single gene defects and complex traits including neuromuscular and behavioural disorders.

She is an Expert Advisory Panel Member of the Small Technologies Industry Uptake Program (STIUP), a Member of the Victorian Cancer Consultative Council for the Victorian Cancer Agency and the Genomics Platform Convenor of BioPlatforms Australia.

Her role as CEO of AGRF has enabled the growth of large scale genomic science in Australia.

Professor Greg Tegart

Chair, Health and Technology Forum
Australian Academy of Technological Sciences and Engineering

Email: gregtegart1@ozemail.com.au

Professor Greg Tegart, whose current area of activity is health, longevity and technology has had a long career in Government and industry in the areas of research, teaching, administration, and high level policy advice to Government on science, technology and environment.

He is a Fellow of the Australian Academy of Technological Sciences and Engineering and was a Member of the Council of the Academy (1984-87, 1990-92, 1994-97) and Chairman of its International Relations Committee (1988-99). Prof Tegart is Chair of the Health and Technology Forum of the Academy. He was the author of the recent major Academy report on Smart Technology for Healthy Longevity. He is a Foreign Fellow of the Royal Swedish Academy of Engineering Sciences and of the Engineering Academy of the Czech Republic.

His main research interests include:

- *Science and technology policy-national and international*
- *Technology and society*
- *Technology foresight and strategic intelligence*
- *Converging technologies in health and in energy*

Professor Bob Williamson

Secretary for Science Policy
Australian Academy of Science

Email: r.williamson@unimelb.edu.au

Professor Bob Williamson became Professor of Molecular Genetics and Biochemistry at St Mary's Hospital Medical School, University of London, in 1976, where he remained until 1995 when he moved to Melbourne as Director of the Murdoch Institute and Professor of Medical Genetics. He retired in October 2004, and now is an Honorary Senior Principal Fellow of the Murdoch Institute, the University of Melbourne, and Monash University. Bob has over 400 refereed career publications, including about 40 in Nature, Nature Genetics, Cell and Lancet.He was involved in the identification of genes for cystic fibrosis, Friedreich ataxia, craniofacial abnormalities, heart disease and Alzheimer disease. More recently he has taken a major interest in national science policy and medical and scientific ethics, and has advised several Premiers, Health Ministers and Ministers for Innovation, and is still advising research groups wishing to use stem cells to treat genetic disorders. He is a Fellow of the Australian Academy of Science (where he is Secretary for Science Policy), a Fellow of the Royal Society, and an Officer of the Order of Australia.

Plenary Presenters

Professor Anne Kelso

Director
WHO Collaborating Centre for Reference and Research on Influenza

Email: anne.kelso@influenzacentre.org

Anne Kelso joined the WHO Collaborating Centre for Reference and Research on Influenza in Melbourne as Director in 2007. She also holds an honorary professorial position in the Department of Microbiology and Immunology at the University of Melbourne where she is involved in collaborative research on immunity to influenza viruses. Following PhD studies, Professor Kelso undertook research on T cell-mediated immunity at the Swiss Institute for Experimental Cancer Research, the Walter and Eliza Hall Institute of Medical Research and, from 1992 to 2007, the Queensland Institute of Medical Research. From 2000 until 2006, she was also Director/CEO of the Cooperative Research Centre for Vaccine Technology. She has previously served as President of the Australasian Society for Immunology and as Secretary-General of the International Union of Immunological Societies and is currently member of several boards and advisory groups, including committees advising the WHO and the Australian Government on influenza.

Influenza pandemics in the 21st century

The occasional emergence of a new pandemic influenza virus presents a special challenge for public health authorities. As we saw in 2009, the H1N1 pandemic virus was carried rapidly along international airline routes; respiratory spread and the pre-symptomatic infectious period rendered border controls, school closures and other non-pharmacological interventions largely ineffective, and a specific vaccine was available too late to mitigate the first wave of infections in most countries. As had SARS in 2003, the 2009 pandemic highlighted the physical and economic connectedness of human populations in the 21st century and the risk that a more pathogenic influenza virus could cause a global disaster. Although neither the timing nor the origin of future influenza pandemics can be predicted, there is growing awareness that high rates of mutation and mixing of avian, swine and human influenza virus genomes in domestic animals in many countries are increasing the opportunity for generation of a novel human-transmissible virus. Better surveillance of human and animal influenza viruses, rapid sharing of virus samples and information, development of "universal" vaccines, and equitable access to vaccines and antiviral drugs are some of the strategies needed to minimise the impact of future pandemics on human health and well-being.

Professor Chung-I Wu

Director
Beijing Institute of Genomics, CAS
Email: cw16@uchicago.edu

Professor Chung-I Wu was born in 1954, Taipei, Taiwan. He obtained his bachelor degree in Biology from Tunghai University, Taiwan, in 1976, and Ph.D degree in Population Genetics from the University of British Columbia, Canada, in 1982. Between 1982 and 1984, he joined the University of Texas, Houston Medical Center, as a senior research associate. In 1985 and 1986, he was an NIH fellow at the University of Wisconsin, Madison.

Between 1986 - 1991, he was an assistant and then associate professor in the Department of Biology, University of Rochester. In 1991, he moved to the University of Chicago as an associate professor in the Department Ecology and Evolution. In 1998, he became a professor and served as the chair of the department until 2006. In 2008, he was appointed the director of Beijing Institute of Genomics, Chinese Academy of Sciences.

Prof. Wu's research activities are mainly involved in the following four areas: 1) Molecular and population genetics of speciation in Drosophila. 2) Evolutionary genomics in Drosophila, especially microRNAs. 3) Evolutionary genomics in human and higher primates. 4) Theories of natural selection for application to human and Drosophila. Over the past several years, he and his laboratory have successfully led the trend of molecular evolution research in United States; his department has played a very important role in transforming the classic evolution research into molecular time. Professor Wu has published about 50 scientific papers and many of them are in high impact international journals such as Nature, Science and Cell.

Neutrality vs. natural selection in the diversification of hepatocellular carcinomas

Yong Tao[1†], Shaoping Ling[1†], Weiwei Zhai[1†], Ke Chen[1†], Shiou-Hwie Yeh[2†], Yu Wang[1], Chunyan Li[1], Jin Xu[1], Yung-Ming Jeng[2], Guojing Liu[1], Caihong Zheng[1], Zechen Chong[1], Jue Ruan[1], Dafei Wu[1], Zhengzhong Qu[1], Lili Dong[1], Wenjie Li[1], Lingtong Hao[1], Jin Yang[1], Lihua Cao[1], Wei Zou[1], Qiang Gong[1], Tao Li[1], Fang Yang[1], Juan Li[1], Shuangli Mi[1], Wanghua Li[1], Jun Cai[1], Shuangli Li[1], Min Sun[1], Yutian Deng[1],Yuzhu Cao[1], Bing Zhang[1], Baoxian Chen[1], Changqing Zeng[1], Yuezheng Zhang[1], Yang Shen[3], Wensheng Liu[3], Hurng-Yi Wang[2], Eric Hungate[6], Kenan Onel[4], Jiang Liu[1], Steven A. Frank[5], Pei-Jer Chen[2*], Xuemei Lu1[*] and Chung-I Wu[1, 6*]

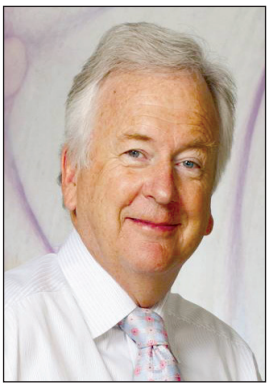
1. Beijing Institute of Genomics, Chinese Academy of Sciences, Beijing 100029, People's Republic of China;
2. Graduate Institute of Clinical Medicine and Hepatitis Research Center, National Taiwan University and Hospital, Taipei 106, Taiwan;
3. State Key Laboratory of Biocontrol, SunYat-Sen University, Guangzhou 510275, People's Republic of China;
4. Department of Pediatrics, University of Chicago, Chicago, Illinois 60637, USA;
5. Department of Ecology and Evolutionary Biology, University of California, Irvine, CA, 92697, USA;
6. Department of Ecology and Evolution, University of Chicago, Chicago, Illinois 60637, USA.

† These authors contributed equally to this work.

A one-sentence summary: Combing evolutionary population genetics with an explicit design of extensive sampling in each case of liver cancer, we found that diversifying natural selection often drives within-tumor genetic variation to an unexpected level and the rate of diversification continues to increase as tumors grow, posing both theoretical and clinical challenges.

Large populations are expected to be genetically diverse; however, the diversity may often be a simple outcome of random mutations and genetic drift (1). Rigorous theories have been advanced in the previous decades to infer the effect of selection in natural populations (2-4). These theories can also be extended to infer whether natural selection drives within-tumor genetic diversity and how the identified driver mutations might govern cell proliferation (5, 6). In this study, we combine methods of evolutionary population genetics with an explicit design of extensive sampling from 12 cases of hepatocellular carcinoma (HCC). Each case of HCC was found to consist of multiple genetically distinct cell lineages. Descendant lineages usually have a higher estimated fitness than the parental ones. Because the data suggest that every sequenced tumor section in this study represents an independently selected lineage, the rate of selective diversification appears far higher than suggested by previous studies. The observed diversification often follows a spatial pattern in which cell migration precedes clonal expansion (7-11). Mutations in extracellular matrix components are common, hinting that selectively favored mutations that confer cell motility further enhance lineage diversification. The degree of selectively driven diversification observed here suggests that tumors may continue to diversify at an accelerated rate as tumors grow.

Speakers



Professor Perry Bartlett

Director
Queensland Brain Institute

Email: p.bartlett@uq.edu.au

Professor Perry Bartlett, FAA was appointed Foundation Chair in Molecular Neuroscience at The University of Queensland in 2002, and inaugural Director of the Queensland Brain Institute in 2003 - the same year he was elected a Fellow of the Australian Academy of Science. He is internationally renowned in the field of cellular and molecular neuroscience. In 1992, his laboratory co-discovered the presence of stem cells in the adult brain that had the capacity to produce new neurons. His group was also the first to isolate and characterise these stem cells; they went on to reveal the presence of a latent hippocampal stem cell population that can be activated by synaptic stimulation and give rise to new neurons. These discoveries underpin the concept of functional stem cells in the adult mammalian brain and the burgeoning interest in their importance to learning and memory. Professor Bartlett has published extensively and received a number of prizes for neuroscience excellence.

Activation of different neurogenic precursor populations in the hippocampus: Potential for dementia and depression therapy

The production of new neurons in the hippocampus is thought to underpin aspects of learning and memory. Defining how neurogenesis is regulated is central to our understanding of the learning process and to the future development of neurogenic-based therapeutics aimed at ameliorating cognitive loss.

Recently, we identified a large precursor pool in the dentate gyrus of the mouse hippocampus, including a small number of true stem cells, which is normally dormant but can be activated by depolarizing levels of K+ to produce large numbers of neurogenic neurospheres. In situ stimulation of the perforant pathway also activates this precursor population and leads to an increase in newly born neurons. Importantly, this population can be activated in the aged mouse, uncovering the potential for significant neurogenesis in the ageing brain.

Further, synaptic activity stimulates precursor activity through the release of a number of soluble factors and the neurotransmitter, norepinephrine (NE). These factors act directly on the precursors with NE activating through a novel adreno-receptor pathway. Interestingly, different stimuli led to the activation of different pools of precursors and stem cells, suggesting production of hippocampal neurons in the dentate gyrus with distinct properties reflective of a specific stimulation process. This provides a mechanism by which the functional capacity and the number of newly generated neurons can be directly influenced by the type and complexity of environmental stimuli.

Professor Matt Brown

Director
The University of Queensland Diamantina Institute

Email: matt.brown@uq.edu.au

Professor Matt Brown is a clinician-scientist who trained initially in medicine and rheumatology in Sydney, Australia before moving in 1994 to Oxford, England to pursue research in genetics of bone and joint diseases, particularly ankylosing spondylitis. He was appointed Professor of Musculoskeletal Sciences at University of Oxford in 2004 and was Deputy Director of the University of Oxford Institute of Musculoskeletal Sciences from 2003-5.

In 2005 Professor Brown returned to Australia, taking a chair of Immunogenetics at University of Queensland Diamantina Institute in Brisbane. There he continues to work in genetics of common diseases, as well as running a specialist service for spondyloarthritis patients at Princess Alexandra Hospital. Professor Brown has recently been appointed as the Director of the UQ Diamantina Institute.

Trans-ethnic gene-mapping studies - experience in Han Chinese

Common human disease genetics took a major leap forwards in 2005 with the development of the genomewide association study (GWAS), which has led to the identification of over 2000 genetic loci associated with common diseases including cancers, metabolic and autoimmune diseases. This haul has revolutionised most major areas of research into the causes and pathogenesis of common human diseases, and examples already exist of therapies arising out of those discoveries despite the short period since they were made. Most GWAS to date have been performed in populations of white European descent, although it has long been suspected that significant differences would exist between genetic determinants of disease in different ethnic groups, and that these differences could be very valuable for biomedical research. As gene-mapping moves into the sequencing era, investigating genetic variants of more recent ancestry and greater population specificity, the need for more diversity in ethnicity of populations being studied has increased. UQ Diamantina Institute, in partnership with Shanghai Second Military Medical University and researchers from Peking University, has established a modern genetics laboratory in Shanghai. We are pursuing trans-ethnic gene-mapping projects in a range of major medical conditions, particularly arthritis (rheumatoid arthritis and ankylosing spondylitis) and neurological diseases (epilepsy, schizophrenia, motor neurone disease and intracranial haemorrhage). The value of this research and the potential gain from further such collaborative studies in the Chinese population will be discussed.

Professor Frank Caruso

Professor and ARC Federation Fellow
The University of Melbourne

Email: fcaruso@unimelb.edu.au

Frank Caruso is a Professor and Australian Research Council Federation Fellow at The University of Melbourne. He received his PhD degree in 1994 from The University of Melbourne, and then moved to the CSIRO Division of Chemicals and Polymers in Melbourne. He was an Alexander von Humboldt Research Fellow and then group leader at the Max Planck Institute of Colloids and Interfaces (Berlin, Germany) from 1997–2002. His research interests focus on developing advanced nano- and biomaterials for biotechnology and medicine. He has published over 280 peer-reviewed papers and is on ISI's most highly cited list, ranking in the top 20 worldwide in materials science in 2011. He is an Editor of Chemistry of Materials and is on the Editorial Advisory Boards of Advanced Functional Materials, Advanced Healthcare Materials, Nano Today and Advances in Colloid and Interface Science. He was elected a Fellow of the Australian Academy of Science in 2009. Prof. Caruso is also the recipient of the inaugural ACS Nano Lectureship Award (Asia/Pacific) from the American Chemical Society in 2012 for global impact in nanoscience and nanotechnology.

Engineered particles for biomedical applications: From materials chemistry to assembly and in-vivo application

During the past few decades, growing interest has been devoted to the design of delivery vehicles for transporting therapeutics to specific sites within the body. The use of polymer-based materials has played an important role in the development of such systems, largely because of the ability to prepare polymers with tailored properties, including biocompatibility, size, structure, and functionality. This presentation will focus on nanoengineered polymer-based particles assembled through the sequential deposition of polymers, and their utilization for the encapsulation, protection and release of oligonucleotides and peptides. The delivery of capsules to antigen presenting cells to stimulate an immune response and the specific binding of antibody-functionalized capsules to cancer cells will be highlighted. The preparation of synthetic hydrogel capsules that possess size and charge exclusion properties to allow for selective permeability of reaction components and facile control over capsule architecture, affording the continuous modification of nucleic acids and the assembly of liposome/polymer composites with a subcompartmentalized structure reminiscent of cells, will also be presented.

Professor Heidi Drummer

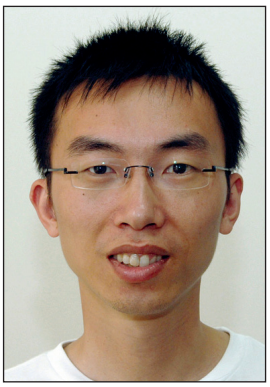
Co-Head Viral Fusion Laboratory
Burnet Institute

Email: hdrummer@burnet.edu.au

Heidi Drummer (PhD) received her BScHons degree in 1988 and her PhD degree in 1993 from the University of Melbourne, Australia. Following 5 years of post-doctoral training, she moved to St Vincent's Institute of Medical Research where she established an independent research group investigating Hepatitis C Virus entry. In 1995 she moved her laboratory to the Burnet Institute, Melbourne, Australia and she is currently co-head of the Viral Fusion Laboratory. In 2010, she was awarded the Gust-McKenzie award and she is an RD Wright Biomedical Research Fellow. Her group investigates how Human Immunodeficiency Virus and Hepatitis C Virus attach to and enter cells with the aim of developing vaccines and therapeutics.

Developing a prophylactic vaccine for Hepatitis C Virus

Three percent of the world's population are chronically infected with hepatitis C virus (HCV) and it is estimated that ~40 million of these individuals live in China. There is no vaccine to prevent infection and current and emerging antiviral drugs are costly and associated with severe side effects. HCV is now the leading indicator for liver transplantation in Western countries and places a significant burden on public health systems. One of the major impediments to vaccine design is the high degree of sequence variation observed between HCV isolates making an immunogen that provides universal protection difficult to achieve. Two major surface glycoproteins function as a heterodimer to attach virions to target cells and mediate membrane fusion. The major surface glycoprotein E2 binds to the cellular receptor CD81 and is a major target of neutralizing antibodies that prevent infection. In this study, we have investigated the role of three variable regions of E2 and their impact on antibody mediated neutralization. Deletion of the variable regions from a recombinant form of glycoprotein E2 (E2core) does not affect glycoprotein expression, CD81 binding or recognition by conformational antibodies. In contrast to intact forms of glycoprotein E2, the E2core domain elicits high titres of antibodies that are broadly neutralizing. This represents an exciting advance towards the production of an effective prophylactic HCV vaccine.



Professor Chunhai Fan

Division Chief
Shanghai Institute of Applied Physics, CAS

Email: fchh@sinap.ac.cn

Chunhai Fan obtained his B.S. and Ph.D. in the Department of Biochemistry, Nanjing University in 1996 and 2000. After postdoctoral research in University of California, Santa Barbara, he joined the faculty of Shanghai Institute of Applied Physics (SINAP), Chinese Academy of Sciences (CAS) in 2004. He is now Professor and Chief of the Division of Physical Biology in SINAP.

Professor Fan has published over 180 papers in peer-reviewed journals, including Nature Nanotechnology, PNAS, JACS, Angew. Chem. and Adv. Matter. He also contributed 10+ invited reviews in premier review journals including Accounts of Chemical Research, Chemical Society Reviews and Trends in Biotechnology. He is the inventor on more than 30 patents (US, Chinese and International). His work has been recognized by many awards including National Award for Young Scientists of China (2011), CAS Award for Young Scientists (Chinese Academy of Sciences, 2012), CCS Award for Young Scientists (Chinese Chemical Society, 2006), NSFC Award for Outstanding Young Scientists (National Science Foundation of China, 2007), 1st-class CAIA Prize for Science and Technology (Chinese Association for Instrumental Analysis, 2007-2009), Shanghai Rising Star for Young Scientists (2005).

Emerging DNA nanotechnology for diagnostic and therapeautic applications

A critical challenge in surface based biomolecular detection is the reduced accessibility of target molecules to probes arranged on heterogeneous surface compared to probe-target recognition in homogeneous solution. To improve the recognition abilities of such heterogeneous surface probes, much effort has been devoted to control surface chemistry, conformation and packing density of the probe molecules as well as the size and geometry of the surface. Here, we devise a new concept to achieve improved probe-target recognition properties by introducing a probe bearing 3D DNA nanostructure based chip platform. This strategy provides significantly enhanced spatial positioning range and accessibility of the probes on surface over previously reported linear or stem-loop probe structures. We demonstrate the use of this versatile DNA nanostructure-based platform for highly specific and sensitive electrochemical sensing of a wide range of biomolecules, as well as its promising applications in cancer therapy.

1 Presenter: Chunhai Fan
2 Corresponding author: Email: fchh@sinap.ac.cn

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Professor Ian Frazer

CEO and Director of Research
Translational Research Institute Pty Ltd

Email: ian.frazer@tri.edu.au

Professor Ian Frazer was trained as a renal physician and clinical immunologist in Edinburgh Scotland. Professor Frazer's research group studies the immunology of papillomavirus associated cancers. In 1991, along with Chinese colleague, Dr Jian Zhou, he developed the virus-like particle technology which has become the basis of vaccines to prevent cervical cancer. Professor Frazer has recently been appointed as CEO and Director of Research of the newly created Translational Research Institute in Brisbane, Australia. He is the current chair of the Scientific Advisory Council of the International Agency for Research on Cancer.

Translation of basic knowledge into clinical practice: Solutions for the 21st Century

Biomedical research over the last 100 years has given us insights into the genetic and environmental factors promoting the chronic non-infectious diseases that cause most of the health burden in the developed world. We have some understanding of pathophysiological processes leading to chronic disease, including ineffective repair of tissue damage with associated chronic inflammation, and ineffective repair of somatic cell DNA damage with associated neoplasia. However, our ability to translate this knowledge into clinical practice is limited by our inability to communicate basic messages about health maintenance, and by diversion of health care resources away from development of effective health interventions towards commercially more popular health products. Progress in delivery of better health care requires a new approach to research and development of effective interventions driven by expert knowledge and public funding rather than commercial feasibility. I will discuss this proposition with examples from the fields of vaccine development and cancer immunotherapy.

Professor George Gao

Professor
Institute of Microbiology Chinese Academy of Sciences, CAS

Email: gaof@im.ac.cn

Professor George F. Gao obtained his Ph.D (DPhil) degree from Oxford University, UK and did his postdoc work in both Oxford University and Harvard University (with a brief stay in Calgary University). He is now the professor and director in CAS Key Laboratory of Pathogenic Microbiology and Immunology, Institute of Microbiology, Chinese Academy of Sciences. He is also the Vice-President of the Beijing Institutes of Life Science, Chinese Academy of Sciences, Deputy Director-General of the Chinese Center for Disease Control and Prevention and Vice-President of the Chinese Society of Biotechnology. His research interests include enveloped viruses and structural immunology. His group research is now focusing on the influenza virus, Streptococcus suis and the molecular/structural basis of recognition of T cell receptors to peptide-MHC complexes. He has published more than 190 refereed papers, 9 books or book chapters and has applied and obtained 20 UK, US and Chinese patents.

2009 pandemic influenza virus: What is special for its NA?

The 2009 pandemic influenza seemingly spreads extremely quickly with worrisome mortalities and resembles some characteristics of the previous three pandemics (1918 Spanish-flu, 1957 Asian-flu and 1968 Hong Kong-flu). The virus was recognized as a new swine-origin H1N1 influenza A virus (S-OIV). Functional and structural characterization of the neuraminidase (NA) (09N1) might give us some clues about its pathogenesis and directs the drug application. We show that the 09N1 crystal structure has been solved (1.9 Å) and the structure surprisingly shows a Group 2-like (or atypical Group 1) active cavity, different from other known N1 structures which are all categorized into Group 1. More importantly, the newly-defined Group-1 150-loop cavity proposed as a drug target should be re-considered as it is not as common as we thought. Our further analysis shows that the N5 has an extended 150-cavity. Comprehensive analysis of laninamivir and its octanoate prodrug with oseltamivir and zanamivir reveals group specific mechanisms for influenza NA inhibition, it's important for the development of novel inhibitors and improvement of current drugs.

Dr Leif Hanlen

Director, Health Business Team
National ICT Australia (NICTA)

Email: Leif.hanlen@nicta.com.au

Dr. Leif Hanlen is the lead for NICTA's e-health business team. His role focuses on the application of internet scale machine learning, natural language processing and streaming data analysis to sports performance monitoring, clinical records, and "smart" homes. Dr. Hanlen holds 3 patents in the field of wireless design for body-area-networks, and over 70 peer reviewed publications. He is a member of Australian Standards for Telehealth, the Australian Information Industry Association eGoverment and eHealth taskforces.

Removing the "E" from eHealth

The reality of the burden of disease is that we must be more effective in our care delivery and meet higher and wider expectations. Digital technology is allowing greater access to care, better clinical outcomes and broader workforce engagement all at less total cost. The true benefits of digital technology can only be realized when "digital" becomes invisible. NICTA is transforming innovative technologies to advance the understanding of human diseases and to improve the health and wellbeing of Australians. Our eHealth team is developing open-access information systems and analysis engines to support national scale digital health programs. We are developing middleware for health data and analysis that allows best use of health information. This talk demonstrates how the new digital health care paradigm is developing in Australia and how activity both here and abroad is supporting new approaches to care delivery.

Professor Peter Hudson

Business Development Manager
CRC for Mental Health

Email: peterhuds@gmail.com

- *Business Development Manager; CRC for Mental Health.*
- *Director of VCB (Victorian Cancer Biologics Consortium) and CSO Avipep Pty Ltd from 2009 for development of antibody products.*
- *Formerly CSIRO Theme Leader for Neuroscience and Founding Chair of Commercialisation, AIBL (Alzheimer's Disease Cohort)*
- *Deputy CEO and Science Director for the CRC for Diagnostics (1997-2008).*
- *Co-founder of both EvoGenix Ltd (Arana) and Avipep Pty Ltd*
- *Co-chair of HUPO-HAI (Human Proteomics Antibody Initiative)*

Healthy ageing and the epidemic of Dementia: The CRC for Mental Health (CRC-MH)

Healthy ageing is dominated by the burgeoning problem of Dementia and Psychosis. Peter Hudson (and Alan Rembach, a "Rising Star" young research scientist) will present how the newly formed Cooperative Research Centre for Mental Health (CRC-MH) will impact Health Ageing. This 7 year, $70 million Federally supported joint venture was launched in July 2011 to discover biomarkers for early diagnosis of neurodegeneration in Alzheimer's and Parkinson's Diseases and psychoses such as schizophrenia and mood disorders. These biomarkers, which may include blood proteins, lipidomic and genomic biomarkers, will become the first wave of personalised medicine through early stage detection of neurodegeneration and Mental Health disorders. CRC-MH integrates over twenty different organisations, which include Australia's leading neuroscience institutes, aged care providers, clinical trial managers and pharmaceutical development companies. Key research outputs of CRC-MH flow from the AIBL cohort for Alzheimer's disease and in parallel Registries established for Parkinson's disease and Schizophrenia. CRC-MH will also develop novel intervention strategies and therapeutic products using either natural products or molecular-designed pharmaceuticals and validate these in clinical trials.

Professor Lei Jiang

Professor
Institute of Chemistry, CAS

Email: jianglei@iccas.ac.cn

Lei Jiang received his B.S. degree in solid state physics (1987), and M.S. degree in physical chemistry (1990) from Jilin University of China. From 1992 to 1994, he studied in Tokyo University of Japan as a China-Japan joint course Ph.D. student and received his Ph.D. degree from Jilin University of China with Tiejin Li. Then, he worked as a postdoctoral fellow in Akira Fujishima's group in Tokyo University. In 1996, he worked as researcher in Kanagawa Academy of Sciences and Technology, Hashimoto's project. In 1999, he joined Institute of Chemistry, Chinese Academy of Sciences (ICCAS) as Hundred Talents Program. Since then, he has been the professor in ICCAS. In 2009, he has been elected as an Academician of the Chinese Academy of Sciences. His scientific interest is focused on the bio-inspired surface & interfacial materials with special wettability and over 400 papers have been published.

Bio-inspired, smart, multiscale interfacial materials

Learning from nature, we revealed that a super-hydrophobic surface needs the cooperation of micro- and nanostructures. Considering the arrangement of the micro- and nanostructures, the surface structures of the water-strider's legs were studied in detail. Accordingly, a series of super-hydrophobic surfaces have been fabricated. Under certain circumstances, a surface wettability can switch between superhydrophilicity and superhydrophobicity, Most recently, we developed a superoleophobic and controllable adhesive water/solid interface which opens up a new strategy to control self-cleaning properties in water. To expand the "switching" concept of the smart 2D surface, we also did a lot of interesting work in 1D system. For example, we discovered the water collection ability of capture silk of the cribellate spider Uloborus walckenaerius and then prepared artificial spider silk which will have great applications in water collection. In addition, we developed the novel biomimetic ion channel systems with a variety of intelligent properties, which were controlled by our designed biomolecules or smart polymers responding to the single external stimulus, provided an artificial counterpart of switchable protein-made nanochannels. These intelligent nanochannels could be used in energy-conversion system, such as photoelectric conversion system inspired by rhodopsin from retina or bR, and concentration-gradient-driven nanofluidic power source that mimic the function of the electric eels.

Professor Xinxin Li

Professor
Shanghai Institute of Microsystem and Information Technology, CAS

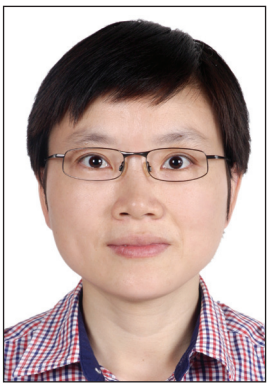
Email: xxli@mail.sim.ac.cn

Prof. Xinxin Li received the B.S. degree in semiconductor physics and devices from Tsinghua University, Beijing, China, in 1987. He worked in Shenyang Institute of Instrumentation Technology for five years as a Research Engineer. He resumed his graduate study and received the M.S. and Ph.D. degrees in microelectronics from Fudan University, Shanghai, China, in 1995 and 1997, respectively. He subsequently worked at Hong Kong University of Science and Technology as a Research Associate, in Nanyang Technological University, Singapore, as a Research Fellow and, then, joined Tohoku University, Japan, as a Lecturer. Since 2001, he has been a professor and now serves as the Director of the State Key Lab of Transducer Technology, Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences. He is now also serving as Adjunct Professor in both Fudan University and Shanghai Jiaotong University. Prof. Li was granted the National Science Fund for Distinguished Young Scholar in 2007. His PhD student was awarded National Excellent PhD Dissertation in 2009.

His research interest has been in the fields of micro/nano sensors & actuators and micro/nano electromechanical systems (MEMS/NEMS). He has invented more than 70 patents and published more than 200 papers in referred journals and academic conferences (including about 120 SCI journal papers). He has served as TPC members, respectively, for IEEE MEMS, Transducers and IEEE International Conference on Sensors. He is the editorial board member for Journal of Micromechanics and Microengineering. He has been invited to present invited talks in numerous international conferences and write topic-review papers for international journals.

Resonant MEMS sensing platform for health/environment monitoring

Microsystem and wireless-sensor-network technologies, which have been developed in SIMIT-CAS for health/safety monitoring, are introduced in the first part of the presentation. Then, the talk will focus on resonant bio/chemical sensors, where micro/nano combined technologies are used to form the MEMS sensing platform for on-the-spot rapid detection of trace-level chemical molecules, DNAs, pathogens, antigens and cancer markers, etc. Both sensitivity and selectivity are significantly improved by exploring optimal resonance mode and directly growing sensitive nano-structures on the micro-devices. With the top-down and bottom-up combined micro/nano technologies, the bio/chemical sensors are promising in health/environment monitoring and telemetric systems.



Professor Xueting Liu

Associate Professor
Institute of Microbiology, CAS

Email: liuxueting_cn@hotmail.com

Dr. Xue-Ting Liu received her Ph. D degree in Medicinal Chemistry from China Pharmaceutical University in 2006. She has the experiences of working in Shanghai Institute of Organic Chemistry, CAS (2006-2007), China, and in University of Wisconsin-La Crosse (2007-2010), USA, as a postdoctoral fellow. She joined Institute of Microbiology, Chinese Academy of Sciences, China, in Oct. 2010.

Her research interests lie in the general areas of Natural Medicinal Chemistry, Pharmacology, and drug design and discovery. The current research mainly focuses on diversifying marine microbial natural product library and discovery of new antibiotics based on bioassay-guided isolation, purification, and structural elucidation.

Bioprospecting natural products for potential anti-infective drugs

Li-Xin Zhang, Xue-Ting Liu, Fu-Hang Song, Huan-Qin Dai, Mei Liu*

Natural products occupy tremendous chemical structural space unmatched by any other small molecule families. One of the major limiting factors in natural products drug discovery industry is that pharmaceuticals have been traditionally designed to target individual factors in a disease system, but diseases are complex in nature and vulnerable at multiple attacks. Therefore, a systematic novel synergistic drug screening approach based on a multi-factorial principle is urgently needed. The up-regulation of multidrug-resistance (MDR) pumps is a key factor in microbial drug resistance. A major challenge in developing efficacious antibiotics against drug-resistant pathogens is to identify compounds that counteract MDR functions. To rapidly discover new antifungal agents especially for drug-resistant pathogens, we developed a high-throughput synergy screening (HTSS) strategy for novel microbial natural products. Our study reveals a novel function of MDR1 in increasing sensitivity of drug-resistant fungal pathogens to selected natural products.

This work was supported in part by grants from National Natural Science Foundation of China (30973665, 30901849, 30873129, 30911120483, 30911120484, 81011120046, 81102356, 31100075, 81102369, 81102362, 31170095, and 31000004), the CAS Pillar Program (XDA04074000) and the Ministry of Science and Technology of China (2007DFB31620, 2011ZX09102-011-11). L.Z. is an Awardee for National Distinguished Young Scholar Program in China.

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Professor Nigel Lovell

Scientia Professor
University of New South Wales

Email: N.Lovell@unsw.edu.au

Nigel Lovell is currently at the Graduate School of Biomedical Engineering University of New South Wales. Sydney where he holds a position of Scientia Professor. He has authored 500+ refereed journals, conference proceedings and abstracts, and been awarded over $68 million in R&D and infrastructure funding. His research work has covered areas of expertise ranging from cardiac modeling, telehealth technologies, biological signal processing, and visual prosthesis design. Through a spin-out company from UNSW, TeleMedCare Pty. Ltd., he has commercialised a range of telehealth technologies for managing chronic disease and falls in the older population. He is also one of the key researchers leading an R&D program to develop an Australian bionic eye.

Medical device technologies for managing disease and wellness

As a response to the increasing burden of chronic disease and the ageing population on health care expenditure, considerable focus has been placed on appropriate technologies for promoting self-care and for supporting ageing-in-place.

A number of medical device technologies aimed at relieving the burden of disease and improving quality of life will be explored. These devices, developed at the Graduate School of Biomedical Engineering, University of New South Wales over the past two decades include telehealth monitoring and decision support systems for chronic disease management; and wearable ambulatory technologies based around triaxial accelerometry for estimating risks of falling and for automatically detecting falls. Brief mention will also be made of work towards the design and testing of a retinal neuroprosthesis to provide some form of vision restoration for lost sensory function.

Trialing and deployment of these technological approaches will be discussed in conjunction with some perspectives on health service delivery models and anticipated health and economic outcomes from the adoption of telehealth systems.

Professor Yue Ma

Laboratory Head
Institute of Biophysics, CAS

Email yuema@ibp.ac.cn

Professor Yue Ma is a developmental biologist and stem cell biologist by training. He obtained his Ph.D. from the Neuroscience & Behavior Program of the University of Massachusetts at Amherst, studying the transcription regulation during embryonic central nervous development. In 2000, he joined the laboratory of Dr. James Thomson at the Primate Research Center of the University of Wisconsin-Madison for his post-doctoral training. During the years in Madison, he studied the transgene expression of human embryonic stem cells using lentiviral vectors, and the cardiac differentiation of these cells. In 2006, Professor Ma joined the Institute of Biophysics, Chinese Academy of Sciences. The long term goal of his research is to realize the fruit of human embryonic stem cells in heart regeneration. Currently, his research is focused on the cardiac subtype specification during human embryonic stem cell differentiation.

Atrial and ventricular specification during human embryonic stem cell differentiation

Cardiomyocytes derived from human pluripotent stem cells (hPSCs) using the classical cardiac differentiation protocols are fair mixtures of nodal, atrial and ventricular myocytes, and each subtypes of cardiomyocytes has its unique electrophysiological properties. Even though hPSCs derived cardiomyocytes have board applications in future cell based heart repair and drug development, the heterogeneity of these cells considerably hampers their usage. Uncover the regulatory mechanisms of cardiac subtype specification is essential for acquiring subtype specific myocytes from hPSCs.

In 2011, we reported that relatively homogeneous atrial and ventricular myocyte populations can be obtained from differentiating human embryonic stem cells (hESCs) by manipulating retinoic acid signaling. By comparing pan-retinoic acid receptor antagonist BMS-189453 (RAi)-treated cultures with RA-treated cultures, we found that the ventricular-specific gene *IRX-4* and MLC-2v were expressed in the majority of the cardiomyocytes in RAi-treated cultures, but not in those of RA-treated cultures. Electrophysiological studies indicated that 83% of the cardiomyocytes in RAi-treated cultures had embryonic ventricular-like action potentials (APs), and 94% of the cardiomyocytes in RA-treated cultures had embryonic atrial-like APs. Recently, we have identified a signal pathway which proactive regulates ventricular differentiation of hESCs. Activating this pathway can promote ventricular differentiation when RA is present in the culture medium.

Professor Michael Monteiro

ARC Future Fellow
The University of Queensland

Email: m.monteiro@uq.edu.au

Prof. Michael Monteiro is currently an ARC Future Fellow at the Australian Institute for Bioengineering and Nanotechnology, The University of Queensland. He has established an international reputation in the field of 'living' radical polymerisation to produce highly complex polymer architectures and nanostructures in water. Monteiro has published over 140 peer reviewed publications ranging from polymerization methods to polymers in drug and vaccine delivery to use of polymer scaffolds for tissue engineering. He was also founder of DendriMed Pty Ltd. His awards also include the J. G. Russell award from the Australian Academy of Science, the UQ Research Excellence award, ARC QEII Fellowship and the ADC Future Leadership award in 2011.

Polymers in biomedical applications

Polymers with designer architectures prepared by 'living' radical polymerization (LRP) have allowed the synthesis of complex architectures, and moreover the applications for such architectures are slowly being realized in biomedical applications. The seminar will present work on the synthesis of complex polymer architectures and their use in vaccine delivery and the delivery of siRNA. The toxicity of nanostructures made using LRP will also be presented. In the case of siRNA, the polymers have been rationally designed to give excellent transfection and knockdown in a cancer cell line. The major obstacles overcome using our self-catalyzed polymer was endosome escapes and release of negatively charged siRNA due to the degradation of the polymer from positively to negatively charged side groups in water. Our system does not rely on biological or external triggers such as enzymatic, pH, heat or ultrasound, and is independent upon the pH of the environment.

Professor Anushka Patel

Chief Scientist
The George Institute for Global Health

Email: apatel@georgeinstitute.org

Anushka Patel is the Chief Scientist at The George Institute for Global Health, a Professor of Medicine at The University of Sydney and a cardiologist at Royal Prince Alfred Hospital in Sydney, Australia. She completed her undergraduate medical training at The University of Queensland, and her training in cardiology in Sydney. She has a Master of Science degree in Epidemiology from Harvard University and a PhD in Medicine from The University of Sydney. She currently holds a National Health & Medical Research Council Senior Research Fellowship. Her research focuses on clinical and health service approaches to improved prevention and management of chronic diseases, particularly in vulnerable populations. More recently, this has focused on affordable health technology innovation and health workforce re-engineering in low resource settings.

Frugal innovation and chronic diseases in ageing populations

In 1999, the "10/90 gap" was coined by the Global Health Forum to describe a mismatch between research funding and global priorities – ***"Investment in health research and development by the public and private sectors amounts to about US$ 56 billion a year. Most of this – a staggering 90% – is spent on research into health problems that concern only 10% of the world's population."*** Over the past decade, this gap has significantly narrowed, but not only as a result of important successes against diseases of poverty, particularly communicable conditions and maternal and child health problems. Rapidly developing economies with expanding and ageing populations now face similar challenges of a rapidly escalating incidence of chronic diseases that have dominated most high income countries for decades. China and Australia now share many similar healthcare priorities, which present common challenges to face within each local context. However, this also provides enormous opportunities to collaborate in designing new strategies to confront these issues. This presentation will focus on patterns of change in disease burden in China and Australia, as well as the potential role for affordable healthcare technology to deliver essential services for the prevention and management of chronic diseases among the rapidly ageing populations of both countries.

Professor Duanqing Pei

Director
Guangzhou Institutes of Biomedicine and Health, CAS

Email: Pei_duanqing@gibh.ac.cn

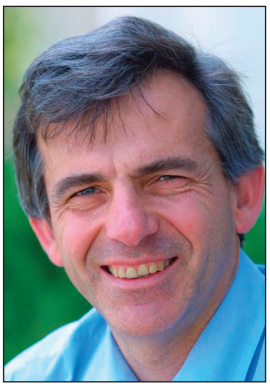
Duanqing Pei is Professor of stem cell biology and also serves as the Director General (President) at the Guangzhou Institutes of Biomedicine and Health (GIBH), Chinese Academy of Sciences, in Guangzhou, China. He obtained his PhD from the University of Pennsylvania in 1991 and trained as a postdoctoral fellow at the University of Michigan before becoming a faculty member at the University of Minnesota School of Medicine in 1996. He joined the Medical Faculty at Tsinghua University in Beijing China in 2002 and moved to the newly formed GIBH in 2004.

Professor Pei studied the transcription regulation of hepatitis B virus (HBV) for his Ph.D. thesis by identifying C/EBP as a repressor for HBV transcription and dissecting the transactivation domains in C/EBP. Then he shifted his research interest into the field of extracellular matrix remodeling by studying the structure and function of matrix metalloproteinases (MMPs). He cloned several novel members of the MMP family, uncovered the unique intracellular activation mechanism of MMPs with the proprotein convertase system, and the intracellular trafficking of membrane-bound MMPs. Upon returning to China, he once again changed his field of study and started working on pluripotency first and then reprogramming. The Pei lab in Tsinghua began to publish in the stem cell field on the structure and function of Oct4, Sox2, FoxD3, Essrb, and Nanog, and their interdependent relationship towards pluripotency. Based the understanding of these factors, the Pei lab was the first in China to create mouse iPSCs using a non-selective system, and then improved the iPS process systematically. The Pei lab subsequently disseminated the iPS technology in China by providing not only resources, but also training workshops. Recent publications from the Pei lab include the discovery of vitamin C as a potent booster for iPSC generation and a mesenchymal to epithelial transition initiates the reprogramming process of mouse fibroblasts. Now, his lab continues to explore new ways to improve iPS technology, dissect the reprogramming mechanisms driven by Oct4/Sox2/Klf4 or fewer factors, and employ iPSCs to model human diseases in vitro.

Jhdm1a/1b enhance somatic reprogramming in a vitamin C dependent manner

Tao Wang,Keshi Chen, Xiaoming Zeng,Jianguo Yang, Yun Wu, Xi Shi,Baoming Qin, Lingwen Zeng,Miguel Angel Esteban,Guangjin Pan,and Duanqing Pei,* Key Laboratory of Regenerative Biology, South China Institute for Stem Cell Biology and Regenerative Medicine, Guangzhou Institutes of Biomedicine and Health, Chinese Academy of Sciences

Vitamin C enhances the reprogramming process, but the underlying mechanisms are unclear. Here we show that the histone demethylases Jhdm1a/1b are key effectors of somatic cell reprogramming downstream of vitamin C. We first observed that vitamin C induces H3K36me2/3 demethylation in mouse embryonic fibroblasts in culture and during reprogramming.We then identified Jhdm1a/1b, two known vitamin C dependent H3K36 demethylases, as potent regulators of reprogramming through gain- and loss-offunction approaches. Furthermore, we found that Jhdm1b accelerates cell cycle progression and suppresses cell senescence during reprogramming by repressing the Ink4/Arf locus. Jhdm1b also cooperates with Oct4 to activate the microR-302/367, an integral component of the pluripotency machinery. Our results reveal a role for H3K36me2/3 in cell fate determination and establish a link between histone demethylases and Vc induced reprogramming.



Professor Martin Pera

Chair, Stem Cells Sciences & Program Leader
The University of Melbourne

Email: martin.pera@unimelb.edu.au

Martin Pera is Professor of Stem Cell Sciences at the University of Melbourne, the Florey Neuroscience Institute, and the Walter and Eliza Hall Institute for Medical Research. He serves as Program Leader for Stem Cells Australia, the Australian Research Council Special Research Initiative in Stem Cell Sciences. His research interests include the cell biology of human pluripotent stem cells, early human development, and germ cell tumours. Pera was among a small number of researchers who pioneered the isolation and characterisation of pluripotent stem cells from human germ cell tumours of the testis, work that provided an important framework for the development of human embryonic stem cells. His laboratory at Monash University was the second in the world to isolate embryonic stem cells from the human blastocyst, and the first to describe their differentiation into somatic cells in vitro. He has provided extensive advice to state, national and international regulatory authorities on the scientific background to human embryonic stem cell research.

Pluripotent stem cell states and fates

The successful exploitation of stem cells in research and medicine relies on a fundamental understanding of the regulation of cell fate. Pluripotent stem cells provide an excellent model for a systems biology approach to the study of cell state transitions. In mouse and human, multiple states of pluripotency span a continuous hierarchy between primordial stem cells and stem cells that have embarked on the process of commitment towards the formation of differentiation lineages. High resolution mapping of pluripotent stem cell populations, based on a combined analysis of cell surface antigen and gene expression at the single cell level, and biologic assay of self renewal and differentiation capacity, provides new insight into how cells transit through this hierarchy of pluripotency, and how cells re-enter the hierarchy during reprogramming.

Professor Nadia Rosenthal

Director and Scientific Head
Monash University

Email: nadia.rosenthal@embl.org.au

Professor Nadia Rosenthal obtained her PhD in 1981 from Harvard Medical School where she directed a biomedical research laboratory, serving for a decade at the New England Journal of Medicine as editor of the Molecular Medicine series. She headed the EMBL-Rome campus from 2001-2012 and held a Professorship of Cardiovascular Science at Imperial College London. She is an EMBO member, was awarded the Ferrari-Soave Prize in Cell Biology and Doctors Honoris Causa from the Pierre and Marie Curie University in Paris and the University of Amsterdam. She is currently Founding Director of the Australian Regenerative Medicine Institute at Monash University and Scientific Head of EMBL Australia. Her research focuses on the role of growth factors and stem cells in tissue regeneration, with over 160 primary research articles and prominent reviews in high impact international journals, and sponsored research funding from major pharmaceutical companies. Professor Rosenthal is a National Health and Medical Research Council Australia Fellow.

Immune modulation of vertebrate regeneration

The adult mammalian body does retain the robust repair capacity of embryonic stages. In contrast to the effective regeneration of other vertebrates, the limited restorative capacity of many adult human tissues has been attributed to the loss of adequate cell replacement coupled with persistent inflammation during age and disease. Our approach has been to intervene in the mechanisms underlying the mammalian response to age, damage or disease, by reducing the impediments to effective regeneration. Using genetic manipulation we have investigated the role of growth factors and resident immune cells in the resolution of tissue injury, in both mouse and axolotl, an efficiently regenerating member of the urodele amphibian family. We have uncovered a complex interaction between local repair mechanisms and circulating immune cells, which participate in the removal of necrotic cells, secrete growth factors that limit inflammation, and promote tissue replacement. We have recently discovered an exciting connection between regenerative processes and immune tolerance. Our work supports the feasibility of improving human regenerative capacity by modulating key signaling pathways controlled by specific components of the immune system, providing new targets for clinical intervention and improving prospects for molecular and cellular combination therapies.

Professor Louis Schofield

Laboratory Head, Infection and Immunity
Walter and Eliza Hall Institute of Medical Research

Email: schofield@wehi.edu.au

Professor Louis Schofield is an International Research Scholar of the Howard Hughes Medical Institute and co-founder of Ancora Pharmaceuticals Inc. He shares the Directorship of the Queensland Tropical Health Alliance with his ongoing research work at the Walter and Eliza Hall Institute. A recognised authority in the immunology and pathogenesis of infectious diseases, he has research programs covering basic molecular sciences, product development and commercialisation, epidemiology and public health. His approach to malaria has resulted in promising vaccine development programs and he is involved in clinical trials in Papua New Guinea and Africa. H e has published several key articles, including in Nature and Science, and has received over 4,000 citations to date.

Professor Rob Shepherd

Director
Bionics Institute

Email: rshepherd@bionicsinstitute.org

Professor Rob Shepherd was appointed the Director of the Bionics Institute (formerly the Bionic Ear Institute) and Professor of Medical Bionics at the University of Melbourne in 2006.

He has made a significant contribution, both scientifically and commercially, to the development of safe and effective cochlear implants - a device that today brings the gift of hearing to over 220,000 deaf adults and children worldwide. In recent years he has applied his extensive personal expertise and multi-disciplinary approach to the development of a bionic eye, and overseen the expansion of the Bionics Institute's research portfolio to include the development of a neurobionic platform technology to alleviate a range of intractable and debilitating central nervous system disorders (e.g., epilepsy, Parkinson's disease).

Professor Shepherd's research includes the original pre-clinical safety and efficacy studies used by Cochlear Ltd as part of their successful FDA submission in 1985. His subsequent research on the effects of paediatric cochlear implantation contributed to the FDA approving the Cochlear Ltd device for use in children as young as 2 years of age in 1990. His research continues to explore ways of improving the quality of hearing provided by the cochlear implant and uses a wide variety of approaches including: in vitro and in vivo biosafety studies; chronic electrical stimulation; histopathology and electrophysiology; brain plasticity; and development of novel drug delivery methods to maintain the auditory nerve which degenerates following deafness.

Professor Shepherd is the leader of the Preclinical Program in a current Australia-wide collaboration – Bionic Vision Australia – to develop a prototype bionic eye. This Australian Research Council grant (AU$42m) aims to restore useful vision to people suffering from eye diseases such as retinitis pigmentosa, a degenerative genetic eye condition. The research team collaborates closely with clinicians, materials scientists and engineers to develop new electrodes, to establish safe biocompatible devices and inform the development of safe surgical procedures and electrical stimulation.

Medical bionics: An Australian perspective

Medical bionics devices electrically stimulate excitable tissue, including nerve and muscle, to provide theraputic intervention for a large variety of maladies. Examples include the cardiac pacemaker to assist heart pacing, the cochlear implant for hearing disorders, deep brain stimulation to relieve symptoms in a variety of neurological diseases including Parkinson's disease, essential tremor and obsessive compulsive disorder, and stimulation devices to relieve drug resistant neuropathic pain. The field is large and undergoing rapid growth world-wide.

Australia has played a significant role in the development of medical bionics, including pioneering work in the development of implantable cardiac pacemakers, the development of hermetic sealing technologies to protect implantable electronics from the corrosive environment of the body, and the development of the first FDA approved multichannel cochlear implant. More recently we have embarked - with colleagues from Bionic Vision Australia - on a program to develop a retinal prosthesis for patients that suffer from retinitis pigmentosa.

I will provide an overview of the development of the medical bionics industry in Australia with an emphasis on the importance of high quality multidisciplinary research and excellent biomedical engineering – both features of the Australian research environment. In the final section of my talk I will provide a brief overview of new medical bionics applications, many of which will be clinically and commercially viable within the next decade. With the appropriate resources and support it is anticipated that Australia can continue to provide leadership in this exciting field.

Funding for this research includes: Australian Research Council to Bionic Vision Australia; The Potter Foundation, The NHMRC and the NIH (HHS-N-263-2007-00053-C).

Professor Hong Tang

Deputy Director General
Wuhan Institute of Virology, CAS

Email: tangh@wh.iov.cn

Professor Hong Tang (BSc, 1988 at Nanjing University, China; PhD, 1996 at Rutgers University, USA) is a Professor of Molecular Immunology, and Deputy Director General of Wuhan Institute of Virology, Chinese Academy of Sciences, China. He is also a member of standing committee of Chinese Society for Immunology, National Science and Technology Review Panel of Prevention and Control of Infectious Diseases Special Funds, Review Panel of Infectious Diseases Study Session of Ministry of Science and Technology of China. His primary research interests are the gene programs underlying virus-host cell interactions, molecular mechanisms of innate immune responses to virus infections, and immunopathology of viral diseases. He has published several dozen original research articles in Nature Medicine, Immunity, PNAS, Cell, Mol Cell, Genes Dev, J Immunol, J Biol Chem. His recent findings on how T cells are involved in modulating the innate inflammatory responses have revealed a novel aspect of the co-evolution of innate and adaptive arms of immunity.

The innate function of T cells in the control of inflammation

We have previously shown that T cells are both necessary and sufficient to temper Toll like receptor (TLR) mediated inflammatory response to pathogens, in a TCR-independent manner. TCR-independency thus highlights that T cells may possess evolutionally conserved characteristics of innate immune cells. Herein I will discuss another feature of how pro-inflammatory CD8+ T cells activate macrophages and initiate myocardiac injury. Macrophages infiltration and activation in myocardium is a pivotal immunopathological lead to hypertensive cardiac micro-injury, but underlying mechanisms remain elusive. My laboratory has found that CD8+ T cells are essential for the process. CD8 gene targeting (CD8 KO) or CD8+ T cells depletion by antibody significantly reduced cardiac pro-fibrotic inflammatory responses induced by angiotensin II (Ang II) infusion, whereas CD8 KO mice reconstituted with CD8+ T cells became sensitive to Ang II. More importantly, CD8+ T cells were required for macrophage infiltration in myocardium and subsequent activation to express pro-inflammatory cytokines and chemokines, including monocyte chemoattractant protein 1 (MCP-1). Furthermore, transwell experiments showed that MCP-1 production by macrophages and its chemotaxis effect on macrophage motility required direct contact with activated CD8+ T cells, but independent of T cell receptor (TCR). TCR-independent activation of macrophage was further confirmed in vivo, where OT-I transgenic mice, although its CD8+ T cells carry a surrogate TCR specific to ovalbumin, showed a similar cardiac pro-inflammatory response to Ang II as wild type mice. Finally, among several CD8+ T cell-dependent pro-inflammatory cytokines and chemokines, MCP-1 antagonism effectively inhibited macrophage infiltration and activation, and effectively prevented Ang II-induced cardiac inflammation. Thus, TCR-independent innate nature of CD8+ T cells are both necessary and sufficient for macrophage-induced hypertensive cardiac fibrosis.

Therefore, TCR-independent activation of macrophages by CD8+ T cells casts yet a novel innate function of T cells that, in addition to suppressing the innate inflammatory response to infections, CD8+ T cells are required to activate inflammatory response of macrophages to danger signals. It has become clearer that the conventional boundary between innate and adaptive immunity becomes blurring.

Professor Zhiyong Tang

National Center for Nanoscience and Technology

Email: zytang@nanoctr.cn

Zhiyong Tang is Professor of National Center for Nanoscience and Technology (NCNST). His research interests are mainly focused on controllable synthesis, property manipulation and practical application of inorganic nanomaterials. He developed the general and fundamental methods for preparation of inorganic nanoparticle assemblies with different dimensions, structures and functionalities, and explored their applications in the field of energy and environment. In the past several years, he has published more than 100 peer-reviewed papers, and among those 40 papers have been published in the journals of the impact factors higher than 8. Until March of 2012, the citation times of Prof. Tang's papers are more than 4500, and his H-index is 30. Because of the pioneering work in nanostructured materials, Prof. Tang's work has been extensively reported by both world-renown news magazines and academic journals including The New York Times, The Washington Times, Nature, Nature Materials, Nature Nanotechnology, Science News, etc.

Fabrication and application of inorganic nanoparticle superstructures

Fabrication of inorganic nanoparticle superstructures is one of the most important ways to realize the practical applications of nanomaterials in many fields, e.g., photonics, electronics and sensors. In this talk, I will introduce the recent progress in our group on this research topic, which include: (1) Fabrication of large-scale and hierarchy superstructures via manipulation of the physical interactions between inorganic nanoparticle building blocks [1,2]; (2) Preparation of dynamic and reversible superstructures by design of Janus-type inorganic nanoparticles [3,4]; and (3) Application of inorganic nanoparticle superstructures in the field of photonic devices including optical signal storage and Raman scattering enhancement [5]. At the end of the talk, I will briefly discuss current challenge in our work.

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Professor Shouyan Wang

Professor of Biomedical Engineering
Suzhou Institute of Biomedical Engineering and Technology

Email: swanglab@gmail.com

Shouyan Wang is a Professor of Biomedical Engineering in Suzhou Institute of Biomedical Engineering and Technology. He earned his PhD in cardiovascular time series analysis and modelling for autonomic function evaluation in 2000. From 2002 to 2007, he worked at the Sensorimotor Control Group in the Physiology Department and Functional Neurosurgery Group in the Nuffield Department of Surgery, University of Oxford, UK. He worked on neural signal processing of deep brain local field potentials, modelling of brain connectivity, quantitative clinical assessment for patients to improve the outcome of deep brain stimulation treatment and understand the mechanisms of neurological diseases. From 2007 to 2012, he lectured at the Institute of Sound and Vibration Research. He further explored the research on brain plasticity after neuroprothetic implantation of cochlear implants and speech processing. His current interests include intelligent neuromodulation, neural activity sensing, brain signal analysis and modelling and intra-operative monitoring.

Invasively modulating and decoding the human brain

Invasive deep brain stimulation techniques are of increasing importance and have translated into sucessful clinical treatment for many neurological diseases. It also provides unique opportunities to explore the function of human brain. The analysis of invasively recorded deep brain local field potentials have provides insights into the mechanisms of Parkinson's disease, dystonia and pain. By decoding the movement or movement disorder related states in the signals, they could be also potentially used for developing the brain-machine or even brain-machine-brain interface. Deep brain local field potentials analysis and brain modelling reveals the possible mechanisims of deep brain stimulation in suppressing over-activiated neural oscillations and resonant basal ganglia-cortical circuit. The future development in neuromodulation engineering aims to recover or replace dysfunction or impairement in neural system by integrating material, micro-electronics, information processing and neuroscience knowledge and technologies. The close collaboration of engineers, neuroscientists and clinicians will enable us to probe and decode the brain activity, translate information into the brain and explore new intelligent, personalised and dynamic treatment for complex neurological diseases.

Associate Professor Christine Wells

QLD Government Smart Futures Fellow
University of Queensland

Email: c.wells@uq.edu.au

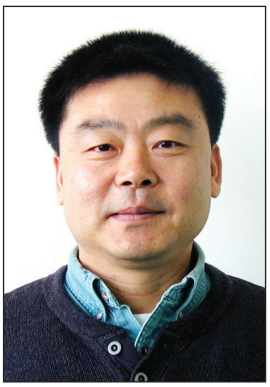
Christine Wells is a genome biologist, interested in the intersection between genes and environment that drives cellular differentiation and activation. She works in an international context, as part of the FANTOM (Functional annotation of the mammalian genome) consortia, has published more than 70 papers, including the first comprehensive transcriptome of the mammalian genome (Nature 2002), the first systematic description of noncoding RNAs (Science 2005), and the first genome-wide description of promoters and promoter architecture (Science 2006). Her laboratory, at the Australian Institute for Bioengineering and Nanotechnology, University of QLD, focuses on the genome biology of Stem Cells and where she has developed the Stemformatics.org resource as a collaborative platform and gene expression compendium for Stem Cells Australia. She also works in innate immune function, where she applies cross-disciplinary approaches to identify the molecular pathways required for healthy immune activation. Christine has a strong collaborative ethic, and works across the Australian research communities to facilitate uptake and engagement of systems-wide approaches to understanding cellular phenotypes.

Systems approaches to stem cell biology

Christine Wells[1], Celena Heazelwood[1], Elizabeth Mason[1], Jessica Mar[2], Nicholas Matigian[3], Rowland Mosbergen[1], Othmar Korn[3], Leo McHugh[4], Kim-Anh Lê Cao[4], Kerry Atkinson[5], John Quackenbush[6]

A major goal of stem cell researchers is the identification, isolation and characterisation of the rare stem cell subsets that reside within adult tissues. These efforts are hampered by a lack of definitive cell markers, or an understanding of the genetic and environmental contributors required for maintaining an adult stem cell network ex vivo. Systems biology offers a platform to integrate a range of features that, in combination, identify key molecular features of the stem cell network, and which provide insight into the impact of extrinsic factors such as cell surface components, growth factors and their signalling pathways, and the epigenetic state of the cells. Building population-based metrics into the systems biology pipeline provides insight into flux of cells around an idealised stem cell state, and further provide the means to understand transition from this state towards lineage commitment during cellular differentiation. I discuss a range of tools that we've developed for studying the gene regulatory networks in exemplar adult stem cell datasets, including the 'attract' pathway tool and the Stemformatics.org expression portal.

1. AIBN, UQ
2. Albert Einstein College of Medicine, NY, USA
3. Eskitis Institute for Cell and Molecular Therapies, Griffith University
4. Queensland Facility for Advanced Bioinformatics
5. Mater Research Institute, UQ
6. Center for Cancer Computational Biology, Dana-Farber Cancer Institute



Professor Jun Yu

Associate Director
Beijing Institute of Genomics, CAS

Email: Junyu56@gmail.com

Professor Jun Yu is currently a professor of Beijing Institute of Genomics (BIG), Chinese Academy of Sciences (CAS). He obtained his B.S. degree in biochemistry from Jilin University in 1983 (from 1978) and Ph.D. degree in biomedical sciences from New York University School of Medicine in 1990 (from 1984). He served as a Research Assistant Professor of Urology at NYU from 1991 to 1993. He joined the University of Washington Genome Center in 1993 and attuned primary research interests toward genomics and bioinformatics. He started to work in China in 1998 and has led many major genome projects in China, such as the International Human Genome Project (the Chinese effort), the Super-hybrid Rice Genome Project, and the Silkworm Genome Project. His current research focuses include genome dynamics and stability, epigenetic and genetic regulation of gene expressions, and tool developments for genomics and bioinformatics. He has published over 200 peer-reviewed scientific papers and serves on editorial board for several peer-reviewed journals, such as Editor-in-Chief for Genomics, Proteomics and Bioinformatics (2003–), Co-Editor-in-Chief for Nature Review Genetics (the Chinese Edition; 2011–), Associate Editors for Genomics (2006–), BMC Evolutionary Biology (2008–), and Frontiers in Plant Genetics and Genomics (2010–). He has won several academic awards, such as 100-Talent Plan (Outstanding, CAS, 2002-2005), Outstanding Young Investigator Award (Class B, the Chinese Natural Science Foundation, 1999–2002), American Foundation for Urological Diseases Ph.D. Research Scholar (1991–1993), and China-US Biology Examination and Application (CUSBEA,1983).

Systematic annotation of human genomes and genes

JiaYan Wu, JingFa Xiao, Dapeng Wang, Zhang Zhang, Xumin Wang and Jun Yu

CAS Key Laboratory of Genome Sciences and Information, Beijing Institute of Genomics, Chinese Academy of Sciences

The human genome harbors ~30,000 genes and ~100,000 transcripts; nearly 10,000 genes are universally expressed or house-keeping. These gene loci cover nearly the entire genome length and are mostly clustered. The gene clusters are conserved within the vertebrate lineage and regulated in synergy, except the circadian regulated genes that tend to escape from gene clusters. Both GC content and size of most human genes have increased over the evolutionary time scale, most pronounced among warm-blooded vertebrates. In any case, comparative genomics provides powerful tools as a top-down approach for annotating human genome based on mammalian genomes.

Most of mutation discovery efforts have focused on protein coding variations of the human genome and their associations with diseases and biological functions. However, along the operational track, many molecular mechanisms, such as pre-mRNA splicing, are also subjected to natural selection as long as a way to define mutation, selection, and their relationship can be devised. Minimal introns (~87bp) represent one example of such mechanisms and so are those related to transcription, DNA repair, and RNA editing/modification. Nevertheless, cell-based omics studies as a bottom-up approach pave a way for understand biological function of genes in a cellular context.

Professor Yuan-Ting Zhang

Chinese Academy of Sciences
Email: ytzhang@ee.cuhk.edu.hk

Professor Zhang completed his undergraduate and Master Degree studies in 1976 and 1981, respectively, in telecommunication from Department of Electronics of Shandong University and was conferred a Ph.D. in the area of Biomedical Engineering from the Department of Electrical Engineering at the University of New Brunswick in 1990.

Professor Yuan-Ting Zhang serves currently as the Director of the Key Lab for Health Informatics of the Chinese Academy of Sciences (HICAS) at the SIAT; the Director of Joint Research Center for Biomedical Engineering, and Professor of Department of Electronic Engineering at the Chinese University of Hong Kong (CUHK). He became the founding Head of Biomedical Engineering Division at the CUHK in Hong Kong and the founding Director of the SIAT Institute of Biomedical and Health Engineering of the Chinese Academy of Sciences in Shenzhen in 2007.

His research spans several fields including wearable medical devices, body sensor networks, bio-THz technologies, bio-modeling, neural engineering, cardiovascular health informatics, and e-p-m-Heath and telemedicine technologies, and is closely tied up to his teaching and publishing activities. He has authored/co-authored over 400 scientific publications and 11 book chapters, and filed 31 patents. His research work has won him and his team a number of Awards including the best journal paper awards and outstanding service award from IEEE-EMBS, and the Asia Pacific ICTA e-Health Grand Award.

Perspectives of health informatics

Population ageing is a global phenomenon. It is estimated that the number of elderly (people aged 60 years or above) will increase from 600 million to 2 billion by 2050, when it will be the first time in human history that elderly people outnumber children (people aged ≤15 years) [1]. In addition to the population ageing, the prevalence of chronic diseases such as heart disease, stroke, and cancer, is the major cause of death in almost all countries. An effective solution to control chronic diseases is to commence monitoring and modifying risk factors and other possible causes leading to the development of these diseases before noticeable symptoms of illnesses have developed. In essence, future healthcare systems should encourage the Participation of all nations for the Prevention of illnesses and the early Prediction of these diseases such that Preemptive treatment is delivered to realize Pervasive and Personalized healthcare, i.e., the paradigm of the 6-Ps medicine [2].

Health informatics plays an important role in implementing the 6-Ps medicine and improving the human health. Health informatics here refers to the application of information technologies, including the Processing, Integration, Storage, Transmission, Acquisition, and Retrieval (PI-STAR) of health information, to understand the mechanism of and prevent the development of diseases. The PI-STAR of the vast amount of health information generated by the dramatic progresses in modern biomedicine requires new strategies and the innovation across multidiscipline. Advancing health informatics has been identified as one of 14 grand challenges in engineering in the 21st century. This talk will present health informatics as a new strategy with a focus on its application for the early detection, early prediction, early diagnosis and early treatment of acute cardiovascular diseases. Using blood plague evaluation as an example, it will be illustrated that advancing cardiovascular health informatics requires interdisciplinary research across multiple scales in the biological hierarchy from molecular, cell, organ and system; and the synergism of science, engineering, and technology with the ultimate aim of translation to practical use. Under this new strategy of health informatics, the enabling technologies will emerge for the improvements of human health and quality of life of people especially aging population with chronic diseases.

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Professor Guangbiao Zhou

Principal Investigator
Institute of Zoology, CAS

Email: gbzhou@ioz.ac.cn

Professor Guangbiao Zhou received his MD degree from Shanghai Jiao Tong University School of Medicine, Shanghai, China and joined the Faculty of Guangzhou Institute of Biomedicine and Health, Chinese Academy of Sciences (CAS) where he directed the researches on targeted therapy for cancer. He is now a professor and head of the Division of Molecular Carcinogenesis and Targeted Therapy for Cancer, State Key Laboratory of Biomembrane and Membrane Biotechnology, Institute of Zoology, CAS. He is a member of the Committee of the Chinese Experimental Hematology Association and the Executive Deputy Editor-in-Chief of the journal Frontiers of Medicine. He served as the CAS side coordinator of the CAS-National Institute of Health of US joint workshop on "Environmental pollution and lung cancer" held in 2010. His primary interest is to elucidate the mechanisms of action of some anticancer drugs and to develop new therapeutic approaches for cancer. His current works include sequencing the whole genome of air pollution-related lung cancer to investigate the pathogenesis of lung cancer and to identify novel therapeutic targets, and development of targeted therapies for non-small cell lung cancer.

Targeted therapy: The new lease on life for acute myeloid leukemia, and beyond

The past two to three decades have witnessed tremendous success in the development of targeted therapies, treatment strategies perturbing the molecules critical for disease pathogenesis, for human cancer. For example, synergistic targeted therapies have significantly improved the disease-free survival of acute promyelocytic leukemia (APL), a distinct subtype of acute myeloid leukemia (AML) driven by the t(15;17)-generated PML-RARα fusion protein. Two drugs, all-trans retinoic acid and arsenic trioxide, trigger catabolism of PML–RARα and synergize in clearance of the fusion protein and eradication of leukemic promyelocytes, turning APL from a highly fatal to a highly curable disease. Recently we have been working on AML with t(8;21) which produces AML1-ETO/AML1-ETO9a fusion transcripts, and demonstrate that a diterpenoid oridonin binds AML1-ETO and directs the enzymatic cleavage at D188 by caspase-3 to generate a truncated AML1-ETO which forms oligomer with the parental oncoprotein and interferes with its trans-regulatory functions. Oridonin inhibits the activity of Sca-1-/Lin-/c-Kit+ leukemia-initiating cells and prolongs survival of mice bearing t(8;21) leukemia cells. The proteasome inhibitor bortezomib interferes with C-KIT processing, transforms the AML1-ETO/AML1-ETO9a into tumor-suppressing fragments and exerts potent therapeutic efficacy in mouse models for t(8;21) AML. In lung cancer, compounds targeting crucial oncoproteins including CIP2A and cyclin D1, also show promising therapeutic potentials. These results indicate that the development of targeted therapies may lead to cancer control, with identification of drug targets and rational design of combination regimens as the keys, in the era of systems biomedicine.

Professor Qi Zhou

Assistant Director
Institute of Zoology, CAS

Email: zhouqi@ioz.ac.cn

Qi Zhou received a PhD in Physiology & Embryology from Northeast Agriculture University, China, 1996. In 1997-1999 he held a postdoctoral and Associate Professor positition in the Institute of Developmental Biology, Chinese Academay of Sciences (CAS), and in 1999-2002 he was a postdoc and Project leader within the group of Prof. J.P. Renard (Developmental Biology and Reproduction, INRA, Jouy-en-Josas, France). In 2001 he was offered a 100 talent position in the Institute of Zoology, CAS, where he is currently Professor of Developmental Biology, Vice Director of State Key Lab of Reproductive Biology.

As a developmental biologist, Dr. Zhou's research interest is to study the mechanisms of differentiation and de-differentiation, particularly, cellular plasticity and totipotency of the stem cells, and the reprogramming mechanisms of the somatic cells. In addition, he also focuses on the translation from fundamental researches towards medicine and technology applications to finally promote the development of regenerative medicine.

Progress of stem cell research and potential application in regenerative medicine

Stem Cell, with its property of unlimited proliferation and fully developmental potential, has become an important cell resource in regenerative medicine research. For most research focus on embryonic stem cells, the ethical issue has been an obstacle for its application. Induced pluripotent stem cell (iPS cell) has been the hotspot of stem cell research since it was invented in 2006. Up to now, ES cells and iPS cells have been successfully derived from mice, human, monkeys, rats and pigs and have been differentiated into many tissue specific cells. Over the years, increased progress in the field of stem cell reseach has been achieved: the demonstration of pluripotency of iPS cells, the generation of iPS cells by recombinant proteins and the identification of pluripotency marker of stem cells. Moreover, the success of direct reprogramming of somatic cells into multipotent stem cells expands the cell resource which is important in application field of stem cells. These achievements will bring a more promising future of stem cell in both basic research and regenerative medicine.

Early Career Researchers

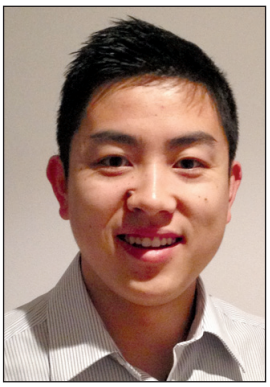
Dr Anselm Enders

Postdoctoral Fellow
The John Curtin School of Medical Research

Email: anselm.enders@anu.edu.au

Anselm Enders received his medical degree from the University of Freiburg, Germany. As a student he spent one year in the lab of Andreas Strasser at the Walter and Eliza Hall Institute in Melbourne before returning to Germany to finish his medical degree. After finishing medical school he worked for two years as a resident at the Children's Hospital in Freiburg, Germany. He then joined Chris Goodnow's group at the John Curtin School of Medical Research in Canberra in 2005. In 2007 he, together with Professor Chris Goodnow, was awarded a Major Initiative Award by the Clive and Vera Ramaciotti Foundation to establish the Ramaciotti Immunisation Genomics Laboratory under his leadership.

His research focuses on finding new genes and pathways controlling the development and function of the immune system with a special focus on B cell development and antibody production following immunizations. By screening mice after random ENU mutagenesis he recently identified a link between phospholipid transport across the cell membrane mediated by ATP11C and B cell development and function and an essential role for a novel endosomal protease in survival and function of mature B cells and specific dendritic cell subsets.



Dr Jeff Hou

Research Officer
Australian Institute for Bioengineering and Nanotechnology

Email: j.hou1@uq.edu.au

Currently a research fellow at the Australian Institute for Bioengineering and Nanotechnology (AIBN) based in Brisbane, Queensland. Working under Prof Peter Gray at AIBN and specialising in mammalian expression system with a focus on stable systems and high throughput bioprocessing. These biological systems developed at AIBN are to be used for the production of high value biopharmaceuticals such as monoclonal antibodies and protein based drugs. These biopharmaceuticals are subsequently used for human trials to target diseases such as cancer. The promise from these systems have orchestrated strong links within the Asia-Pacific. Countries within the region such as China have become the main drivers in the cohension and understanding of such processes and technologies leading to a spectrum of opportunities. As a consequence we look to further enrich and develop the current relationships while also continue to explore future opportunities with China in this field.

Ms Jane Kotey

PhD Candidate
Monash University

Email: jane.kotey@monash.edu

Jane Kotey is a PhD Candidate at Monash University undertaking research as part of the Australian Research Council funded Stem Cell Tourism Research Project. Her research focuses on patient experience in clinics in China, as well as exploring views of clinicians, policy makers and other who work in and/or regulate the stem cell field. Jane has previously undertaken narrative research in relation to expatriate medical treatments in China.

Dr Jia-Yee Lee

Director, Health and Life Sciences Business Team
National ICT Australia (NICTA)

Email: Jia-yee.lee@nicta.com.au

Dr Jia-Yee Lee is the Director of the Health and Life Science Business Team at National ICT Australia Ltd, Australia's Information and Communications Technology Research Centre of Excellence. Jia-Yee manages the teams that undertake programs in Diagnostic Genomics, Computational Genomics, Biomedical Informatics, Bio-Imaging Analytics, Portable Motion Analytics and Assistive Bionics. Prior to joining NICTA, Jia-Yee worked in the management consulting sector providing leadership in developing and implementing strategies and operational plans that improved business outcomes for clients in government, ICT, and healthcare / biomedical sectors. Jia-Yee has extensive experience gained through working on complex multi-disciplinary and multi-million dollar programs funded by State and Commonwealth governments. She was formerly a medical researcher who led research programs at MacFarlane Burnet Centre (now "Burnet Institute") and the Victorian Infectious Diseases Reference Laboratory in Melbourne. Her research into hepatitis B virus and rubella virus was funded by the National Health and Medical Research Council of Australia. Jia-Yee has a PhD from the University of Melbourne and a MBA from Melbourne Business School.

Dr Joseph Powell

Postdoctoral Research Fellow
University of Queensland Diamantina Institute

Email: joseph.powell@uq.edu.au

Dr Powell is a postdoctoral research fellow in the complex trait genomics group headed by Peter Visscher at the Diamantina Institute, University of Queensland. He moved to Brisbane early in 2010 after a stint in Edinburgh where he did his PhD in Statistical Genetics at the Roslin Institute, University of Edinburgh. He has been fortunate to work on a range of projects involving methods, theory and application around the nexus of quantitative, statistical and population genetics. This has provided a good foundation for his more recent research investigating the genetic architecture regulating gene expression and its role within a systems genetics framework. Most of his current work involves the investigation of genetic (co)variance of transcript levels both within and between different tissues. More details of his research can be found at: http://www.complextraitgenomics.com/

Dr Stephen Redmond

Senior Lecturer
University of New South Wales

Email: s.redmond@unsw.edu.au

Stephen received the BE (Hons) degree in electronic engineering from the National University of Ireland, Dublin, in 2002. He received the degree of PhD in Biomedical Signal Processing from the same institute in 2006. He is currently a Senior Lecturer at the Graduate School of Biomedical Engineering at the University of New South Wales, Sydney. His primary research interests revolve around the application of signal processing and pattern recognition techniques to develop novel non-invasive diagnostic procedures and technologies, ultimately making healthcare more accessible and affordable for the general population. One of the major arms of this research includes the development of telehealth technologies and associated software algorithms, bringing fundamental biomonitoring into the home to assist sufferers of chronic disease. Similarly, he and his research team are developing wearable ambulatory monitoring to reduce the burden of falls among older individuals, through anticipation of instability during normal movement, triggering the administration of a preventative rehabilitation program.

Dr Alan Rembach

Post-doctoral Research Fellow
Mental Health Research Institute

Email: a.rembach@unimelb.edu.au

Dr Alan Rembach is a post doctoral research fellow in the Alzheimer's Disease Research Group at The Mental Health Research Institute and is the site coordinator for the AIBL study (Australian Imaging, Biomarkers and Lifestyle (Flagship) Study of Ageing). Alan received his bachelor of Science with honours in the Department of Anatomy and Cell Biology at Monash University and his PhD, through the centre for Neuroscience at the University of Melbourne where he graduated in 2006. Alan's principal scientific interest and expertise is in neurodegeneration research, in particular the role of transition metals in Alzheimer's disease. Alan is also the scientific coordinator for the Cunningham-DAX "Mindfields" program and is a committee member of the Australian Neuroscience Society.

Dr Mohit Shivdasani

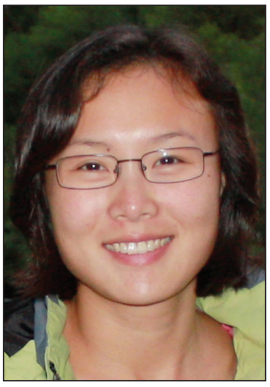
Research Fellow
Bionics Institute

Email: mshivdasani@bionicsinstitute.org

Dr Shivdasani arrived in Australia in 2003 from India to pursue a Masters degree in Biomedical Engineering at La Trobe University. He then went on to complete a PhD in 2009 at the Bionics Institute on Auditory Brainstem Implants, devices that electrically stimulate the auditory parts of the brain to restore hearing to deaf people who cannot benefit from a cochlear implant.

During his PhD, Dr Shivdasani published two research papers in prestigious international scientific journals and won five awards including the 2006 Young Biomedical Engineer Award presented by Engineers Australia – College of Biomedical Engineers. He has since published a total of 13 peer-reviewed journal articles including four as first author.

Dr Shivdasani is now part of a large multi-disciplinary team developing a retinal prosthesis through Bionic Vision Australia and plays a major role in the preclinical testing of devices prior to clinical trials.



Dr Yan Yan

Postdoctoral Fellow
The University of Melbourne

Email: yanyan@unimelb.edu.au

Dr Yan Yan is a postdoctoral fellow at the Department of Chemical and Biomolecular Engineering at the University of Melbourne. She received her PhD in Biochemistry and Molecular Biology from Peking University in 2008. During her PhD, she pursued a two and a half-year visiting study at the Neuropeptide Group led by Prof. Geoff Tregear in the Howard Florey Institute at the University of Melbourne where her investigation focused on signaling and trafficking of G-protein coupled receptors. After completion of her PhD, Dr Yan has joined the Nanostructured Interfaces and Materials group led by Prof. Frank Caruso at the University of Melbourne. Currently, her research focuses on understanding cellular dynamics of nanomaterials. Dr Yan has been a recipient of a number of awards and scholarships. She has co-authored 21 peer-reviewed publications in high profile journals, including Nature Nanotechnology, ACS Nano and Advanced Materials.

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