The 12th Emerging Information and Technology Conference
(EITA-EITC 2012)

Research, Innovation and Commercialization

Conference Proceedings

The Bahen Center for Information Technology
University of Toronto
Toronto, Ontario, Canada

Thursday - Friday, August 16th - 17th, 2012

Table of Contents

Table of Contents 2

Conference Themes 4

Planning Committee 5

Co-organizing Associations 7

Conference Program 8

Thursday August 16th, 2012 8

Friday August 17th, 2012 18

Abstracts and Biographies 26

Opening Speech 30

Session D1-W1-T1: New Green Energy/Environment/Sustainability, Intelligent/ Electric Vehicle 33

Session D1-W2-T1: Medicine, Public Health, Biomedical Science and Engineering 41

Session D1-W3-T1: New Materials Science and Engineering, Nanotechnology 49

Session D1-W4-T1: Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip) 58

Session D1-W1-T2: New Green Energy/Environment/Sustainability, Intelligent/Electric Vehicle 66

Session D1-W2-T2: Medicine, Public Health, Biomedical Science and Engineering 73

Session D1-W3-T2: New Materials Science and Engineering, Nanotechnology 81

Session D1-W4-T2: Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip) 87

Keynote 93

Workshop 4 Keynote (System-on-Chip) 92

Session D1-W1-T3: New Green Energy/Environment/Sustainability, Intelligent/Electric Vehicle 96

Session D1-W2-T3: Medicine, Public Health, Biomedical Science and Engineering **103**

Session D1-W3-T3: New Materials Science and Engineering, Nanotechnology **113**

Session D1-W4-T3: Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip) **119**

Session D2-W1-T1: New Green Energy/Environment/Sustainability, Intelligent/Electric Vehicle **126**

Session D2-W2-T1: Medicine, Public Health, Biomedical Science and Engineering **132**

Session D2-W3-T1: New Materials Science and Engineering, Nanotechnology **140**

Session D2-W4-T1: Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip) **146**

Session D2-W1-T2: New Green Energy/Environment/Sustainability, Intelligent/Electric Vehicle **155**

Session D2-W2-T2: Medicine, Public Health, Biomedical Science and Engineering **162**

Session D2-W3-T2: New Materials Science and Engineering, Nanotechnology **173**

Session D2-W4-T2: Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip) **181**

Session D2-W1-T3: New Green Energy/Environment/Sustainability, Intelligent/Electric Vehicle **186**

Session D2-W2-T3: Medicine, Public Health, Biomedical Science and Engineering **191**

Session D2-W3-T3: New Materials Science and Engineering, Nanotechnology **200**

Session D2-W4-T3: Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip) **207**

Travel, Accommodation, and Registration **213**

Conference Themes

"Research, Innovation and Commercialization"

- **Research** - to conduct pioneering research in key areas of emerging technologies and services,

- **Innovation** - to make fundamental discoveries, generate innovative solutions to practical problems,

- **Commercialization** - to develop new technologies for commercial application.

The scope of the conference includes, but is not limited to, the following major topics as they relate to the research and development aspects of Emerging Technology and Services:

- **New Green Energy/Environment/Sustainability, Intelligent/Electric Vehicle**
- **Medicine, Public Health, Biomedical Science and Engineering**
- **New Materials Science and Engineering, Nanotechnology**
- **Broadband Technologies and Multimedia Services, Cloud Computing, Cyber Security, and SoC (System-on-a-Chip)**
- **Agricultural Science and Technology, Biosystems Engineering**
- **Arts, Culture, New Media, and Entertainment**
- **Business and Management - Entrepreneurship and Innovation**

Planning Committee

General Conference Chair

Peter Liu		The University of Toronto
Ching-Fuh Lin	林清富	National Taiwan University

Conference Organizers

Da Hsuan Feng	馮達旋	National Tsing Hua University
Wei Hwang	黃威	National Chiao-Tung University
Anne Chow	周京懷	Economic Division, TECO in Canada
Ting-An Wang	汪庭安	Science & Technology Division, TECO in Canada
I-Chun Cheng	陳奕君(Project Manager)	National Taiwan University
Hsi-Pin Ma	馬席彬	National Tsing Hua University
Wei-Jiun Su	蘇偉儁	The University of Toronto
Liz Hsiang	向華翎	The University of Toronto
Afra Wang	王馨	The University of Toronto

Program Committee

Workshop Track/Session Chairs (*: workshop co-chair)

Workshop 1: New Green Energy/Environment/Sustainability, Intelligent/ Electric Vehicle

***Ching-Fuh Lin**	林清富	**National Taiwan University**
***Yen-Han Lin**		**University of Saskatchewan**
Fue-Sang Lien	連復桑	University of Waterloo
Da-Hui Lin	林大惠	National Cheng-Kung University

Workshop 2: Medicine, Public Health, Biomedical Science and Engineering

***Peter Liu**		**University of Toronto**
***Hsueh-Fen Juan**	阮雪芬	**National Taiwan University**

Workshop 3: New Materials Science and Engineering, Nanotechnology

***Huey-Liang Hwang**	黃惠良	**National Tsing Hua University**
***Taya Chu**	朱達雅	**National Research Council Canada**
Da Hsuan Feng	馮達旋	National Tsing Hua University

Workshop 4: Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)

***Chi-Hsiang Yeh**	葉啟祥	**Queen's University**
***Li-Chun Wang**	王蒞君	**National Chiao-Tung University**

Conference Manager

Liz Hsiang	向華翎	The University of Toronto

Publication

Conference Program	I-Chun Cheng	陳奕君 National Taiwan University
Conference Proceedings	Hsi-Pin Ma	馬席彬 National Tsing Hua University

Conference Treasurer

Chinese Institute of Engineers

Local Management (Student Volunteers)

Erica Cai	蔡佩珊	The University of Toronto
Yen-Ming Chan	陳晏明	The University of Toronto
Joe Yen	顏怡堂	The University of Toronto
Howard Chen	陳厚任	The University of Toronto
Kuo-Chieh Liao	廖國傑	The University of Toronto
Wei-Lin Ou	歐維霖	The University of Toronto
Alex Tsai	蔡宜霖	The University of Toronto

On-Site Registration

Taiwanese Graduate Student of Toronto

Web Development

Michael, Hwa-Han Wang 王華漢 EBMedia LLC

Co-organizing Associations and Sponsors

Co-organizing Associations

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Taipei Economic and Cultural Office in Canada (TECO in Canada)	Homepage
Economic Division, TECO in Canada	Homepage
Science and Technology Division, TECO in Canada	Homepage

Co-Sponsors

Taipei Economic and Cultural Office in Canada (TECO in Canada)	Homepage
Economic Division, TECO in Canada	Homepage

Conference Program

Day 1 (Thursday, August 16th, 2012)

8/16th (Thur) 8:00 am - 6:00 pm : Registration

8/16th (Thur) 8:30 am - 9:40 am : Opening Speech
Room: BA1200

Dr. Peter Liu (peter.liu@utoronto.ca)
Professor, Department of Medicine, The University of Toronto

Chair

Dr. Ching-Fuh Lin (cflin@cc.ee.ntu.edu.tw)
Chair, Graduate Institute of Photonics and Optoelectronics, National Taiwan University
台灣大學光電工程學研究所所長暨電機工程學系 林清富 教授

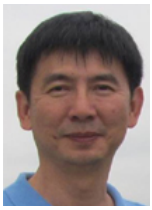
Ambassador Chih-Kung Liu ( )
Representative, Taipei Economic and Cultural Office in Toronto
駐加拿大台北經濟文化代表處劉志攻博士

Opening Keynote Speech
"Technological Convergence and the Transformation of Medicine and Public Health"
Dr. David Naylor (david.naylor@utoronto.ca)
President, The University of Toronto

8/16th (Thur) 9:40 am - 11:10 am : Technical Session D1-W1-T1: New Green Energy/ Environment/Sustainability, Intelligent/Electric Vehicle
Room: BA2179

Chair

Dr. Ching-Fuh Lin (cflin@cc.ee.ntu.edu.tw)
Chair, Graduate Institute of Photonics and Optoelectronics, National Taiwan University
台灣大學光電工程學研究所所長暨電機工程學系 林清富 教授



"Development of an Integrated Multiscale Modelling Framework for Wind Energy Application"
Dr. Fue-Sang Lien (fslien@uwaterloo.ca**)**
Professor, Department of Mechanical Engineering, University of Waterloo
滑鐵盧機械工程系 連復桑 教授

"Artificial Photosynthesis on Metal-Nitride Nanowire Arrays"
Dr. Zetian Mi (zetian.mi@mcgill.ca)
Assistant Professor, Department of Electrical and Computer Engineering, McGill University

"Light Harvesting Schemes for High-Performance Polymer Solar Cells"
Dr. Fang-Chung Chen (fcchen@mail.nctu.edu.tw)
Associate Professor, Department of Photonics and Display Institute, National Chiao Tung University
交通大學光電工程系 陳方中 教授

8/16th (Thur) 9:40 am - 11:10 am : Technical Session D1-W2-T1: Medicine, Public Health, Biomedical Science and Engineering
Room: BA3008

Chair 

Dr. Peter Liu (peter.liu@utoronto.ca**)**
Professor, Department of Medicine, The University of Toronto

"Overcoming the Logistical Challenges of Mesenchymal Stem Cell Therapy for Heart Disease"
Professor Techung Lee (chunglee@buffalo.edu)
Associate Professor, Department of Biochemistry and Biomedical Engineering, The State University of New York.

"Automating the Radiation Therapy Process"
Dr. Thomas Purdie (tom.purdie@rmp.uhn.on.ca)
Medical Physicist, Radiation Medicine Program, Princes Margaret Hospital
Assistant Professor, Department of Radiation Oncology, The University of Toronto

"Genetics of Alzheimer's Disease"
Dr. Li-San Wang (swang@mail.med.upenn.edu)
Assistant Professor, Department of Pathology and Laboratory Medicine, School of Medicine
賓州大學醫學院 王立三教授

8/14th (Sat) 9:40 am - 11:10 am : Technical Session D1-W3-T1: New Materials Science and Engineering, Nanotechnology
Room: BA3012

Chair

Dr. Huey-Liang Hwang (hlhwang@ee.nthu.edu.tw)
Institute of Electronic Engineering, National Tsing Hua University
清華大學電機工程學系暨電子工程研究所 黃惠良 教授

"Materials for Thermoelectric Energy Conversion, Enhanced via Nanostructuring"
Dr. Holger Kleinke (kleinke@uwaterloo.ca)
Professor and Canada Research Chair, Waterloo Institute for Nanotechnology, Department of Chemistry, University of Waterloo

"Micro/Nanomechanical Resonators: Materials, Design, and Applications"
Dr. Srikar Vengallatore (srikar.vengallatore@mcgill.ca)
Associate Professor and Canada Research Chair, Department of Mechanical Engineergin, McGill Institute for Advanced Materials, McGill University

"Formation of Single-Crystal Si Thin Foil Using Nano-Structure Etching "
Dr. Ching-Fuh Lin (cflin@cc.ee.ntu.edu.tw)
Chair, Graduate Institute of Photonics and Optoelectronics, National Taiwan University
台灣大學光電工程學研究所所長暨電機工程學系 林清富 教授

8/16th (Thur) 9:40 am - 11:10 am : Technical Session D1-W4-T1: Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)
Room: BA3116

Chair

Dr. Li-Chun Wang (lichun@cc.nctu.edu.tw**)**
Department of Electrical Engineering, National Chiao Tung University
交通大學電機工程學系主任暨特聘教授 王蒞君 教授

"Broad Wireless Access over Fibre-Connected Massively Distributed Antennas"
Dr. Victor C. M. Leung (vleung@ece.ubc.ca)
Professor and TELUS Mobile Research Chair, Department of Electrical and Computer Engineering, The University of British Columbia
英屬哥倫比亞大學電機暨電腦工程學系 梁中明 教授

"Localization of Wireless Terminals in Indoor Environment"
Dr. Shahrokh (valaee@comm.utoronto.ca)
Director, Wireless and Internet Research Laboratory, Professors, Department of Electrical and Computing Engineering, The University of Toronto

"Recent Developments in 3D Vision, Image Segmentation and Object/Action Recognition"
Dr. Jonathan Wu (jwu@uwindsor.ca)
Professor and Canada Research Chair, Department of Electrical and Computer Engineering, University of Windsor

8/16th (Thur) 11:10 am - 11:30 am : Break

8/16th (Thur) 11:30 am – 1:00 pm : Technical Session D1-W1-T2: New Green Energy/ Environment/Sustainability, Intelligent/Electric Vehicle
Room: BA2179

Chair

Dr. Fue-Sang Lien (fslien@uwaterloo.ca**)**
Professor, Department of Mechanical Engineering, University of Waterloo
滑鐵盧機械工程系 連復桑 教授

"Challenges in Numerical Simulation of Unconventional Oil and Gas Reservoirs"
Dr. Zhangxin (John) Chen (zhachen@ucalgary.ca)
Professor, NSERC/AERI/Foundation CMG Chair and iCORE Chair, Director, Schlumberger iCenter for Simulation & Visualization, Department of Chemical and Petroleum Engineering, University of Calgary
卡爾加里大學化學與石油工程學系 陳掌星 教授

"Hysteresis Control of Voltage Source Converters for Synchronous Machine Emulation"
Dr. Zeb Tate (zeb.tate@utoronto.ca)
Assistant Professor, Department of Electrical and Computing Engineering, The University of Toronto

"My Career with Photovoltaics"
Dr. Huey-Liang Hwang (hlhwang@ee.nthu.edu.tw)
Institute of Electronic Engineering, National Tsing Hua University
清華大學電機工程學系暨電子工程研究所 黃惠良 教授

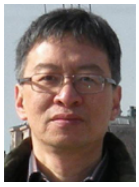
8/16th (Thur) 11:30 am – 1:00 pm : Technical Session D1-W2-T2: Medicine, Public Health, Biomedical Science and Engineering

Room: BA3008

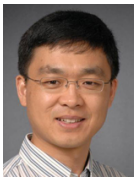
Chair 

Professor Hsueh-Fen Juan (yukijuan@ntu.edu.tw)
Institute of Molecular and Cellular Biology, National Taiwan University
台灣大學分子細胞生物學研究所 阮雪芬 教授

"Pyrophosphatase: a Membrane Embedded Proton-Pumping Protein"
Dr. Yuh-Ju Sun (yjsun@life.nthu.edu.tw)
Professor, the Institute of Bioinformatics and Structural Biology & Department of Life Sciences, National Tsing Hua University
清華大學生物資訊與結構生物研究所暨生命科學系 孫玉珠 教授



"Principles of Protein Folding from Coarse-Grained Models"
Dr. Hue Sun Chan (chan@arrhenius.med.toronto.edu)
Professor, Department of Biochemistry, Molecular Genetics, and Physics, The University of Toronto
多倫多大學生物化學系分子遺傳學系暨物理系 陳曉新 教授



"Bioinformatics Analysis of Mass Spectrometry Data for Proteomics"
Dr. Bin Ma (binma@uwaterloo.ca)
Professor and University Research Chair, School of Computer Science, The University of Waterloo
滑鐵盧大學計算機科學系首席科研 馬斌 教授

"Evaluating Sites of Post-Translational Modification in p53 Using Convergent Association Testing"
Dr. David K. Y. Chiu (dchiu@uoguelph.ca)
Professor, Department of Computing and Information Science, The University of Guelph
圭爾夫大學計算機與信息科學系 趙國耀 教授

8/16th (Thur) 11:30 am – 1:00 pm : Technical Session D1-W3-T2: New Materials Science and Engineering, Nanotechnology

Room: BA3012

Chair 

Dr. Da-Hsuan Feng (fengd@mx.nthu.edu.tw)
Senior Vice President, National Tsing Hua University
清華大學資深副校長 馮達旋 教授

"Paper-Based Micro Sensors"
Dr. Xinyu Liu (xinyu.liu@mcgill.ca)
Assistant Professor, Department of Mechanical Engineering, McGill University
麥吉爾大學機械工程學系 劉新宇 教授

"Functional Biodegradable Nanomaterials for Drug Delivery"
Dr. Chong Cheng (ccheng8@buffalo.edu)
Assistant Professor, Department of Chemical and Biological Engineering, The State University of New York at Buffalo
紐約州立大學水牛城分校化學工程與生物工程學系 程教授

Mr. Chih-Kuang Chen ()
Ph.D. Candidate, Department of Chemical and Biological Engineering, The State University of New York at Buffalo
紐約州立大學水牛城分校化學工程與生物工程學系 陳致光

"Engineering, Kinetics and Fate of Nuclear-Targeting Nanoparticles"
Dr. Warren Chan (warren.chan@utoronto.ca)
Canada Research Chair of BioNanotechnology, Associate Professor, Institute of Biomaterials and Biomedical Engineering, The University of Toronto

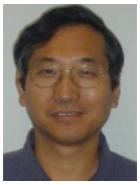
Mr. Peter Tang (peter.tang@utoronto.ca)
Ph. D. Candidate, Institute of Biomaterials & Biomedical Engineering Integrated Nanotechnology & Biomedical Science Laboratory, The University of Toronto
多倫多大學生物材料和生物醫學工程研究所 湯士毅

8/16th (Thur) 11:30 am – 1:00 pm : Technical Session D1-W4-T2: Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)
Room: BA3116

Chair

Dr. Chi-Hsiang Yeh (chi-hsiang.yeh@ece.queensu.ca)
Department of Electrical and Computer Engineering, Queen's University,
女王大學電機暨電腦工程學系 葉啟祥 教授

"Web Caching Prefetch by ART2 Neural Network"
Dr. Wenying Feng (wfeng@trentu.ca)
Professor, Department of Computing & Information Systems and Department of Mathematics, Trent University



"Cloud Computing and Resource Allocation in Cloud"
Dr. Ling Guan (lguan@ee.ryerson.ca)
Canada Research Chair, Director, Ryerson Multimedia Research Lab, Professor, Department of Electrical and Computer Engineering, Ryerson University

"Autonomous Resilient Routing for Selective Forwarding Attack in Wireless Sensor Networks"
Dr. Shanchieh Jay Yang (jay.yang@rit.edu)
Associate Professor & Department Head, Department of Computer Engineering, Rochester Institute of Technology
羅徹斯特理工學院電腦工程學系主任 楊善傑 教授

8/16 (Thur) 1:00 pm - 2:30 pm : Lunch

8/16th (Thur) 2:30 pm - 3:30 pm: The Keynote and Panel Session
Room: S361

Moderator

Dr. Da-Hsuan Feng (fengd@mx.nthu.edu.tw)
Senior Vice President, National Tsing Hua University
清華大學資深副校長 馮達旋 教授

" "
Dr. Janice Stein ()
Director, Munk School of Global Affairs, The University of Toronto

8/16th (Thur) 3:30 pm – 5:00 pm : Technical Session D1-W1-T3: New Green Energy/ Environment/Sustainability, Intelligent/Electric Vehicle

Room: BA 2179

Chair

Dr. Ching-Fuh Lin (cflin@cc.ee.ntu.edu.tw **)**
Chair, Graduate Institute of Photonics and Optoelectronics, National Taiwan University
台灣大學光電工程學研究所所長暨電機工程學系 林清富 教授

"Fabrication of Printable Organic Photovoltaics, One Step Closer to Commercialization"
Dr. Ta-Ya Chu (ta-ya.chu@nrc-cnrc.gc.ca**)**
Research Officer, National Research Council Canada
加拿大國家研究理事會 朱達雅 博士

“ ”
Dr. Haibo Zeng ( )
Assistant Professor, Department of Electrical and Computer Engineering, McGill University

“Fuel Ethanol Production: Technology and Process Development”
Dr. Yen-Han Lin (yenhan.lin@usask.ca)
Professor, Department of Chemical and Biological Engineering, University of Saskatchewan

8/16 (Thur) 3:30 pm – 5:00 pm : Technical Session D1-W2-T3: Medicine, Public Health, Biomedical Science and Engineering
Room: BA3008

Chair 

Dr. Peter Liu (peter.liu@utoronto.ca)
Professor, Department of Medicine, The University of Toronto

“Engineering Liver on Lab Chip”
Dr. Cheng-Hsien Liu (liuch@pme.nthu.edu.tw)
Professor and CEO of the Engineering College ILP, Department of Power Mechanical Engineering, National Tsing Hua University
清華大學工學院產學聯盟執行長暨動力機械工程學系教授 劉承賢 教授

“Targeting Tiumor Microenvironment for Cancer Detection and Therapeutic Efficacy Evaluation”
Dr. Zheng-Rong Lu (zxl125@case.edu)
Professor, Department of Biomedical Engineering, Case Western Reserve University
凱斯西儲大學生物醫學工程系 呂正榮 教授

“Revealing Biological Contexts in Signed Molecular Network”
Dr. Hsuan-Cheng Huang (hsuancheng@ym.edu.tw)
Professor, Institute of Biomedical Informatics, National Yang Ming University
陽明大學生物醫學資訊研究所 黃宣誠 教授

“Bone Marrow Tissue Engineering”
Dr. J. H. David Wu (davidwu@che.rochester.edu)
Professor, Department of Chemical Engineering and of Biomedical Engineering, University of Rochester
羅徹斯特大學化學工程系暨生物醫學工程學系 吳政惠 教授

8/16th (Thur) 3:30 pm – 5:00 pm : Technical Session D1-W3-T3: New Materials Science and Engineering, Nanotechnology
Room: BA3012

Chair 

Dr. Ta-Ya Chu (ta-ya.chu@nrc-cnrc.gc.ca)
Research Officer, National Research Council Canada
加拿大國家研究理事會 朱達雅 博士

"Electrically Conductive Bacterial Nanowires: Fundamentals and Applications"
Dr. Jun Yang (jyang@eng.uwo.ca)
Associate Professor, Department of Mechanical and Material Engineering, The University of Western Ontario
西安大略大學機械與材料工程系 楊軍 教授

"Nanomanufacturing: Manipulation and Characterization of Nanomaterials inside SEM"
Dr. Yu Sun ()
Canada Research Chair in Micro and Nano Engineering Systems, Associate Professor, Department of Mechanical and Industrial Engineering, The University of Toronto
多倫多大學機械與工業工程學系 孫鈺 教授

Mr. Brandon Chen ()
Ph. D. Student, The University of Toronto

Dr. Huey-Liang Hwang (hlhwang@ee.nthu.edu.tw)
Institute of Electronic Engineering, National Tsing Hua University
清華大學電機工程學系暨電子工程研究所 黃惠良 教授

8/16th (Thur) 3:30 pm – 5:00 pm : Technical Session D1-W4-T3: Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)
Room: BA3116

Chair 

Dr. Li-Chun Wang (lichun@cc.nctu.edu.tw)
Department of Electrical Engineering, National Chiao Tung University
交通大學電機工程學系主任暨特聘教授 王蒞君 教授

"Digital Image Forensics: There is More to a Picture Than Meets the Eye"
Dr. Siwei Lyu(lsw@cs.albany.edu)
Assistant Professor, Department of Computer Science, The State University of New York at Albany
紐約州立大學奧爾巴尼分校計算機科學系 吕思伟 教授

"Interactive Video Object Cutout from Live Sequences"
Dr. Minglun Gong (gong@cs.mun.ca)
Associate Professor, Department of Computer Science, Memorial University of NewFoundland
紐芬蘭紀念大學計算機科學系 龔明倫 教授

"Trends and Challenges in Supercomputing"
Dr. Charng-Da Lu (charngda@buffalo.edu)
Computational Scientist, Center for Computational Research, The State University of New York at Buffalo
妞約州立大學水牛城分校電腦研究中心 呂長達 博士

Day 2 (Friday, August 17, 2012)

8/17 (Fri) 9:00 am - 5:00 pm : Registration

8/17th (Fri) 9:40 am - 11:10 am : Technical Session D2-W1-T1: New Green Energy/ Environment/Sustainability, Intelligent/Electric Vehicle
Room: BA2179

Chair 

Dr. Yen-Han Lin
Department of Chemical and Biological Engineering, University of Saskatchewan

"Refining the Sunshine: the Sustainability of Microalgal Biofuels"
Dr. Christopher Q. Lan (Christopher.Lan@uottawa.ca)
Associate Professor, Department of Chemical and Biological Engineering, University of Ottawa
渥太華大學化學暨生物工程系 蘭青道 教授

"Zero-Energy Building and Building Energy Efficiency"
Dr. Xinlei Wang (xwang2@illinois.edu)
Associate Professor, Bioenvironmental Engineering, Department of Agricultural and Biological Engineering, University of Illinois at Urbana-Champaign

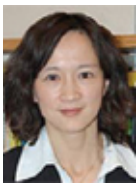
"Combining Solid Oxide Fuel Cells and Compressed Air Energy Storage for Load-Following Power Production with Near-Zero CO_2 Emissions"
Dr. Thomas A. Adams II (tadams@mcmaster.ca)
Assistant Professor, Department of Chemical Engineering, McMaster University

8/17th (Fri) 9:40 am - 11:10 am : Technical Session D2-W2-T1: Medicine, Public Health, Biomedical Science and Engineering
Room: BA3008

Chair 

Professor Hsueh-Fen Juan (yukijuan@ntu.edu.tw)
Institute of Molecular and Cellular Biology, National Taiwan University
台灣大學分子細胞生物學研究所 阮雪芬 教授

"Developing Novel Molecular Probes for Bacterial Detection"
Dr. Yingfu Li (liying@mcmaster.ca)
Canada Research Chair in Nucleic Acids Research, Professor, Department of Biochemistry and Biomedical Sciences & Chemistry and Chemical Biology, McMaster University
麥克馬斯特大學生物化學生物醫學 李應福 教授



"A Human Ubiquitin Conjugating Enzyme (E2) - HECT E3 Ligase Structure-function Screen"
Dr. Yi Sheng (yisheng@yorku.ca)
Assistant Professor, Department of Biology, York University
約克大學生物學系 盛禕 教授

"Next Generation MRI Contrast Agent"
Dr. Xiao-an Zhang (xazhang@utsc.utoronto.ca)
Assistant Professor, Department of Chemistry and Department of Physical and Environmental Sciences, The University of Toronto
多倫多大學化學系、物理暨環境科學系 張曉安 教授

"Synthetic Biology Approach for Building Artificial Cell"
Dr. Allen Po-Chih Liu (allenliu@umich.edu)
Assistant Professor, Department of Mechanical Engineering, University of Michigan, Ann Arbor
密西根大學安那堡分校機械工程系 劉柏池 教授

8/17th (Fri) 9:40 am - 11:10 am : Technical Session D2-W3-T1: New Materials Science and Engineering, Nanotechnology
Room: BA3012

Chair

Dr. Ta-Ya Chu (ta-ya.chu@nrc-cnrc.gc.ca)
Research Officer, National Research Council Canada
加拿大國家研究理事會 朱達雅 博士

"3D Nanowire Architectures for High;y-Efficient Photoelectrochemical Anodes"
Dr. Xudong Wang (xudong@engr.wisc.edu)
Assistant Professor, Department of Materials Science and Engineering, University of Wisconsin-Madison
威斯康辛大學麥迪遜分校材料科學與工程系 王旭東 教授

"Nanofabrication by Nanoimprint and Electron Beam Lithography and Applications"
Dr. Bo Cui (bcui@uwaterloo.ca)
Director, Waterloo Nanofabrication Group, Assistant Professor, Department of Electrical and Computer Engineering, University of Waterloo
滑鐵盧大學電子與計算機工程系 崔波 博士

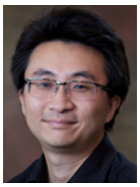
"Chalcogenide Glass Resonant Cavity Devices for On-chip Infrared Sensing"
Dr. Juejun Hu (hujuejun@udel.edu)
Assistant Professor, Department of Materials Science and Engineering, University of Delaware

8/17th (Fri) 9:40 am - 11:10 am : Technical Session D2-W4-T1: Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)
Room: BA3012

Chair

Dr. Chi-Hsiang Yeh (chi-hsiang.yeh@ece.queensu.ca)
Department of Electrical and Computer Engineering, Queen's University,
女王大學電機暨電腦工程學系 葉啟祥 教授

"Combining Quantitative Location Information and Qualitative Connectivity Information for Clustering in Wireless Sensor Networks"
Dr. Chung-Hung Ling (chlung@sce.carleton.ca)
Associate Professor, Department of Systems and Computer Engineering, Carleton University
卡爾頓大學電腦工程學系 龍中弘 教授



"Survivable Virtual Infrastructure Management in Virtualized Data Clusters"
Dr. Jian Tang (jtang02@syr.edu)
Assistant Professor, Department of Electrical Engineering and Computer Science, Syracuse
雪城大學電子工程與計算機科學 唐劍 教授

"Securing Entropy Sources in Cloud Computers"
Dr. Yu Chen (ychen@binghamton.edu)
Assistant Professor, Department of Electrical and Computing Engineering, The State University of New York at Binghamton

"Video over Infrastructure-Based Cognitive Radio Networks"
Dr. Chih-Wei Huang (cwhuang@ce.ncu.edu.tw)
Assistant Professor, Department of Communication Engineering, National central University
中央大學通訊工程學系 黃志煒 教授

8/17th (Fri) 10:50 am - 11:30 am : Break

8/17th (Fri) 11:30 am – 1:00 pm : Technical Session D2-W1-T2: New Green Energy/ Environment/Sustainability, Intelligent/Electric Vehicle
Room:BA2179

Chair

Dr. Ching-Fuh Lin (cflin@cc.ee.ntu.edu.tw**)**
Chair, Graduate Institute of Photonics and Optoelectronics, National Taiwan University
台灣大學光電工程學研究所所長暨電機工程學系 林清富 教授

"Catalytic Reforming of Ethanol into Methane Using Near- and Super-critical Water and Its Potential Application as a Fuel for Internal Combustion Engines "
Dr. **Chunbao (Charles) Hu** (cxu6@uwo.ca)
Associate Professor, Department of Chemical and Biochemical Engineering, The University of Western Ontario
西安大略大學化學工程與生物化工系 徐春保 教授

"Hydrothermal Conversion of Lignocellulosic Biomass to Alkanes and 5-HMF"
Dr. Zhongchao Tan (tanz@uwaterloo.ca)
Associate Professor, Department of Mechanical and Mechatronics Engineering, University of Waterloo
滑鐵盧大學機械系與機械電子工程系 譚中超 教授

"n-Butanol Production through Native and Engineered Microorganisms"
Dr. Si-Yu Li (syli@dragon.nchu.edu.tw)
Assistant Professor, Department of Chemical Engineering, National Chung Hsing University
中興大學化學工程系 李思禹 教授

8/17th (Fri) 11:30 am – 1:00 pm : Technical Session D2-W2-T2: Medicine, Public Health, Biomedical Science and Engineering

Room: BA3008

Chair

Dr. Peter Liu (peter.liu@utoronto.ca**)**
Professor, Department of Medicine, The University of Toronto

"Targeting ErbB Receptors for Cancer Therapy with New Ideas"
Dr. Zhixiang Wang (zhixiang.wang@ualberta.ca)
Professor, Department of Medical Genetics, University of Alberta
亞伯達大學醫學遺傳學系 王志翔 教授

"Stem Cell Biology and Regenerative Medicine in Skeletal Development and Disease"
Dr. Wei Hsu (wei_hsu@urmc.rochester.edu)
Professor, Department of Biomedical Genetics and Oncology, University of Rochester Medical Center
羅徹斯特大學醫學中心生物醫學遺傳學及種留學 許瑋 教授

"Postpartum Depression and Misregulation of Stress Signaling in Luman Recruitment Factor (LRF or CREBRF) - deficient Mice"
Dr. Ray Lu (rlu@uoguelph.ca)
Associate Professor, Department of Molecular and Cellular Biology, University of Guelph
掛爾夫大學分子與細胞生物學 陸瑞 教授

8/17th (Fri) 11:30 am – 1:00 pm : Technical Session D2-W3-T2: New Materials Science and Engineering, Nanotechnology
Room: BA3012

Chair 

Dr. Huey-Liang Hwang (hlhwang@ee.nthu.edu.tw)
Institute of Electronic Engineering, National Tsing Hua University
清華大學電機工程學系暨電子工程研究所 黃惠良 教授

"A Framework of Nano Crystal Growth"
Dr. Hanchen Huang (hanchen@uconn.edu)
Connecticut Clean Energy Fund Professor in Sustainable Energy, Department of Mechanical Engineering, University of Connecticut
康乃狄克大學機械工程系 黃漢臣教授

"Magnified Hard X-ray Imaging at Nano Scales"
Dr. Gu Xu (xugu@mcmaster.ca)
Professor, Department of Materials Science and Engineering, McMaster University
麥克馬斯特大學材料科學與工程系 許谷 教授

"Selectivity Transparent and Conducting Photonic Crystal for Enhanced Photovoltaics and Allied Devices"
Dr. Nazir P. Kherani (kherani@ecf.utoronto.ca)
Associate Professor, Departments of Electrical & Computer Engineering and Materials Science and Engineering, The University of Toronta

8/17th (Fri) 11:30 am – 1:00 pm : Technical Session D2-W4-T2: Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)

Room: BA3116

Chair

Dr. Li-Chun Wang (lichun@cc.nctu.edu.tw**)**
Department of Electrical Engineering, National Chiao Tung University
交通大學電機工程學系主任暨特聘教授 王蒞君 教授

"**Malware Propagation in Online Social Networks and Detection Mechanisms**"
Dr. Uyen Trang Nguyen (utn@cse.yorku.ca)
Associate Professor, Department of Computer Science and Engineering, York University

"Gamma Codes: A Low-Overhead Low-Complexity Network Coding Solution"
Dr. Masoud Ardakani (ardakani@ualberta.ca)
Associate Professor, Department of Electrical & Computer Engineering, University of Albert

" "
Dr. Chi-Hsiang Yeh (chi-hsiang.yeh@ece.queensu.ca)
Department of Electrical and Computer Engineering, Queen's University,
女王大學電機暨電腦工程學系 葉啟祥 教授

8/17th (Fri) 1:00 pm - 2:30 pm : Lunch

8/17th (Fri) 2:30 pm – 4:00 pm : Technical Session D2-W1-T3: New Green Energy/ Environment/Sustainability, Intelligent/Electric Vehicle
Room: BA2179

Chair

Dr. Ta-Hui Lin ()
Department of Mechanical Engineering, National Cheng-Kung University
成大機械系特聘教授 林大惠 教授

"Exploring the Opportunity of Using Electrical Vehicles as an Energy Distribution Network"
Dr. Ting Zhu (tzhu@binghamton.edu)
Assistant Professor, Department of Computer Science, The University of New York at Binghamton

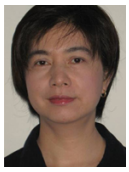
" "
Dr. Jie Yu (jieyu@mcmaster.ca)
Assistant Professor, Department of Chemical Engineering, McMaster University
麥克馬斯特大學化學工程學系 余杰 教授

"Formation of Single-Crystal Si Thin Foil Using Nano-structure Etching"
Dr. Ching-Fuh Lin (cflin@cc.ee.ntu.edu.tw)
Chair, Graduate Institute of Photonics and Optoelectronics, and Professor, Department of Electrical Engineering, National Taiwan University
台灣大學光電工程研究所所長暨電機工程學系教授 林清富 教授

8/17th (Fri) 2:30 pm – 4:00 pm : Technical Session D2-W2-T3: Medicine, Public Health, Biomedical Science and Engineering
Room: S360

Chair 

Dr. Peter Liu (peter.liu@utoronto.ca**)**
Professor, Department of Medicine, The University of Toronto



"Emerging Role of microRNA in Preeclampsia"
Dr. Chun Peng (cpeng@yorku.ca)
Professor, Department of Biology, York University
約克大學生物學系 彭純 教授

"Small Molecules as Inductors to Direct Stem Cell Differentiation"
Dr. Qiao Li (qiaoli@uottawa.ca)
Assistant Professor, Department of Pathology and Laboratory Medicine, School of Medicine, University of Ottawa
渥太華大學醫學院 李樵 教授

"Blocking Ectopic ATP Synthase Suppresses Lung Adenocarcinoma"
Dr. Hsueh-Fen Juan (yukijuan@ntu.edu.tw)
Professor, Department of Life Science, Institute of Molecular and Cellular Biology, Graduate Institute of Biomedical Electronics and Bioinformatics, National Taiwan University
台灣大學分子細胞生物學研究所 阮雪芬 教授

8/17th (Fri) 2:30 pm – 4:00 pm : Technical Session D2-W3-T3: New Materials Science and Engineering, Nanotechnology
Room: S360

Chair 

Dr. Huey-Liang Hwang (hlhwang@ee.nthu.edu.tw)
Institute of Electronic Engineering, National Tsing Hua University
清華大學電機工程學系暨電子工程研究所 黃惠良 教授

"Polyoxometalate Modified Carbon Nanotubes for Electrochemical Capacitors"
Dr. Keryn K. Lian (keryn.lian@utoronto.ca)
Associate Professor, Department of Materials Science and Engineering, The University of Toronto
多倫多大學材料科學與工程系 連珂 教授

" "
Dr. Andrei Sazonov ()
Associate Professor, Department of of Electrical and Computer Engineering,University of Waterloo

"Plasmonic Nanoantenna and Nanolaser"
Dr. Shangjw (Felix) Guo (gwo@mx.nthu.edu.tw)
Vice President for Research & Development, Professor, Department of Physics, National Tsing Hua University
清華大學研究發展處研發長暨物理系 果尚志 教授

8/17th (Fri) 2:30 pm – 4:00 pm : Technical Session D2-W4-T3: Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)
Room: BA3116

Chair 

Dr. Chi-Hsiang Yeh (chi-hsiang.yeh@ece.queensu.ca)
Department of Electrical and Computer Engineering, Queen's University,
女王大學電機暨電腦工程學系 葉啟祥 教授

"An Agent-Based Infrastructure for Mobile Commerce"
Dr. Xining Li (xli@socs.uoguelph.ca)
Director, Intelligent Mobile Agents Laboratory (IMAGO Lab), Professor, School of Computer Science, The University of Guelph.
圭爾夫大學計算機學院 李西寧 教授

"Parallelization of Spectrum Sensing Algorithms Using Graphic Processing Units"
Dr. Sao-Jie Chen (csj@cc.ee.ntu.edu.tw)
Professor, Department of Electrical Engineering, National Taiwan University.
台灣大學電機工程學會 陳少傑 博士

"Mobile Cloud in 5G Wireless"
Dr. Li-Chun Wang (lichun@cc.nctu.edu.tw)
Distinguished Professor & Chairman, Department of Electrical Engineering, National Chiao Tung Univesity
交通大學電機工程學系暨特聘教授 王蒞君 教授

Abstracts and Biographies

Opening Speech

Conference Chair

Peter P. Liu, PhD

Department of Medicine, The University of Toronto
Email: peter.liu@utoronto.ca

BIOGRAPHY

Peter P. Liu, MD, FRCPC

Scientific Director, University of Ottawa Heart Institute
Professor of Medicine, University of Ottawa
Professor of Medicine & Physiology, Peter Munk Cardiac Centre, University of Toronto
President of International Society of Heart Failure of World Heart Federation

Dr. Liu graduated from the University of Toronto Faculty of Medicine. During his cardiology training, he also pursued a post-doctoral fellowship in cardiovascular imaging and immunology at the Massachusetts General Hospital of Harvard Medical School, and clinical epidemiology at McMaster University. In 1985 he joined the Division of Cardiology at the Toronto General Hospital, University of Toronto. Since 1999, he has been the Heart & Stroke/Polo Chair Professor at the University Health Network, and serves as the inaugural Director of the Heart & Stroke/Richard Lewar Centre of Excellence in Cardiovascular Research at the University of Toronto. Since 2005, he was the Scientific Director at CIHR's Institute of Circulatory & Respiratory Health, the major federal funding agency that supports biomedical research in Canada. At CIHR, he designed a number of innovative research programs and leveraged funding for several major research networks and consortia across the country and internationally. He served on the executive committee and provided research leadership for the Canadian Heart Health Strategy, Canadian Lung Health Framework, and National Sodium Reduction Strategies with the federal and provincial governments. Since this past July, Dr. Liu has also assume the role of Scientific Director of the University of Ot-

tawa Heart Institute, a prestigious institution that is a leader in personalized medicine and imaging. He will be working with members and stakeholders to enhance further the excellence and global impact of research and innovation of the Ottawa Heart Institute.

Dr. Liu focuses his own research on the pathophysiology and clinical outcomes of heart failure from bench to bedside. His team has elucidated the role of inflammation in changing heart structure and function, and potential novel treatment targets in heart failure. His laboratory has also identified how viruses and bacteria can accelerate heart failure and coronary artery disease, and is developing novel vaccines to prevent these complications. With support from Genome Canada, CIHR group and team programs, and Ontario Research Global Leadership Fund – he is also pursuing novel biomarkers and therapeutic targets for early cardiovascular disease identification and intervention. He has published over 320 peer reviewed articles in high impact journals, and his work has been cited over 20,000 times in the literature. In addition, he co-chaired a series of Canadian Cardiovascular Society Consensus Guideline Recommendations for heart failure care.

He is the recipient of numerous awards in recognition of his scientific contributions and accomplishments including the Rick Gallop Research Award Recognizing Research Excellence from the Heart & Stroke Foundation of Ontario (2003), the Research Achievement Award from the Canadian Cardiovascular Society (CCS, 2003), Visiting Research Professor Award from the Royal College of Physicians and Surgeons (2005), Extramural Award of Merit from the American College of Cardiology (2005), the Jean Davignon Cardiometabolic Award (2008), and Lifetime Achievement Award from CCS (2011), and Distinguished Lecture Award of the ICRH at CIHR (2012). He has served as the scientific program chair for the Canadian Cardiovascular Society, Heart Failure Society of America, International Human Proteomic Organization, and World Heart Federation.

Currently he is the Director of the National C-CHANGE Initiative, harmonizing and integrating cardiovascular preventive guidelines for both the professional and patients, and develops strategies for implementation. This just has been adopted as the national standards across all provinces in Canada for implementation by the Ministries of Health. He is also President of the International Society of Heart Failure of the World Heart Federation (WHF), and also serves on the Research and Policy Committees of WHF, coordinating global fight against heart disease and promoting its prevention.

Conference Chair

Ching-Fuh Lin, PhD (林清富 教授)

Graduate Institute of Photonics and Optoelectronics and Department of Electrical Engineering
National Taiwan University
No. 1, Sec. 4, Roosevelt Road, Taipei, Taiwan
Tel: +886-2-33663540, Fax: +886-2-23642603
Email: cflin@cc.ee.ntu.edu.tw

BIOGRAPHY

Prof. Ching-Fuh Lin obtained the B.S. degree from National Taiwan University in 1983, and the M.S. and Ph.D. degrees from Cornell University, Ithaca, NY, in 1989 and 1993, respectively, all in electrical engineering.

He is now the Director of Innovative Photonics Advanced Research Center (i-PARC), the Chairman of Graduate Institute of Photonics and Optoelectronics and a joint professor in the Graduate Institute of Photonics and Optoelectronics, Graduate Institute of Electronics Engineering, and Department of Electrical Engineering at National Taiwan University. His research interests include organic-inorganic composite thin-film solar cells and optoelectronic devices, single-crystal Si thin-film solar cells, Si-based photonics, and physics in broadband semiconductor lasers and optical amplifiers.

He is a Fellow of IEEE, a Fellow of SPIE, Member of Asia-Pacific Academy of Materials, and a member of OSA. He has published over 140 journal papers and more than 350 conference papers and hold over 30 patents. He is also the sole author of a book, Optical Components for Communications: Principles and Applications, published by Kluwer Academic Publishers (USA 2004), and co-author/edit a book, Organic, Inorganic and Hybrid Solar Cells – from Principles to Practices, to be published by John Wiley & Sons, Inc. and IEEE Press. He had obtained the Distinguished Research Award and several Class A Research Awards from National Science Council of Taiwan, ROC, and the Outstanding Electrical Engineering Professor Award from the Chinese Institute of Electrical Engineering. He and his students had also been granted the 18th Acer Research Golden Award, 18th Acer Research Excellent Award, 14th Acer Re-

search Excellent Award, Collins Thesis Awards for years of 1998, 2001, 2002, 2004, 2007, 2009, and 2010.

Prof. Lin has served as the Chair of IEEE LEOS Chapter Taipei Section, the Board member of the 17th IEEE Taipei Section, the Evaluation Committee member of Higher Education Evaluating & Accreditation Council of Taiwan, the Council member of the 10th Optical Engineering Society of ROC, and the Convener in the area of Electronics and Information for the Conventional Industry Technology Development Project in the Bureau of Industry, Ministry of Economics, ROC. He has also served as Project Instructors of the National Programs in the nano-science and nano- technology and the renewable energy (solar energy).

Opening Speech

Guest Speaker

Chih-Kung Liu, PhD (劉志攻代表)

Representative, Taipei Economic and Culture Office in Canada

BIOGRAPHY

Date of Birth: April 7, 1951.
Place of Birth: Taiwan, Republic of China
Education:

B.A. in Diplomacy, National Chengchi University, 1972
M.A. in Political Science, National Chengchi University, 1975
Ph. D. in Political Science, National Chengchi University, 1983

Work Experience:

1984-1985: Associate Research Fellow, Institute of International Relations, National Chengchi University
1986: Senior Specialist, Protocol Department, Ministry of Foreign Affairs (MOFA)
1987: Senior Specialist, Department of North American Affairs, MOFA
1990-1993: Deputy Director-General, Taipei Economic and Cultural Affairs Office (TECO) in Boston
1994: Counselor, Embassy of the Republic of China in Pretoria, South Africa
1995-1996: Deputy Director-General, Department of North American Affairs, MOFA
1996-1999: Director of Political Division, Taipei Economic and Cultural Representative Office (TECRO) in Washington, D.C.
1999-2000: Director-General, Department of North American Affairs, MOFA
2001-2004: Director-General, TECO in Boston
2005- : Foreign Service Institute, MOFA
2006: Visiting Fellow, Shorenstein APARC, Stanford University
2007-2008: Representative, Taipei Trade and Economic Representative Office in Ulaanbaatar, Mongolia

2008-2010: Representative, Taipei Economic and Cultural Office in Prague, Czech Republic
2010-2012: Deputy Secretary-General, National Security Council
2012 - : Representative, Taipei Economic and Cultural Office in Canada

Publications:

1985: *The Republic of China's Participation in the United Nations General Assembly: An Examination of the ROC's Foreign Policy and its Participation Behavior, 1946-1970.* Commercial Press, Taipei.

Opening Speech

Guest Speaker

Technological Convergence and the Transformation of Medicine and Public Health

David Naylor, PhD

President
The University of Toronto

BIOGRAPHY

David Naylor has been President of the University of Toronto since 2005. He earned his MD at Toronto in 1978, followed by a D Phil at Oxford where he studied as a Rhodes Scholar. Naylor completed clinical specialty training and joined the Department of Medicine of the University of Toronto in 1988. He was founding Chief Executive Officer of the Institute for Clinical Evaluative Sciences (1991-1998), before becoming Dean of Medicine and Vice Provost for Relations with Health Care Institutions of the University of Toronto (1999 – 2005). Naylor has co-authored approximately 300 scholarly publications, spanning social history, public policy, epidemiology and biostatistics, and health economics, as well as clinical and health services research in most fields of medicine. Among other honours, Naylor is a Fellow of the Royal Society of Canada, a Foreign Associate Fellow of the US Institute of Medicine, and an Officer of the Order of Canada.

Session D1-W1-T1: New Green Energy/Environment/Sustainability, Intelligent/ Electric Vehicle

Session Organizer & Chair

Ching-Fuh Lin, PhD (林清富 教授)

Graduate Institute of Photonics and Optoelectronics and Department of Electrical Engineering
National Taiwan University
No. 1, Sec. 4, Roosevelt Road, Taipei, Taiwan
Tel: +886-2-33663540, Fax: +886-2-23642603
Email: cflin@cc.ee.ntu.edu.tw

BIOGRAPHY

Prof. Ching-Fuh Lin obtained the B.S. degree from National Taiwan University in 1983, and the M.S. and Ph.D. degrees from Cornell University, Ithaca, NY, in 1989 and 1993, respectively, all in electrical engineering.

He is now the Director of Innovative Photonics Advanced Research Center (i-PARC), the Chairman of Graduate Institute of Photonics and Optoelectronics and a joint professor in the Graduate Institute of Photonics and Optoelectronics, Graduate Institute of Electronics Engineering, and Department of Electrical Engineering at National Taiwan University. His research interests include organic-inorganic composite thin-film solar cells and optoelectronic devices, single-crystal Si thin-film solar cells, Si-based photonics, and physics in broadband semiconductor lasers and optical amplifiers.

He is a Fellow of IEEE, a Fellow of SPIE, Member of Asia-Pacific Academy of Materials, and a member of OSA. He has published over 140 journal papers and more than 350 conference papers and hold over 30 patents. He is also the sole author of a book, Optical Components for Communications: Principles and Applications, published by Kluwer Academic Publishers (USA 2004), and co-author/edit a book, Organic, Inorganic and Hybrid Solar Cells – from Principles to Practices, to be published by John Wiley & Sons, Inc. and IEEE Press. He had obtained the Distinguished Research Award and several Class A Re-

search Awards from National Science Council of Taiwan, ROC, and the Outstanding Electrical Engineering Professor Award from the Chinese Institute of Electrical Engineering. He and his students had also been granted the 18th Acer Research Golden Award, 18th Acer Research Excellent Award, 14th Acer Research Excellent Award, Collins Thesis Awards for years of 1998, 2001, 2002, 2004, 2007, 2009, and 2010.

Prof. Lin has served as the Chair of IEEE LEOS Chapter Taipei Section, the Board member of the 17th IEEE Taipei Section, the Evaluation Committee member of Higher Education Evaluating & Accreditation Council of Taiwan, the Council member of the 10th Optical Engineering Society of ROC, and the Convener in the area of Electronics and Information for the Conventional Industry Technology Development Project in the Bureau of Industry, Ministry of Economics, ROC. He has also served as Project Instructors of the National Programs in the nano-science and nano- technology and the renewable energy (solar energy).

Session D1-W1-T1: New Green Energy/Environment/Sustainability, Intelligent/ Electric Vehicle

Development of an Integrated Multiscale Modelling Framework for Wind Energy Application

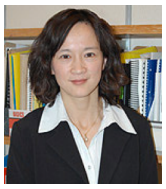
Fue-Sang Lien (連復桑)

Professor, University of Waterloo
200 University Avenue West, Waterloo, ON, N2L 3G1, CANADA
Tel: +1-519-888-4567 ext. 36528, Fax: +1-519-885-5862
Email: fslien@uwaterloo.ca

ABSTRACT
Wind energy is expected to play a significantly increasing role in the generation of clean electrical power worldwide owing to the fact that it is the most developed and cost effective of the renewable energy sources. To reduce barriers for clean energy deployment of wind turbines when injected in a power system requires state-of-the-science predictive tools to address the following two critical problems: (1) provision of reliable and accurate wind power forecasts to manage the variability of wind generation required for the optimal integration of wind energy into electrical grids; and, (2) prediction and assessment of the environmental impact of wind turbine noise which constitutes a key aspect for public acceptability of wind turbines and/or wind farms sited at locations near residential areas.

To address these deficiencies, the objective of this talk is to report recent progress in the development of a single integrated (unified) multiscale modeling and simulation framework for wind energy applications that can be used to provide wind power forecasts and wind turbine designs, and to predict noise at wind turbine sites.

BIOGRAPHY



Prof. Fue-Sang Lien received his BASc and MASc from National Cheng Kung University (NCKU) in 1982 and 1984, respectively. He received his PhD from University of Manchester Institute of Science and Technology (UMIST) in the UK in 1992. His major field of study is computational fluid dynamics (CFD) and turbulence modelling.

He has more than 20 years of experience developing and systematically applying CFD to a wide range of fluid mechanics problems such as turbulence, urban flow, dispersion, aeroacoustics and multiscale mod-

eling. He has also actively participated in a wide range of projects supported by British Aerospace, Rolls Royce Aeroengines, the Defence Research Agency in the UK, BMW in Germany, the European Commission, Defence R&D Canada – Suffield, Environment Canada, Natural Resources Canada, Ontario Ministry of the Environment, Ford Motor Company, Atomic Energy of Canada Limited, Bombardier Aerospace in Toronto, NSERC, MITACS and SHARCNET. Prof. Lien has published more than 150 journal and conference papers on numerical techniques, turbulence modeling (URANS and LES) and model validation.

He is internationally recognized as a major contributor to the development and stable implementation of many sophisticated turbulence closure models in RANS and these turbulence models have been widely applied in research and industrial computations of turbulent flows – indeed three of these turbulence closure models appear as options in the influential code OpenFOAM, which is a free open source CFD software package that has a large user base from many areas in engineering and science and from both the academic and commercial community. Since 2003, he has been working collaboratively with Defence R&D Canada (DRDC) – Suffield and Environment Canada (EC) to develop a unique multi-scale, multi-physics urban flow/dispersion modeling system supported by the Chemical, Biological, Radiological-Nuclear, and Explosives (CBRNE) Research and Technology Initiative (CRTI). This is a significant achievement because this modeling system provides a new, unique comprehensive operational capability in Canada to support chemical, biological, and radiological response planning and response for civilian operations (both domestically and internationally). As a result, a spin-off company - called WATCFD (www.watcfd.com) - was established in 2003.

PUBLICATIONS

1. H. Ji, F.S. Lien and E. Yee (2010), "A New Adaptive Mesh Refinement Data Structure with an Application to Detonation", *Journal of Computational Physics*, **229**, 8981-8993.
2. A. Scott and F.S. Lien (2010), "Application of the NS-α Model to a Recirculating Flow", *Flow, Turbulence and Combustion*, **84**, 167-192.
3. F.S. Lien, E. Yee, B.C. Wang and H. Ji (2009), "Grand Computational Challenges for Prediction of the Turbulent Wind Flow and Contaminant Transport and Dispersion in the Complex Urban Environment", Atmospheric Turbulence, Meteorological Modeling and Aerodynamics, P.R. Lang and F.S. Lombargo (Eds.), Nova Science Publishers.

Session D1-W1-T1: New Green Energy/Environment/Sustainability, Intelligent/ Electric Vehicle

Artificial Photosynthesis on Metal-Nitride Nanowire Arrays

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ABSTRACT

It has been envisioned that the current energy and environment issues can be largely addressed by developing artificial photosynthesis that can mimic the natural system. However, conventional artificial photosynthesis process generally exhibits very low efficiency, which is directly related to the poor absorption of sunlight by the associated photocatalyst. In this context, we have investigated artificial photosynthesis on metal-nitride (InGaN) nanowire arrays, whose energy bandgap can encompass nearly the entire solar spectrum by varying the alloy compositions. We have demonstrated one-step solar-to-hydrogen conversion using such nanowire arrays.

In this work, nearly defect-free InGaN nanowire arrays are grown directly on Si(111) substrates by molecular beam epitaxy. The wires exhibit uniform distribution and are vertically aligned to the substrate. Through detailed O_2 and H_2 half reactions in the presence of sacrificial reagents, it is confirmed that the lateral surfaces (*m*-plane) of GaN and InGaN nanowires can exhibit high photocatalytic activity under UV and visible light irradiation, respectively. We have subsequently demonstrated overall water splitting on such nanowire arrays, wherein Rh/Cr_2O_3 nanoparticles are also employed as co-catalysts on the wire lateral surfaces to further promote H_2 evolution. Nearly stoichiometric evolution of H_2 and O_2 gases are observed with no apparent degradation of photocatalytic activity for more than 30 hours. These results, in conjunction with the achievement of high efficiency overall water splitting on multi-band nanowire arrays under direct solar irradiation will be presented. This work will open up new opportunities for the production of low cost, clean and renewable sources of energy, including H_2 and methanol by using only sunlight, carbon dioxide, and water.

BIOGRAPHY

Zetian Mi is an Assistant Professor in the Department of Electrical and Computer Engineering at McGill University in Montreal, Canada. He received the Ph.D. degree in Applied Physics from the University of Michigan in 2006. His teaching and research interests are in the areas of III-nitride semiconductors, low

dimensional nanostructures, artificial photosynthesis, nanophotonics, and nanoelectronics. He has published 5 book chapters and more than 160 refereed journal and conference papers.

Prof. Mi currently serves as the Associate Editor of IEEE Journal of Lightwave Technology. He has organized (or co-organized) the Green Energy Session of Photonics North 2012, IEEE Photonics Society 2011 Winter Topical Meeting on Photonic Materials and Integration Architectures, Information Photonics Topical Meeting IP2011 on Photonic Integration, and Symposium on Wide-Bandgap Semiconductor Materials and Devices of the 221st and the 219th ECS Meetings. He has also served on the technical program committees of 2010 and 2011 North American Conference on MBE, 2009-2012 IEEE-NANO (Nano-optics, Nanophotonics, and Nano-Optoelectronics), and 2010-2012 OSA Integrated Photonics Research: Silicon Photonics and Nanophotonics (IPR).

Prof. Mi has received the Young Investigator Award from the 27th North American Molecular Beam Epitaxy Conference. He has also received the Hydro-Quebec Nano-Engineering Scholar Award in 2009, the William Dawson Scholar Award in 2011 and the Christophe Pierre Award for Research Excellence in 2012 at McGill University.

Session D1-W1-T1: New Green Energy/Environment/Sustainability, Intelligent/ Electric Vehicle

Light Harvesting Schemes for High-performance Polymer Solar Cells

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ABSTRACT

Organic photovoltaic devices (OPVs) have received much attention because they are promising alternative tools for harnessing renewable energy. Recently the power conversion efficiencies (PCEs) of these OPV devices have reached as high as ~10%, opening up the possibility for their practical use as flexible, light-weight, low-cost, renewable energy systems. While the internal quantum efficiency of OPVs can approach 100%, efficient light harvesting in OPVs remains one of the major limitations toward realizing high PCEs. In this talk, we will present light harvesting techniques for high-performance OPVs. First, we have employed indium tin oxide (ITO) as an optical spacer in inverted devices. We have found that the optical interference effect led to spatial redistribution of the optical field in the devices, resulting in favorable distribution of photogenerated excitons. The exiton quenching at the electrodes could be inhibited, thereby improving the device performance. Further, we blended gold nanoparticles (Au NPs) into the anodic buffer layer to trigger localized surface plasmon resonance (LSPR) for enhancing the performance of the OPVs. The power conversion efficiency of the OPVs incorporating the Au NPs can be improved. The mechanism of the plasmonic-enhanced OPVs will be discussed. Finally, we recently found that the direct excitation of charge-transfer excitons in the donor–acceptor blends of the OPVs can lead to substantially near-infrared photovoltaic response. The device probably will become a promising wireless electrical source for biological nanodevices. Further, the results might open up new avenues for harvesting the long-wavelength spectrum of solar irradiation to provide even higher-efficiency solar cells. The details of the device characterization will be discussed.

BIOGRAPHY

Prof. Fang-Chung Chen was born on 4th June, 1974 in Taichung, Taiwan. He received the B.S. and master degree in Chemistry from National Taiwan University, Taiwan, in 1996 and 1998, respectively, and the Ph.D. degree in Materials Science and Engineering from University of California, Los Angeles (UCLA), USA, in 2003.

He was a teaching assistant in Department of Chemistry, National Taiwan University in 1998. He was a postdoctoral research associate in Department of Materials Science and Engineering, UCLA, from Oct. to Dec. in 2003. He joined Department of Photonics and Display Institute at National Chiao Tung University (NCTU) since Feb. 2004 as an assistant professor. He is currently an Associate Professor. He was also the chairman of Degree Program of Flat Panel Display Technology in NCTU. His research interests include polymer solar cells, organic photodetectors, organic memories, organic light-emitting diodes, and organic thin-film transistors.

Prof. Chen is the recipient of Award for Junior Research Investigators of Academia Sinica 2008, which is one of the most important awards for junior research investigators in all research fields in Taiwan. He has published more than 70 Journals papers, one book chapter, 60 conference papers and owned six patents. He is currently on the Editorial Boards of *Active and Passive Electronic Components*. He frequently serves as a referee for many high-quality Journals, such as *JACS, Adv. Mat., Adv. Funct. Mat., ACS Nano, Energy Environ. Sci., J. Mat. Chem., APL* etc..

*Session : **D1-W2-T1:*** **Medicine, Public Health, Biomedical Science and Engineering**

Session Organizer & Chair

Peter P. Liu, PhD

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BIOGRAPHY

Peter P. Liu, MD, FRCPC

Scientific Director, University of Ottawa Heart Institute
Professor of Medicine, University of Ottawa
Professor of Medicine & Physiology, Peter Munk Cardiac Centre, University of Toronto
President of International Society of Heart Failure of World Heart Federation

Dr. Liu graduated from the University of Toronto Faculty of Medicine. During his cardiology training, he also pursued a post-doctoral fellowship in cardiovascular imaging and immunology at the Massachusetts General Hospital of Harvard Medical School, and clinical epidemiology at McMaster University. In 1985 he joined the Division of Cardiology at the Toronto General Hospital, University of Toronto. Since 1999, he has been the Heart & Stroke/Polo Chair Professor at the University Health Network, and serves as the inaugural Director of the Heart & Stroke/Richard Lewar Centre of Excellence in Cardiovascular Research at the University of Toronto. Since 2005, he was the Scientific Director at CIHR's Institute of Circulatory & Respiratory Health, the major federal funding agency that supports biomedical research in Canada. At CIHR, he designed a number of innovative research programs and leveraged funding for several major research networks and consortia across the country and internationally. He served on the executive committee and provided research leadership for the Canadian Heart Health Strategy, Canadian Lung Health Framework, and National Sodium Reduction Strategies with the federal and provincial governments. Since this past July, Dr. Liu has also assume the role of Scientific Director of the University of Ottawa Heart Institute, a prestigious institution that is a leader in personalized medicine and imaging. He will be working with members and stakeholders to enhance further the excellence and global impact of

research and innovation of the Ottawa Heart Institute.

Dr. Liu focuses his own research on the pathophysiology and clinical outcomes of heart failure from bench to bedside. His team has elucidated the role of inflammation in changing heart structure and function, and potential novel treatment targets in heart failure. His laboratory has also identified how viruses and bacteria can accelerate heart failure and coronary artery disease, and is developing novel vaccines to prevent these complications. With support from Genome Canada, CIHR group and team programs, and Ontario Research Global Leadership Fund – he is also pursuing novel biomarkers and therapeutic targets for early cardiovascular disease identification and intervention. He has published over 320 peer reviewed articles in high impact journals, and his work has been cited over 20,000 times in the literature. In addition, he co-chaired a series of Canadian Cardiovascular Society Consensus Guideline Recommendations for heart failure care.

He is the recipient of numerous awards in recognition of his scientific contributions and accomplishments including the Rick Gallop Research Award Recognizing Research Excellence from the Heart & Stroke Foundation of Ontario (2003), the Research Achievement Award from the Canadian Cardiovascular Society (CCS, 2003), Visiting Research Professor Award from the Royal College of Physicians and Surgeons (2005), Extramural Award of Merit from the American College of Cardiology (2005), the Jean Davignon Cardiometabolic Award (2008), and Lifetime Achievement Award from CCS (2011), and Distinguished Lecture Award of the ICRH at CIHR (2012). He has served as the scientific program chair for the Canadian Cardiovascular Society, Heart Failure Society of America, International Human Proteomic Organization, and World Heart Federation.

Currently he is the Director of the National C-CHANGE Initiative, harmonizing and integrating cardiovascular preventive guidelines for both the professional and patients, and develops strategies for implementation. This just has been adopted as the national standards across all provinces in Canada for implementation by the Ministries of Health. He is also President of the International Society of Heart Failure of the World Heart Federation (WHF), and also serves on the Research and Policy Committees of WHF, coordinating global fight against heart disease and promoting its prevention.

*Session : **D1-W2-T1:*** **Medicine, Public Health, Biomedical Science and Engineering**

Overcoming the logistical challenges of mesenchymal stem cell therapy for heart disease

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ABSTRACT

Clinical trials of stem cell therapy for heart repair have thus far demonstrated inconsistent benefits, indicating an urgent need to optimize the therapeutic platform and enhance stem cell potency. Mesenchymal stem cells (MSC) constitute a minor population of the nucleated cells in adult bone marrow, and require significant ex vivo amplification for therapeutic applications. However, the growth of adult stem cells in vitro is limited due to cellular senescence. This makes it necessary to continuously culture MSC from fresh donors. This hurdle constitutes a significant bottleneck in realizing the therapeutic potential of MSC. Adding to this challenge is adult stem cell heterogeneity and donor variations, which can cause inconsistent stem cell quality and adversely impact clinical application of MSC. There is a need to develop a stable source of functionally consistent MSCs that are safe to use in the clinic. Since MSC are immunoprivileged, allogeneic MSC are feasible to modify for broad clinical application. The use of allogeneic MSC isolated from young healthy donors offers a major advantage because the stem cells can be thoroughly tested and formulated into off-the-shelf cell medicine in advance. We have developed a cell reprogramming method based on transient expression of cyclin-dependent kinase 1 (patent pending). The reprogrammed MSC maintain their ability to secrete growth factors and cytokines, which can be formulated into a trophic cocktail for tissue regeneration. Therapeutic use of a cocktail of well-defined stem cell factors is fundamentally different from the traditional single-drug or single-growth factor treatment modules, and appears strategically advantageous. We have taken advantage of the trophic action of MSC in formulating a minimally invasive therapeutic approach for heart failure treatment using a rodent model, which is based on injection of MSC or MSC-derived trophic cocktail into the limb muscle away from the diseased heart. This remote cell administration strategy based on intramuscular injection into the skeletal muscle contrasts with the traditional intramyocardial or intracoronary delivery approaches. We demonstrated that MSC-derived IL-6-type cytokines activate the skeletal muscle JAK/STAT3 axis, and this upstream signaling event leads to activation of the STAT3 target genes encoding the growth factors/cytokines HGF, IGF, SDF-1 and VEGF. These trophic factors acting in concert can mediate cardiac repair through their progenitor cell-mobilizing, angiogenic, cytoprotective, myogenic, antifibrotic, and anti-inflammatory properties, thus providing a feasible strategy for eliciting prominent therapeutic response in humans.

BIOGRAPHY

Dr. Techung Lee was born on October 31, 1958 in Tai-Chung, Taiwan, Republic of China. He received his B.S. in Botany in 1981 and his M.S. in Biochemistry in 1983 from National Taiwan University, Taipei, Taiwan. He received his Ph.D. in Microbiology and Immunology in 1989 from Virginia Commonwealth University, Richmond, Virginia, USA.

He was RESEARCH ASSOCIATE with the Department of Cell Biology, Baylor College of Medicine, Houston, Texas, USA from 1990 to 1992, and was promoted to INSTRUCTOR during 1992-1993. He joined the Department of Biochemistry, University at Buffalo as ASSISTANT PROFESSOR in 1994, and was promoted to ASSOCIATE PROFESSOR in 2000. He became DIRECTOR of Biomedical Research Service and Clinical Applications (www.bmrservice.com) in 2002. He joined the Department of Biomedical Engineering, University at Buffalo in 2009. His previous research concerned molecular and cellular regulation of cardiomyocyte function. His current research interests encompass adult stem cell biology and therapeutic applications.

Professor Lee is a member of American Heart Association. He received Young Investigator Award from European Heart Society in 1998, Siegel Award for Teaching Excellence from University at Buffalo in 2004, First Place Poster Award from the International Federation of Societies for Surgery of the Hand in 2004, and Visionary Innovator Award from University at Buffalo in 2010. He has a pending US Patent on Stem cell material and method of use (PCT/US2010/059678). He currently serves on the editorial board of World Journal of Stem Cells, Journal of Chinese Clinical Medicine, Insciences Journal, ISRN Vascular Medicine, and Current Tissue Engineering. His three most recent publications are: *Am J. Physiology 299:H1428-1438, 2010*, Shabbir et al: Activation of host tissue trophic factors through JAK/STAT3 signaling: A mechanism of mesenchymal stem cell-mediated cardiac repair. *Circulation Research 109:1044-1054, 2011*, Suzuki et al: Autologous mesenchymal stem cells mobilize c-kit+ and CD133+ bone marrow progenitor cells and improve regional function in hibernating myocardium. *Am J Physiology 301:H2422-2432, 2011*, Zisa et al: Intramuscular VEGF activates an SDF1-dependent progenitor cell cascade and an SDF1-independent muscle paracrine cascade for cardiac repair.

*Session : **D1-W2-T1:*** **Medicine, Public Health, Biomedical Science and Engineering**

Automating the radiation therapy process

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ABSTRACT

The delivery of radiation for the treatment of cancer is a complicated process that requires both clinical and technical expertise to ensure radiation treatments are safe and effective. We are developing automated methods to improve the efficiency and quality of the radiation therapy process. One focus of this automated initiative has been the quality assurance (QA) process in radiation therapy. Sub-optimal treatment plans have the potential to result in significant detriment to the patient. In addition, several studies have shown radiation therapy plans, which deviate from established QA guidelines, result in worse patient outcomes. Therefore we are applying sophisticated mathematical algorithms, based on a bank of thousands of previous treatment plans deemed to be safe and of high quality. For a new plan created, the algorithm examines features of the plan to establish relationships and patterns in the data in order to identify deviations and errors compared to the bank of plans. The algorithm will simplify the plan review process and provide the radiation therapy team essential knowledge to make more informed decisions about patient treatment. The methodology is based on a personalized cancer medicine approach using evidence-based expert consensus, which will promote widespread dissemination and adoption at other institutions to benefit all patients receiving radiation therapy.
Another automation focus has been on the treatment of patients with breast cancer using intensity modulated radiation therapy (IMRT). The goal of this work is to develop automated treatment planning in order to permit patients' greater access to high-quality IMRT treatments and reduces the resources required for treatment planning. In addition, an automated process would allow outlying centres, without the expertise in planning IMRT for breast, to incorporate more modern techniques into their practice without additional resource utilization and allow centralized centres to increase throughput. Applying the automated tools with on-line delivery would represent a fundamental improvement to the current treatment planning process and reduce the current delay between planning and treatment. The significance from a cancer patient's perspective is reduced wait times and less visits to the hospital while ensuring the highest quality breast radiation therapy treatment.

BIOGRAPHY

Thomas Purdie grew up in the Niagara Region in Southern Ontario in Canada. Dr. Purdie has a Bachelor's degree in physics with specialization in medical and health physics from McMaster University (Hamilton, Ontario, Canada) in 1997. This was followed by a PhD degree in medical biophysics from the University of Western Ontario (London, Ontario, Canada) in 2002. Following graduate school, Dr. Purdie completed a medical physics residency at Princess Margaret Hospital (Toronto, Ontario Canada) in 2004.

He is currently a staff medical physicist at the Princess Margaret Hospital and is an Assistant Professor in the Department of Radiation Oncology and an adjunct professor in the Department of Mechanical and Industrial Engineering at the University of Toronto. He is also a cross-appointed faculty member of the TECHNA Research Institute at the University Health Network. Current research interests include automating processes in breast radiation therapy and quality assurance.

Dr. Purdie completed a medical physics residency program at Princess Margaret Hospital and is a certified member of the Canadian College of Physicists in Medicine (CCPM). Dr. Purdie is a member of the Canadian Organization of Medical Physicists (COMP) and the American Association of Physicists in Medicine (AAPM).

*Session : **D1-W2-T1:*** **Medicine, Public Health, Biomedical Science and Engineering**

Genetics of Alzheimer's Disease

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ABSTRACT

Alzheimer's disease (AD) is the most common type of dementia that affects 3-5 million people in the United States and costs $24.6 billion/year for health care and an additional $36.5 billion/year for lost productivity. AD is characterized by gradual but extensive brain atrophy which may take up ten years. Patients gradually lose cognitive functions including memory, speech, and executive functions, and becomes incapacitated and completely dependent upon caregivers.

For the more common late-onset AD (LOAD, age at onset > 65y), the Apolipoprotein E (APOE) gene was discovered in early 1990s to be a susceptibility locus, and is recently shown to be involved in the metabolism of beta amyloid, the main constituent of the senile plaque that is a molecular hallmark found in the brains of Alzheimer's patients. Little is known about other genes until genome-wide association (GWA) studies become available since 2005. The number of susceptibility loci for LOAD has increased to nine when a series of high profile, large-scale GWA studies were published between 2009 and 2011.

This talk is an overview of Alzheimer's Disease Genetics Consortium (ADGC) and National Institute on Aging Genetics of Alzheimer's Disease Data Storage Site (NIAGADS), two initiatives established by the National Institute on Aging (NIA) in the United States for Alzheimer's disease genetics research. The ADGC project is a multi-institutional collaboration in the United States to conduct GWA studies and high throughput sequencing experiments to identify genes associated with LOAD risk. The NIAGADS data repository is a data repository established by NIA to facilitate access by qualified investigators to genotypic data in order to promote the study of the genetics of LOAD.

BIOGRAPHY

Li-San Wang received his B.S. (1994) and M.S. (1996) in Electrical Engineering from the National Taiwan University. He received his M.S. (2000) and Ph.D. (2003) from the University of Texas at Austin, both in

Computer Sciences, and was a postdoctoral fellow at the University of Pennsylvania between 2003 and 2006. Currently he is an Assistant Professor of Pathology and Laboratory Medicine, a faculty member of Penn Center for Bioinfomatics, and a fellow of Institute on Aging and Penn Genome Frontiers Institute, University of Pennsylvania. Dr. Wang's research integrates bioinformatics, genomics, and genetics to study neurodegeneration and psychiatric disorders. He has authored sixty peer-reviewed book chapters and journals on these topics and served on the program and organizing committees of various international workshops and conferences. He is the Principal Investigator of the National Institute on Aging Genetics of Alzheimer's Disease Data Storage Site (NIAGADS) and a Co-PI of the Alzheimer's Disease Genetics Consortium (ADGC).

Session : D1-W3-T1: **New Materials Science and Engineering, Nanotechnology**

Session Organizer & Chair

Huey-Liang Hwang, PhD (黃惠良 教授)

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Star River Chair Professor and Director of Photovoltaic Research Center
Shanghai Jiaotong University
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BIOGRAPHY

Huey-Liang Hwang (黃惠良) was born in Mainland China in 1946. He received the B.S.E. and M.S.E. degree in Electrical Engineering from National Cheng Kung University, Tainan, Taiwan, ROC in 1969 and 1971, respectively. In 1976 he was awarded the Ph.D degree in Solar Cells from Brown University, Providence R.I., USA. Since then he joined the faculty of the Electrical Engineering Department of National Tsing Hua University, Hsin-chu,Taiwan. His research areas include Giant Area Microelectronics (solar cells, displays, medical imaging devices and etc.) and ULSI. He was a pioneer researcher in Ternary Chalcopyrite Semiconductors and he has published more than 440 papers in scientific journals and conference proceedings. He was the Conference Chairmen of the first International Symposium on Electronic Devices and Materials(1980), Non-stoichiometry in Semiconductors(1991), 7th International Conference on Solid Films and Surfaces (1994) and 12th International Conference on Ternary and Multinary Compounds(2000).

Dr. Hwang was elected Fellow of IEEE in 1994 for "contributions in fundamental understanding of photovoltaic and semiconductor materials and devices", he was elected Fellow of National Science Council of Republic of China for his distiguished research, in 1996 he was also elected Fellow of American Vacuum Society in 1998 for "contributions for pioneering and sysmatical work on thin film photovoltaic materials and the fundamental understanding of hydrogenated Si films". Dr. Hwang was elected Member of Asia Pacific Academy of Materials (APAM) in 1998, and in 2011 he was elected President of APAM.

Dr. Hwang was the founders of the Electrical Engineering Departments of National Tsing Hua University and National Chung Hsing University, Tze-chiang Foundation of Science and Technology (the most re-nowned high tech engineers training center in Taiwan), and Sinonar Corp. (the 1st Amorphous Si Solar Cell manufacturer in Taiwan) 、Cando Corp. (Cando is the world front ranking manufacturer in Color Filter & touch panels)、IDTI (Integrated Digital Technology Inc, the 1st LCD Design House in Taiwan) ,

Lofsolar (the world uniue color solar cell corp.) all of the four companies are located in Hsin-Chu Science Industrial Park. He was the Visiting Professors of the University of Stuttgart, University of Tokyo, Danish Technical University, Stanford University and Hong Kong University of Science and Technology (HKUST). He was nominated as the 1st Y.Z. Hsu Scientific (the 1st Chair Professor of Nano Science in Taiwan) since 2002, and Tsing Hua Chair Professor of Electrical Engineering and Computer Science since 2003. Since Feburary 2012 he was appointed as the Star River Chair Professor and Director of Photovoltaic Research Center of Shanghai Jiaotong University.

Session : D1-W3-T1: **New Materials Science and Engineering, Nanotechnology**

Materials for the Thermoelectric Energy Conversion, enhanced via Nanostructuring

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ABSTRACT

Out of all the energy generated by mankind, more than half is transformed into waste heat. Considering the continuously increasing energy demands of our society, recovering part of the waste heat – normally lost – would be extremely beneficial, both for our society and for the environment. As proven by first field tests in trucks and cars, thermoelectric (TE) materials are capable of converting energy from the waste heat of the exhaust gases of automobiles into useful energy. This electricity production with current state-of-the-art thermoelectric generators (TEGs) may lead to fuel economy improvements of 5% - 10% by reducing the alternator load on the engine. In addition, the electricity may be employed to charge the battery of a hybrid car containing an electrical engine.[1,2]

Here we present our results on nanostructuring of $Mo_3Sb_{7-x}Te_x$, a material originally developed[3] and subsequently optimized as a high temperature thermoelectric bulk material in our group.[4,5]
Ball-milling of the bulk sample will lead to lower electrical and thermal conductivity, as will C_{60} additions. The thermoelectric performance may thus be improved, depending on whether the increased phonon scattering outweighs the increased electron scattering.

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BIOGRAPHY

Education

2001	Philipps-Universität Marburg, Germany, Habilitation in Chemistry
1994	J.-Gutenberg-Universität Mainz, Germany, Ph. D. in Chemistry
1991	W.-Wilhelms-Universität Münster, Germany, Diploma in Chemistry (M. Sc.)

Academic Appointments

since 2006	Full Professor, Inorganic Chemistry, University of Waterloo, Ontario
2002-06	Associate Professor, Inorganic Chemistry, University of Waterloo, Ontario
2000-02	Assistant Professor, Inorganic Chemistry, University of Waterloo, Ontario
1997-99	Habilitand, Inorganic Chemistry, Philipps-Universität Marburg, Germany
1995-97	Post-doctoral Fellow, Materials Chemistry, Ames Laboratory, IA, USA
1994-95	Post-doctoral Fellow, Inorganic Chemistry, J.-G.-Universität Mainz, Germany

Research Interests

Solid state materials chemistry: thermoelectric energy conversion, structure predictions, relations between structure, bonding, and physical properties.

Key publications

1. Sankar, C. R.; Guch, M.; Assoud, A.; Kleinke, H.: Structural, thermal and physical properties of the thallium zirconium telluride Tl_2ZrTe_3. *Chem. Mater.* 2011, *23*, 3886 - 3891.
2. Kleinke, H.: New bulk Materials for Thermoelectric Power Generation: Clathrates and Complex Antimonides. *Chem. Mater.* 2010, *22*, 604 - 611.
3. Cui, Y.; He, J.; Amow, G.; Kleinke, H.: Thermoelectric properties of n-type double substituted $SrTiO_3$ bulk materials. *Dalton Trans.* 2010, *39*, 1031 - 1035.

Awards

2002 Ontario Distinguished Researcher Award. Toronto, Canada.
2001 Canada Research Chair in Solid State Chemistry (tier II, NSERC). Ottawa, Canada.
2000 Premier's Research Excellence Award (Province of Ontario). Toronto, Canada.
1999 Fellowship for Habilitands (DFG). Bonn, Germany.
1997-99 Liebig-Fellowship (FCI, Fonds der Chemischen Industrie and BMBF, Bundesministerium für Bildung, und Forschung). Frankfurt, Germany.
1995-97 Postdoctoral Fellowship (DFG, Deutsche Forschungsgemeinschaft). Bonn, Germany.
1994 Ph.D. Award (FCI, Fonds der Chemischen Industrie). Frankfurt, Germany.

Scholarly and Professional Activities

since 2011	Media Ambassador, Waterloo Institute for Nanotechnology
since 2007	Advisory Board member, Chemistry of Materials
since 2007	Member, Brockhouse Institute for Materials Research

since 2006	Editorial Board member, Journal of Solid State Chemistry
since 2005	Editor, Journal of Alloys and Compounds
since 2000	Member, Canadian Society for Chemistry
since 2000	Member, Materials Research Society
since 2000	Member, Materials and Manufacturing Ontario
since 1998	Member, International Thermoelectric Society
since 1996	Member, American Chemical Society
since 1994	Member, German Chemical Society

Session : D1-W3-T1: **New Materials Science and Engineering, Nanotechnology**

Micro/Nanomechanical Resonators: Materials, Design, and Applications

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ABSTRACT

Micro/nanomechanical resonators are emerging as versatile building blocks for an impressive array of valuable applications. Even at this early stage in their evolution, these miniaturized devices have led to a series of impressive achievements: sensing forces and masses as small as an attonewton and an attogram, respectively, and controlling mechanical motion at gigahertz frequencies. These unprecedented capabilities are now being harnessed to create entirely new classes of systems for force-detected magnetic resonance imaging, mass spectroscopy, scanning probe microscopy, ultra-low power signal processing, and vibration energy harvesting. In addition, miniaturized resonators are excellent model systems for fundamental studies of nonlinear dynamics and cryogenic mechanics.

All these wonderful applications share one major requirement in common, namely, minimize dissipation by structural damping and increase the quality factor (Q) of resonance. Indeed, some applications require quality factors as large as one million. This is a formidable challenge because damping is a notoriously difficult phenomenon. In this talk, I will describe our efforts to probe the fundamental mechanisms of dissipation in micro/nanomechanical resonators. For a small set of materials, and under certain conditions of operation, it is possible to reduce dissipation to very low values approaching the ultimate thermodynamically-mandated limits of damping. This limit is set by the mechanism of thermoelastic damping. Models for thermoelastic damping and experiments with single-crystal silicon microresonators will be presented [1-4].

The second part of the talk will focus on dissipation in ultrathin nanocrystalline films of common metals. These materials are widely used as coatings on micro/nanomechanical resonators to enhance electrical conductivity, optical reflectivity, and surface chemistry. Unfortunately, they also degrade the performance by causing a disproportionate increase in dissipation. In these films, damping is dominated by internal friction caused by the irreversible motion of crystallographic defects. As a first step towards scale-dependent process-structure-dissipation correlations, we have measured the effects of frequency, thickness, and grain size on internal friction in nanocrystalline aluminum films. The details of these measurements, and the contribution of grain-boundary sliding to internal friction in aluminum films, will be discussed.

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BIOGRAPHY

Srikar Vengallatore received the B.Tech. degree (with honours) in metallurgical engineering from the Institute of Technology, Banaras Hindu University, Varanasi, India, in 1994, and the Ph.D. degree in materials science from the Massachusetts Institute of Technology (MIT), Cambridge, in 1999.

Following postdoctoral research at MIT, he joined McGill University, Montreal, Quebec, Canada, where he is currently a Canada Research Chair and Associate Professor in the Department of Mechanical Engineering. His research program integrates materials research with device development for microsystems and nanosystems (MEMS/NEMS). His current activities include fundamental studies of energy dissipation and damping in micro/nanomechanical resonators; origins and evolution of residual stresses in thin film materials; design and prototyping of miniaturized devices for energy harvesting and portable power generation; and developing microdevices for biomedical applications.

Dr. Vengallatore is a member of Alpha Sigma Mu and Sigma Xi. He was the recipient of the Class of '44 Award for Outstanding Teaching in 2007 and the Early Career Research Excellence Awards in 2009, both from the Faculty of Engineering, McGill University.

Session : D1-W3-T1: **New Materials Science and Engineering, Nanotechnology**

Formation of Single-Crystal Si Thin Foil using Nano-structure Etching

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The foreseeable depletion of fossil fuel and the global warming caused by the carbon dioxide had led to the increasing attention of alternative renewable energy and energy saving. Therefore, crystalline Si-PV devices are quickly spreading. However, current Si-PVs need a large amount of materials and consume significant energy in the fabrication. Thus an important trend is to reduce the material consumption. Here we explore a technique to form single crystalline Si thin foils from regular (100) Si wafer. It involves two-step etching. The first step is to etch Si wafer with nano-structures or micro-structure using the electroless metal-assisted etching. The etched features can be controlled by nano-patterns or lithography. The second step is to etch Si with more horizontal direction. Hence the top portion can be removed from the Si wafer. As the procedure is repeated on the same Si wafer, Si thin foils can be obtained from a single Si wafer. The film thickness could be from around 5 um to 25 um. For the film of 15 um, the absorption is 99% in the wavelength range from below 400 nm to 800 nm, then decreases to about 90% at the wavelength 912 nm. The film has very good crystal orientation, almost identical to (100) Si wafer.

BIOGRAPHY

Prof. Ching-Fuh Lin obtained the B.S. degree from National Taiwan University in 1983, and the M.S. and Ph.D. degrees from Cornell University, Ithaca, NY, in 1989 and 1993, respectively, all in electrical engineering.

He is now the Director of Innovative Photonics Advanced Research Center (i-PARC), the Chairman

of Graduate Institute of Photonics and Optoelectronics and a joint professor in the Graduate Institute of Photonics and Optoelectronics, Graduate Institute of Electronics Engineering, and Department of Electrical Engineering at National Taiwan University. His research interests include organic-inorganic composite thin-film solar cells and optoelectronic devices, single-crystal Si thin-film solar cells, Si-based photonics, and physics in broadband semiconductor lasers and optical amplifiers.

He is a Fellow of IEEE, a Fellow of SPIE, Member of Asia-Pacific Academy of Materials, and a member of OSA. He has published over 140 journal papers and more than 350 conference papers and hold over 30 patents. He is also the sole author of a book, Optical Components for Communications: Principles and Applications, published by Kluwer Academic Publishers (USA 2004), and co-author/edit a book, Organic, Inorganic and Hybrid Solar Cells – from Principles to Practices, to be published by John Wiley & Sons, Inc. and IEEE Press. He had obtained the Distinguished Research Award and several Class A Research Awards from National Science Council of Taiwan, ROC, and the Outstanding Electrical Engineering Professor Award from the Chinese Institute of Electrical Engineering. He and his students had also been granted the 18th Acer Research Golden Award, 18th Acer Research Excellent Award, 14th Acer Research Excellent Award, Collins Thesis Awards for years of 1998, 2001, 2002, 2004, 2007, 2009, and 2010.

Prof. Lin has served as the Chair of IEEE LEOS Chapter Taipei Section, the Board member of the 17th IEEE Taipei Section, the Evaluation Committee member of Higher Education Evaluating & Accreditation Council of Taiwan, the Council member of the 10th Optical Engineering Society of ROC, and the Convener in the area of Electronics and Information for the Conventional Industry Technology Development Project in the Bureau of Industry, Ministry of Economics, ROC. He has also served as Project Instructors of the National Programs in the nano-science and nano- technology and the renewable energy (solar energy).

Session : D1-W4-T1: **Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)**

Session Organizer & Chair

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BIOGRAPHY

Li-Chun Wang (M'96 – SM'06 – F'11) received the B.S. degree from National Chiao Tung University, Taiwan, R. O. C. in 1986, the M.S. degree from National Taiwan University in 1988, and the Ms. Sci. and Ph. D. degrees from the Georgia Institute of Technology , Atlanta, in 1995, and 1996, respectively, all in electrical engineering.

From 1990 to 1992, he was with the Telecommunications Laboratories of the Ministry of Transportations and Communications in Taiwan (currently the Telecom Labs of Chunghwa Telecom Co.). In 1995, he was affiliated with Bell Northern Research of Northern Telecom, Inc., Richardson, TX. From 1996 to 2000, he was with AT&T Laboratories, where he was a Senior Technical Staff Member in the Wireless Communications Research Department. In August 2000, he has joined the Department of Electrical Engineering of National Chiao Tung University in Taiwan and has been promoted to the full professor since 2005.

His current research interests are in the areas of radio resource management and cross-layer optimization techniques for wireless systems, heterogeneous wireless network design, and cloud computing for mobile applications.

He was elected to the IEEE Fellow grade in 2011 for his contributions in cellular architectures and radio resource management in wireless net- works. Dr. Wang was a co-recipient (with Gordon L. St¨uber and Chin-Tau Lea) of the 1997 IEEE Jack Neubauer Best Paper Award for his paper "Architecture Design,Frequency Planning, and Performance Analysis for a Microcell/Macrocell Overlaying System," IEEE Transactions on Vehicular Technology, vol. 46, no. 4, pp. 836-848, 1997. He has published over 180 journal and international conference papers. He served as an Associate Editor for the IEEE Trans. on Wireless Communications from 2001 to 2005, the Guest Editor of Special Issue on "Mobile Computing and Networking" for IEEE Journal on Selected Areas in Communications in 2005 and on "Radio Resource Manage-

ment and Protocol Engineering in Future IEEE Broadband Networks" for IEEE Wireless Communications Magazine in 2006. He is holding nine US patents.

Session : D1-W4-T1: **Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)**

Broadband Wireless Access over Fibre-connected Massively Distributed Antennas

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ABSTRACT

Wireless access architectures employing femto- and pico-cell base-station/access point can reduce power consumption and enhancing wireless spectrum utilization by shortening the links and exploiting cooperative and cognitive mechanisms, but co-ordinations between base-stations or access points may incur large overheads. We present a novel architecture that exploit wireless-optical convergence for next generation broadband wireless access employing fibre-connected massively distributed antennas (BWA-FMDA). In this architecture, a large number of distributed antennas are connected via radio over fibres (RoF) to a centralized processing entity to minimize the communication overhead of system co-ordination. The coverage area of the proposed BWA-FMDA system can range from a few tens of square meters in homes and office environments, delivered via IEEE 802.11a/g/n or femto-cell hotspot solutions, to several square kilometers supporting last-mile technologies such as WiMAX, LTE, and LTE-A using pico- and micro-base-stations. This new architecture leads to many new research problems, including the fundamental performance limits of massively distributed antenna systems, improved measurement-based channel models involving massively distributed antennas, advanced radio resource management and access control schemes that approach the performance limits in realistic propagation environments, and improved opto-electronic transceivers designs for low cost active optical cables suitable for RoF applications. In this talk we demonstrate the potentials of BWA-FMDA architecture by considering its application in license-free and licensed wireless systems. We present the cognitive WLAN over fibre (CWLA-NoF) system, which applies the BWA-FDMA architecture in the license-free ISM band for cooperative spectrum sensing, interference avoidance/mitigation and dynamic channel assignment. BWA-FMDA can also be applied in licensed bands to create coordinated multiple point (CoMP) operations of femto-cells, which provides higher spectral efficiency (bps/Hz) and higher energy efficiency (bits/Joule). Simulation results and address potential research issues are presented for each scenario. We conclude with a short discussion on our current effort to develop and deploy a BWA-FMDA testbed based on commercially available equipment.

BIOGRAPHY

Victor C. M. Leung received the BASc (Hons.) degree in electrical engineering from the University of British Columbia (UBC) in 1977, and was awarded the APEBC Gold Medal as the head of the graduating class in the Faculty of Applied Science. He attended graduate school at UBC on a Natural Sciences and Engineering Research Council Postgraduate Scholarship and completed the PhD degree in electrical engineering in 1981.

From 1981 to 1987, he was a Senior Member of Technical Staff at MPR Teltech Ltd., specializing in the planning, design and analysis of satellite communication systems. In 1988, he started his academic career at the Chinese University of Hong Kong, where he was a Lecturer in the Department of Electronics. He returned to UBC as a faculty member in 1989, and currently holds the positions of Professor and TELUS Mobility Research Chair in Advanced Telecommunications Engineering in the Department of Electrical and Computer Engineering. He is a member of the Institute for Computing, Information and Cognitive Systems at UBC. He also holds adjunct/guest faculty appointments at Jilin University, Beijing Jiaotong University, South China University of Technology, the Hong Kong Polytechnic University and Beijing University of Posts and Telecommunications. He has co-authored more than 500 technical papers in international journals and conference proceedings, and several of these papers had been selected for best paper awards. His research interests are in the areas of architectural and protocol design, management algorithms and performance analysis for computer and telecommunication networks, with a current focus on wireless networks and mobile systems.

Dr. Leung is a registered professional engineer in the Province of British Columbia, Canada. He is a Fellow of IEEE, a Fellow of the Engineering Institute of Canada, and a Fellow of the Canadian Academy of Engineering. He is a Distinguished Lecturer of the IEEE Communications Society. He is serving in the editorial boards of the IEEE Transactions on Computers, IEEE Wireless Communications Letters, Computer Communications, the Journal of Communications and Networks, as well as several other journals. Previously, he has served in the editorial boards of the IEEE Journal on Selected Areas in Communications – Wireless Communications Series, the IEEE Transactions on Wireless Communications and the IEEE Transactions on Vehicular Technology. He has guest-edited several journal special issues, and served in the technical program committees of numerous international conferences. He is a General Co-chair of IEEE CIT 2012. He was a TPC Co-chair of the MAC and Cross-layer Design track of IEEE WCNC 2012. He chaired the TPC of the wireless networking and cognitive radio track in IEEE VTC-fall 2008. He was the General Chair of AdhocNets 2010, WC 2010, QShine 2007, and Symposium Chair for Next Generation Mobile Networks in IWCMC 2006-2008. He was a General Co-chair of FutureTech 2012, MUSIC 2012, GCN Workshop at ICC 2012 and Infocom 2011, GNSG Workshop at Infocom 2012, CSA 2011, Chinacom 2011, MobiWorld, BodyNets 2010, CWCN Workshop at Infocom 2010, ASIT Workshop at Globecom 2010, MobiWorld Workshop at CCNC 2010, IEEE EUC 2009 and ACM MSWiM 2006, and a TPC Vice-chair of IEEE WCNC 2005. He is a recipient of an IEEE Vancouver Section Centennial Award, and a 2011 UBC Killam Research Prize.

Session : D1-W4-T1: **Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)**

Localization of Wireless Terminals in Indoor Environment

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Abstract:

Localization of wireless terminals is a challenging problem, which has received much attention in recent years. If wireless terminals can be localized accurately, a host of new applications will emerge, ranging from security and emergency to location-based services and navigation. Recent advances in signal processing have created a new impetus for tackling the localization problem. In particular Compressive Sensing can find an application in localization of wireless nodes since location estimation is an intrinsically sparse problem. We have applied the theory of compressive sensing, combined with Affinity Propagation, for localization of wireless terminals in indoor applications. Our preliminary studies show surprising results. The accuracy of location estimates is very high, making the technique suitable for navigation, such as directing visually impaired individuals to find their way through buildings. In this talk, we will discuss how new advances in signal processing can be used to localize wireless terminals in indoors, and demonstrate the test results carried out at the Canadian National Institute for the Blind (CNIB) by thirty individuals with severe vision loss.

Biography

Shahrokh Valaee is a Professor and the Associate Chair for Undergraduate Studies and holds the Nortel Institute junior chair of Computer Networks in the Edward S. Rogers Sr. Department of Electrical and Computer Engineering at the University of Toronto. He is the founder and the Director of the Wireless and Internet Research Laboratory (WIRLab) at the University of Toronto.

Prof.. Valaee was the Technical Program Co-Chair and the Local Organizing Chair of the IEEE PIMRC 2011. He was the Co-Chair for Wireless Communications Symposium of IEEE GLOBECOM 2006. He has served as a guest editor for several journals including IEEE Wireless Communications Magazine, Wiley Journal on Wireless Communications and Mobile Computing, EURASIP Journal on Advances in Signal Processing, and International Journal of Wireless Information Networks. He is currently an Editor of the

IEEE Transactions on Wireless Communications, and an Associate Editor of the IEEE Signal Processing Letters. His current research interests are in wireless vehicular and sensor networks, location estimation and cellular networks.

Session : D1-W4-T1: **Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)**

Recent Developments in 3D Vision, Image Segmentation and Object/Action Recognition

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ABSTRACT

Many applications benefit from the ability to "see in 3D", and use the depth information to measure distances, estimate the shape of surfaces, inspect manufactured objects or track objects in a complex environment. The progression from 2D to 3D relies on techniques such as triangulation and stereovision, which have given rise to new applications and opportunities in areas such as industrial inspection and quality control, surveillance and security, face and gesture recognition, vision-guided robotics, biomedical imaging, virtual reality, and intelligent transportation, among others. However real word conditions like cluttered scenes, lighting, occlusions, sudden depth changes, variable textures of the objects, reflections, transparencies, complex motions, pose a significant challenge in generating precise depth maps.

Miniaturization of components, and advances in key technologies like sensors, processors, and optics has helped in creating a new generation of 3D "smart" sensors that utilize embedded processing, resulting in cost-effective, low power consuming, light weight systems that provide superior performance and accuracy levels.
In this talk, we first of all briefly review the state-of-the-art in 3D sensors and their applications. Then we discuss the development of a fully integrated, miniaturized, embedded, real-time stereo vision system, followed by the presentation of research results related to the development of new Gaussian mixture models for image segmentation and a general framework for object and action recognition systems.

BIOGRAPHY

Dr. Jonathan Wu was born in China in 1962. He received his Ph.D. degree in electrical engineering from the University of Wales, Swansea, U.K., in 1990.

From 1995, he worked at the National Research Council of Canada (NRC) for 10 years where he became a senior research officer and the head of a research division. He is currently a full Professor in the Department of Electrical and Computer Engineering at the University of Windsor, Canada. Dr. Wu holds a Tier 1 Canada Research Chair (CRC). He has published one book entitled "Guide to Three Dimensional Structure and Motion Factorization," by Spinger London, more than 200 peer-reviewed papers in areas of computer vision, image processing, pattern recognition, and intelligent information systems. His current research interests include 3D vision, medical image analysis, active video object tracking, human action recognition, and multimedia communication systems.

Dr. Wu is an Associate Editor for IEEE Transaction on Systems, Man, and Cybernetics (part A). He is also on the editorial board of International Journal of Robotics and Automation. Dr. Wu has served on the Technical Program Committees and International Advisory Committees for many prestigious conferences.

Session D1-W1-T2: New Green Energy/Environment/Sustainability, Intelligent/Electric Vehicle

Session Organizer & Chair

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ABSTRACT
Wind energy is expected to play a significantly increasing role in the generation of clean electrical power worldwide owing to the fact that it is the most developed and cost effective of the renewable energy sources. To reduce barriers for clean energy deployment of wind turbines when injected in a power system requires state-of-the-science predictive tools to address the following two critical problems: (1) provision of reliable and accurate wind power forecasts to manage the variability of wind generation required for the optimal integration of wind energy into electrical grids; and, (2) prediction and assessment of the environmental impact of wind turbine noise which constitutes a key aspect for public acceptability of wind turbines and/or wind farms sited at locations near residential areas.

To address these deficiencies, the objective of this talk is to report recent progress in the development of a single integrated (unified) multiscale modeling and simulation framework for wind energy applications that can be used to provide wind power forecasts and wind turbine designs, and to predict noise at wind turbine sites.

BIOGRAPHY

Prof. Fue-Sang Lien received his BASc and MASc from National Cheng Kung University (NCKU) in 1982 and 1984, respectively. He received his PhD from University of Manchester Institute of Science and Technology (UMIST) in the UK in 1992. His major field of study is computational fluid dynamics (CFD) and turbulence modelling.

He has more than 20 years of experience developing and systematically applying CFD to a wide range of fluid mechanics problems such as turbulence, urban flow, dispersion, aeroacoustics and multiscale modeling. He has also actively participated in a wide range of projects supported by British Aerospace, Rolls

Royce Aeroengines, the Defence Research Agency in the UK, BMW in Germany, the European Commission, Defence R&D Canada – Suffield, Environment Canada, Natural Resources Canada, Ontario Ministry of the Environment, Ford Motor Company, Atomic Energy of Canada Limited, Bombardier Aerospace in Toronto, NSERC, MITACS and SHARCNET. Prof. Lien has published more than 150 journal and conference papers on numerical techniques, turbulence modeling (URANS and LES) and model validation.

He is internationally recognized as a major contributor to the development and stable implementation of many sophisticated turbulence closure models in RANS and these turbulence models have been widely applied in research and industrial computations of turbulent flows – indeed three of these turbulence closure models appear as options in the influential code OpenFOAM, which is a free open source CFD software package that has a large user base from many areas in engineering and science and from both the academic and commercial community. Since 2003, he has been working collaboratively with Defence R&D Canada (DRDC) – Suffield and Environment Canada (EC) to develop a unique multi-scale, multi-physics urban flow/dispersion modeling system supported by the Chemical, Biological, Radiological-Nuclear, and Explosives (CBRNE) Research and Technology Initiative (CRTI). This is a significant achievement because this modeling system provides a new, unique comprehensive operational capability in Canada to support chemical, biological, and radiological response planning and response for civilian operations (both domestically and internationally). As a result, a spin-off company - called WATCFD (www.watcfd.com) - was established in 2003.

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Session : D1-W1-T2: New Green Energy/Environment/Sustainability, Intelligent/ Electric Vehicle

Challenges in Numerical Simulation of Unconventional Oil and Gas Reservoirs

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ABSTRACT

Mathematical models have widely been used to predict, understand, and optimize complex physical processes in modeling and simulation of multiphase fluid flow in petroleum reservoirs. These models are important for understanding the fate and transport of chemical species and heat. With this understanding the models are then applied to the needs of the petroleum industry to design enhanced oil and gas recovery strategies.

While mathematical modeling and computer simulation have been successful in the recovery of conventional oil and gas, there still exist a lot of challenges in unconventional oil and gas modeling. As conventional oil and gas reserves dwindle and oil prices rise, the recovery of unconventional oil and gas (such as heavy oil, oil sands, tight gas, and shale gas) is now the center stage. For example, enhanced heavy oil recovery technologies are an intensive research area in the oil industry, and have recently generated a battery of recovery methods, such as cyclic steam stimulation (CSS), steam assisted gravity drainage (SAGD), vapor extraction (VAPEX), hybrid steam-solvent processes, and other emerging recovery processes. This presentation will give an overview on challenges encountered in modeling and simulation of these recovery processes: insufficient physics/chemistry in current models, multi-scale phenomena, phase behavior, geomechanics, assisted history matching with closed-loop optimization, transport of solvents, wellbore modeling, and four-phase flow. It will also discuss the development of fast and accurate computational algorithms and their matching-up with emerging hardware architecture.

BIOGRAPHY

Dr. Zhangxin (John) Chen is currently a Professor at the University of Calgary and Director of iCentre for Simulation & Visualization, and holds the NSERC/AERI/Foundation CMG Senior Research Chair in Reservoir Simulation, iCORE Industrial Chair in Reservoir Modeling in Canada, and Distinguished Professorship of "Thousand Talents" in China. He received his B.S. degree from the University of Jiangxi, M.S. degree from Xi'an Jiaotong University, China, and Ph.D. degree from Purdue University, USA. He formerly held a Tengfei Chaired and Chang Jiang Chaired Professorship (the most prestigious professor position awarded by the Chinese Ministry of Education in China) at Xi'an Jiaotong University, Tepin Professorship of Energy and Resources at the Peking University, Ziqiang Professorship at Shanghai University, and Gerald J. Ford Research Professorship at Southern Methodist University (SMU). Other significant appointments include oil and gas related research and university appointments by such notable organizations such as Texas A&M University, the University of Minnesota, and the Mobil (now ExxonMobil) Technology Company, and Director of the Center for Scientific Computation at SMU, Director of the Center for Advanced Reservoir Modeling and Simulation at Peking University, and President, Chinese Association for Science and Technology in Texas, USA. Dr. Chen has edited six books, written four books, and published over 250 research articles in international high-quality journals. He has delivered over 240 invited, plenary, and keynote presentations worldwide. His research interest is in numerical reservoir simulation, mathematical modeling, algorithm development, and archaeological exploration. Dr. Chen has received many prestigious awards and honours, including the Sigma Xi Outstanding Research Award, the Gerald J. Ford Outstanding Leadership Award, IBM Faculty Award, and the Overall Research Excellence Award, University of Calgary.

Session : D1-W1-T2: New Green Energy/Environment/Sustainability, Intelligent/ Electric Vehicle

Hysteresis Control of Voltage Source Converters for Synchronous Machine Emulation

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ABSTRACT:

Synchronous generators (SGs) are the major contributors in maintaining the stability of power systems. As SGs are displaced by electronically-coupled distributed energy resources (DERs) such as Type 4 wind generators and solar PV, the dynamic behaviour of these new generation technologies will become critical in ensuring grid stability. One method of ensuring continued provision of voltage and frequency regulation is to have these new devices emulate the response of traditional SGs. Achieving the desired emulation behaviour requires fast, robust control of DERs to track the rapid changes in current injections that arise when SGs are subjecting to changing grid conditions. This presentation focuses on the feasibility of controlling a voltage source converter to emulate the behaviour of a SG during both steady-state and transient periods. Two types of hysteresis current controllers (HCCs) are considered for tracking the current injections of a virtual SG in real-time---standard and space vector (SV) based HCC. Demonstration of both types of HCCs through simulation illustrate that each is capable of providing the desired tracking behavior, although there are distinct advantages and disadvantages to each approach.

BIOGRAPHY

Prof. Joseph Euzebe (Zeb) Tate received the B.S. degree in electrical engineering from Louisiana Tech University, Ruston, LA, in 2003 and the M.S. and Ph.D. degrees in electrical and computer engineering from the University of Illinois at Urbana-Champaign in 2005 and 2008. He is currently an Assistant Professor in the Department of Electrical and Computer Engineering at the University of Toronto, a position he has held since 2008. His research focuses on combining advanced telemetry, data processing, and visualization techniques to facilitate renewable integration and improve power system reliability and efficiency.

Session : D1-W1-T2: New Green Energy/Environment/Sustainability, Intelligent/ Electric Vehicle

My Career with Photovoltaics

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ABSTRACT

In this talk I will explain the start-up of my career with photovoltaics(PV) since 1972 in Brown University, and over the years, how I established my academic activities in different areas of solar cells and how are they linked to the PV developments in Taiwan. Also, I will elaborate my research and developments on GAMES (Giant Area Microelectronics including solar cells, Medical Imaging,and Touch panels, etc.)using the PV concepts. The Color PV Systems installed in China pavalion of 2010 Shanghai EXPO highlight this developments. Therefore, starting from photovoltaics, I started business in different areas in Hsinchu Science Park to realize the concepts from Innovations to Incubations, which led to their successful commercializations. In the last part, I will brief the current research activities both in Innovation Centers located in Shanghai, Hsinchu and Novosibirsk, and research like SPA novel structures for Si thin film solar cells, the initiation of grating surface structures and advanced passivations in crystalline Si cells for improvement in their energy conversion efficiencies. Finally, as the pioneer of CIGS solar cells, I will describe our activities how to overcome the difficulties encountered in the industrialization of this promising thin film PV industry.

BIOGRAPHY

Huey-Liang Hwang (黃惠良) was born in Mainland China in 1946. He received the B.S.E. and M.S.E. degree in Electrical Engineering from National Cheng Kung University, Tainan, Taiwan, ROC in 1969 and 1971, respectively. In 1976 he was awarded the Ph.D degree in Solar Cells from Brown University, Providence R.I., USA. Since then he joined the faculty of the Electrical Engineering Department of National Tsing Hua University, Hsin-chu,Taiwan. His research areas include Giant Area Microelectronics (solar cells, displays, medical imaging devices and etc.) and ULSI. He was a pioneer researcher in Ternary Chalcopyrite Semiconductors and he has published more than 440 papers in scientific journals and conference

proceedings. He was the Conference Chairmen of the first International Symposium on Electronic Devices and Materials(1980), Non-stoichiometry in Semiconductors(1991), 7th International Conference on Solid Films and Surfaces (1994) and 12th International Conference on Ternary and Multinary Compounds(2000).

Dr. Hwang was elected Fellow of IEEE in 1994 for "contributions in fundamental understanding of photovoltaic and semiconductor materials and devices", he was elected Fellow of National Science Council of Republic of China for his distiguished research, in 1996 he was also elected Fellow of American Vacuum Society in 1998 for "contributions for pioneering and sysmatical work on thin film photovoltaic materials and the fundamental understanding of hydrogenated Si films". Dr. Hwang was elected Member of Asia Pacific Academy of Materials (APAM) in 1998, and in 2011 he was elected President of APAM.

Dr. Hwang was the founders of the Electrical Engineering Departments of National Tsing Hua University and National Chung Hsing University, Tze-chiang Foundation of Science and Technology (the most re-nowned high tech engineers training center in Taiwan), and Sinonar Corp. (the 1st Amorphous Si Solar Cell manufacturer in Taiwan) 、Cando Corp. (Cando is the world front ranking manufacturer in Color Filter & touch panels)、IDTI (Integrated Digital Technology Inc, the 1st LCD Design House in Taiwan) , Lofsolar (the world uniue color solar cell corp.) all of the four companies are located in Hsin-Chu Science Industrial Park. He was the Visiting Professors of the University of Stuttgart, University of Tokyo, Danish Technical University, Stanford University and Hong Kong University of Science and Technology (HKUST). He was nominated as the 1st Y.Z. Hsu Scientific (the 1st Chair Professor of Nano Science in Taiwan) since 2002, and Tsing Hua Chair Professor of Electrical Engineering and Computer Science since 2003. Since Feburary 2012 he was appointed as the Star River Chair Professor and Director of Photovoltaic Research Center of Shanghai Jiaotong University.

Session D1-W2-T2: Medicine, Public Health, Biomedical Science and Engineering

Session Organizer & Chair

Hsueh-Fen Juan

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BIOGRAPHY

Hsueh-Fen Juan was born in 1969, Miao-Li, Taiwan. She received her BS and MS degree in Botany and PhD in Biochemical Sciences from National Taiwan University (NTU) in 1999. She worked as a research scientist in the Japan International Research Center for Agricultural Sciences (Tsukuba, Japan) during 2000-2001 and a postdoctoral research fellow in the Institute of Biological Chemistry, Academia Sinica (Taipei, Taiwan) during 2001-2002.

She started her academic career in the Department of Chemical Engineering, National Taipei University of Technology as an assistant professor and in the Department of Computer Science and Information Engineering at NTU as an adjunct assistant professor in 2002. She moved to NTU in 2004 as an assistant professor in the Department of Life Science and the Institute of Molecular and Cellular Biology. She was promoted to be an associate professor in 2006 and full professor in 2009. Dr. Juan is currently working on cancer systems biology, integrating transcriptomics, proteomics and bioinformatics for biomarker and drug discovery.

Prof. Juan has developed a number of novel methods to advance systems-biology research and applied such approach for drug discovery and elucidating molecular mechanism of drug responses in cancer cells. In the past five years, she has published more than 36 journal papers including prestigious journals such as *Proc. Natl. Acad. Sci. USA*, *Oncogene*, *J. Proteome Res.*, *Proteomics*, *Bioinformatics*, and edited a scientific book entitled as *Systems Biology: Applications in cancer-related research* (2012). She also serves as the reviewer of thirty various journals like *Molecular and Cellular Proteomics* (ASBMB), *Proteomics* (Wiley-VCH), *BMC Bioinformatics*, and has organized several international systems biology and bioinformatics symposiums. In 2008, she was awarded as Taiwan's Ten Outstanding Young Persons. In 2011, she received FY2011 JSPS Invitation Fellowship Program for Research in Japan. She currently serves as the Board Member in the Taiwan Society for Biochemistry and Molecular Biology, Taiwan Proteomics Society, Taiwan Bioinformatics and Systems Biology Society.

Session D1-W2-T2: **Medicine, Public Health, Biomedical Science and Engineering**

Pyrophosphatase: a Membrane Embedded Proton-Pumping Protein

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ABSTRACT

H^+-pyrophosphatase (H^+-PPase), a primary active proton transporter, establishes the proton gradient at expense of pyrophosphate (PPi) for secondary transport of ions, metabolites, and even toxic substances. H^+-PPase was found primarily in the vacuolar membrane of plants and the plasma membrane of several protozoa and prokaryotes. H^+-PPase functions as a homodimer with a unique amino acid sequence and belongs to its own type of proton pumping protein. We have successfully isolated the *Vigna radiata* H^+-PPase (*Vr*H^+-PPase) from *Saccharomyces cerevisiae*, in a homodimeric form. *Vr*H^+-PPase demonstrates PPi hydrolysis and proton pumping ability. VrH^+-PPase consists of an integral membrane domain formed by 16 transmembrane helices. A novel proton translocation pathway is formed by six core transmembrane helices with four acid-base pairs residues.

BIOGRAPHY

Birth (date/place): 1959, July 30/ Kaohsiung, Taiwan

Education:

1982	B.S. in Chemistry, Chung-Yuan Christian University, Taiwan
1995	Ph.D. in Crystallography, University of Pittsburgh, Pittsburgh, U.S.A.

Professional Appointments:

2009-Present	Professor

Institute of Bioinformatics and Structural Biology, National Tsing Hua University, Hsinchu, Taiwan.

2004-2009 Associate Professor
Institute of Bioinformatics and Structural Biology, National Tsing Hua University, Hsinchu, Taiwan.

2000-2004 Assistant Professor
Department of Life Science, National Tsing Hua University, Hsinchu, Taiwan.

Selected Recent Publications:

- Lin, S.-M. Tsai, J.-Y., Hsiao, C.-D., Huang, Y.-T., Chiu, C.-L., Liu, M.-H. Tung, J.-Y., Liu, T.-H., Pan, R.-L. and Sun Y.-J.* (2012) Crystal Structure of a Membrane-embedded H^+-translocating Pyrophosphatase *Nature* 484, 399-403.
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Session D1-W2-T2: **Medicine, Public Health, Biomedical Science and Engineering**

Principles of Protein Folding from Coarse-Grained Models

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ABSTRACT

Thousands of different types of proteins are responsible for the functioning of life. Understanding and predicting the three-dimensional structures and dynamic properties of proteins from their sequences of amino acids require basic knowledge of molecular forces. I will give a brief summary of how physicists' approaches to statistical mechanical and polymer modeling have contributed to this exciting endeavour. Comparisons between theory and experiment on cooperative folding indicate a prominent role of desolvation barriers, i.e., the energetic penalties of water exclusion. These barriers contribute to an apparent general organizing principle entailing a coupling between local conformational preferences and nonlocal packing interactions. Examples will be given to illustrate how important folding principles have been gleaned from studies using native-centric models and how nonnative interactions may be treated perturbatively.

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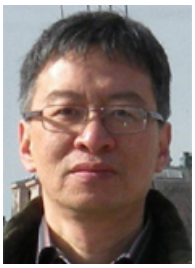
BIOGRAPHY



Hue Sun Chan was born in Hong Kong in 1959. He received his B.Sc. (first class honours, in physics) from the University of Hong Kong in 1981 and his M.A. and Ph.D. in physics from the University of California at Berkeley in 1983 and 1987 respectively.

He is currently Professor of Biochemistry, Molecular Genetics and Physics at the University of Toronto. Before taking up his appointment at the University of Toronto in 1998, he was Associate Adjunct Professor in the Department of Pharmaceutical Chemistry at the University of California at San Francisco (UCSF). He was trained as a theoretical particle physicist at the University of California at Berkeley (1981-1987). However, since his postdoctoral years at UCSF (1987-1989), his

research interest has turned to theoretical and computational biophysics. His current research interests include protein folding, role of solvation in the properties of biomolecules, protein-protein interactions involving intrinsically disordered proteins, molecular evolution, and DNA topology.

Prof. Chan is a member of the Biophysical Society (US) and a member of the Editorial Board of *Proteins: Structure, Function, and Bioinformatics*. He has published about 110 scientific papers which have received over 8,000 citations.

Session D1-W2-T2: **Medicine, Public Health, Biomedical Science and Engineering**

Bioinformatics Analysis of Mass Spectrometry Data for Proteomics

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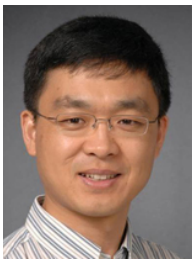
ABSTRACT

Proteomics is an emerging research area that studies the proteins present in a specimen. Recent advancement in proteomics has led to the discovery of important biomarkers that can help diagnose or predict a disease, and the development of new medicine for the treatment. Mass spectrometry is the experimental technology widely used in proteomics for high-throughput protein identification and characterization. This talk presents a brief review of the history and recent development of mass spectrometry in proteomics, and focuses on the bioinformatics analysis of the mass spectrometry data.

BIOGRAPHY



Bin Ma studied at Beijing University, China during 1990-1999. He received his Bachelor degree in 1994 and Ph.D. degree in 1999 from Beijing University.

He is currently a professor and university research chair in the David R. Cheriton School of Computer Science at the University of Waterloo. Before joining University of Waterloo in 2008, he was an assistant professor and then associate professor at University of Western Ontario from 2000-2008; a postdoc at University of Waterloo from 1999-2000; and a research assistant at City University of Hong Kong from 1998-1999. He published over 100 research papers, and is the creator of several popular bioinformatics software packages including PEAKS and PatternHunter.

Session D1-W2-T2: **Medicine, Public Health, Biomedical Science and Engineering**

Evaluating Sites of Post-Translational Modification in p53 using Convergent Association Testing

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ABSTRACT

In our previous studies involving multiple sequence alignment, we found interdependent (association) sites can be indicative of structural and functional characteristics of the molecule. They can be used in algorithms to construct the tertiary structure of small ribosomal RNA and transfer RNA. Recently, we found information from site associations can be used to construct: 1) the core sites in the 3-dimensional structure of the SH3 protein, 2) the hierarchical structure of the ubiquitin domains, and 3) related hereditary patterns of some cancers using p53, a cancer tumor suppressor. In this study, we continue to investigate the roles of sites with association pattern in discriminating between p53 and its homologs.

Using the aligned sequences of p53, we developed a new method of association testing that involves the use of multiple level contingency table analysis. The idea is to incorporate analysis using a concept known as granular computing, representing information with different levels of granularity or resolutions. When associations of multiple sites are converged, these sites reflect points of inter-relatedness between sites in the molecule. We found that these identified sites are significantly predictive of post-translational modification in the molecule, among other things. Furthermore, when these sites are aligned with p63/p73, the homologs of p53, they are statistically discriminating between the human sequences of the p53 family. Thus the study confirms the importance of these identified sites.

BIOGRAPHY

Professor David Chiu was born and educated in Hong Kong. He has a Ph.D. in Systems Design Engineering from University of Waterloo (1986), a M.Sc. in Computing and Information Science (1979) from Queen's University, a B.Sc. in Science from University of Guelph (1976) and a B.A. degree in Psychology from University of Waterloo (1978), Ontario, Canada.

Currently he is a tenured full Professor in Computer Science and a graduate faculty with the Bioinformatics program, the Biophysics program at the University of Guelph in Canada. He has worked with NCR Canada Ltd. on unconstrained character recognition in 1979-1982. In 1992, he received the Science and Technology Agency (STA) Fellowship of Japan and worked in Electrotechnical Laboratory of Japan (currently National Institute of Advanced Industrial Science and Technology, AIST). In 2012, he was awarded the Dr. H. Stanley and Doreen Heaps Chair in Computer Science at St. Francis Xavier University in Nova Scotia, Canada. He has worked with the National Network Centers of Excellence, Advanced Foods and

Materials Network of Canada. He has published more than 100 research papers in book chapters, journals and international conferences. His research interests are in pattern analysis, machine intelligence, bioinformatics and image analysis.

Session D1-W3-T2: New Materials Science and Engineering, Nanotechnology

Session Organizer & Chair

Da-Hsuan Feng, PhD (馮達旋教授**)**

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Session D1-W3-T2: **New Materials Science and Engineering, Nanotechnology**

Paper-Based Micro Sensors

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ABSTRACT

Paper, as a ubiquitous material in everyday life, has recently been re-engineered into low-cost yet effective sensing platforms for applications in the fields of medical diagnostics and flexible electronics. In this talk, I will present our recent work on developing paper-based micro sensors, including: (i) a microfluidic biosensor for point-of-care diagnosis; and (ii) a piezoresistive physical sensor for force/acceleration measurements. Targeting low-cost diagnosis in resource-limited settings, we have developed a paper-based microfluidic biosensor for performing enzyme-linked immunosorbent assays (ELISA). The device is fabricated from patterned paper and double-sided adhesive tape, and is inexpensive, portable, and disposable. Operation of the device is skill independent, and an untrained user can manipulate the device and perform an assay in 43 min. Compared to conventional ELISA, the device requires shorter assay time, less volumes of sample/reagents, and simpler/cheaper instruments. Use of the device is demonstrated for detecting rabbit IgG and hepatitis B surface antigens in serum. In physical sensor development, we explored the use of paper as the structural material for construction of piezoresistive force sensors and accelerometers. The working principle of this type of sensors is based on the piezoresistive effect generated by conductive materials patterned on a paper substrate. The entire fabrication process can be completed within one hour using simple tools, without requiring expensive cleanroom facilities. In addition, paper can be readily folded into three-dimensional structures, representing a unique characteristic not shared by other solid-state materials for micro sensor construction. These devices are suitable for applications that require moderate sensing capabilities and have cost constraints.

BIOGRAPHY

Xinyu Liu is an Assistant Professor in the Department of Mechanical Engineering at McGill University. He received his Ph.D. degree in mechanical engineering from the University of Toronto in 2009. Prior to joining McGill in 2011, he was a Postdoctoral Research Fellow in the Department of Chemistry and Chemical Biology at Harvard University. At McGill, he is leading the Biomedical Microsystems Laboratory, with active research projects in microrobotic biomanipulation, bioMEMS, and microfluidics. He received the Chwang-Seto Faculty Scholar Award, the Canadian Rising Star in Global Health Award, and several best paper awards at major engineering and biomedical conferences. He is a co-inventor of 9 US/PCT patents (issued or pending).

Session D1-W3-T2: **New Materials Science and Engineering, Nanotechnology**

Functional Biodegradable Nanomaterials for Drug Delivery

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ABSTRACT

Drug delivery has become a very vibrant research field because of its tremendous importance in the treatment of diseases. Correspondingly, the development of novel biomaterials to enable reliable and highly efficient drug delivery has emerged as an important research topic. We are interested in using functional biodegradable scaffolds for the delivery of small molecule drugs and genes with high efficacy and minimal side effects. Biodegradable polylactides (PLAs) with pendent acetylene or allyl groups were synthesized by ring-opening polymerizations and utilized as base polymers. From acetylene-functionalized PLAs, polymer-drug conjugates (PDCs) with PLA-based backbones and hydrophilic poly(ethylene glycol) (PEG) grafts were prepared through azide-alkene click reactions. These PDCs carrying anticancer drug moieties, such as paclitaxel, exhibited not only nanoscopic dimensions and excellent water-dispersibility, but also considerable degradability and sustained drug release behavior. In vitro studies showed that the polymeric scaffolds were non-toxic but the PDCs were very toxic towards cancer cells. From allyl-functionalized PLAs, cationic PLAs (CPLAs) carrying tertiary amine groups were obtained by thiol-ene click reactions. These CPLAs exhibited remarkable hydrolytic degradability and low cytotoxicity. The nanoplexes of CPLAs with IL-8 siRNA formed in aqueous solutions were readily taken up by prostate cancer cells, resulting in significant IL-8 gene silencing. It is found that the degradability and cytotoxicity of CPLAs, as well as the transfection efficiency of the CPLA-IL-8 siRNA nanoplexes, positively correlate with the amine mol% of CPLAs. From our perspective, these functional biodegradable drug delivery systems have important application potentials.

BIOGRAPHY

Dr. Chong Cheng was born in Anhui, China, in 1973. He obtained a Bachelor of Engineering degree in polymer materials from Hefei University of Technology in Anhui, China in 1993. He acquired a Master of Engineering degree in polymer materials from Beijing University of Chemical Technology in 1996. He then came to the United States for doctoral study at City University of New York, and obtained a Ph.D. in chemistry in 2003.

In 2003-2007, he worked as a postdoctoral research associate in Department of Chemistry at Washington University in Saint Louis. Since 2007, he has worked as a tenure-track Assistant Professor in Department of Chemical and Biological Engineering at University at Buffalo, the State University of New York. His research interests include biodegradable polymers and nanostructures for drug delivery, nanomaterials via miniemulsion, and novel brush polymers.

Dr. Cheng is a member of American Chemical Society, American Institute of Chemical Engineers, and American Society for Nanomedicine. A few of his recent publications are given as follows:

1) J. Zou, C. C. Hew, E. Themistou, Y. Li, C.-K. Chen, P. Alexandridis, C. Cheng, *Adv. Mater.* **2011**, *23*, 4274.
2) Y. Yu, J. Zou, L. Yu, W. Jo, Y. K. Li, W. C. Law, C. Cheng, *Macromolecules* **2011**, *44*, 4793.
3) Y. Li, E. Themistou, J. Zou, B. P. Das, M. Tsianou, C. Cheng, *ACS Macro Lett.* **2012**, *1*, 52.
4) C.-K. Chen, W.-C. Law, R. Aalinkeel, A. Kopwitthaya, S. D. Mahajan, J. L. Reynolds, J. Zou, S. A. Schwartz, P. N. Prasad, C. Cheng, *Adv. Healthcare Mater.* **2012**, *accepted*.

Session D1-W3-T2: New Materials Science and Engineering, Nanotechnology

Engineering, Kinetics and Fate of Nuclear-Targeting Nanoparticles

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ABSTRACT

Progress in nanotechnology has greatly advanced drug delivery to the nucleus. One major strategy relies on conjugating nanoparticles to viral peptides such as the nuclear localization signal peptides (NLS). However, little is known about their nuclear accumulation kinetics and interaction with nuclear components. Here we show that the kinetics is dictated by surface NLS densities of nanoparticles, and that these nanoparticles pass into nuclei of daughter cells by binding to histones. We showed the effects of surface ligand densities on nuclear accumulation kinetics by adjusting the ratios between native and mutant NLS while keeping total peptides per nanoparticle constant. We further found that these nuclear nanoparticles transferred into the daughter cell nucleus along with chromosomes. Karyotyping showed such association was non-specific. Dot blot analysis attributed the association to electrostatic interaction between the negatively charged NLS-nanoparticles and the positively charged histones, which are proteins that package DNA into chromosomes during mitosis. We further used nanoparticles of different sizes to illustrate the size effects on nuclear accumulation kinetics. We found fastest kinetics for NLS-modified nanoparticles of 15 nm compared to their 30 nm and 60 nm counterparts, and accumulation was abolished for nanoparticles modified by mutant NLS. Our results provide clues to nanoparticles rationale design for optimal nuclear accumulation kinetics, and warrant further investigation of their long-term effects on nuclear components.

BIOGRAPHY

Dr. Chan is currently an Associate Professor in the Institute of Biomaterials and Biomedical Engineering at the University of Toronto. He also holds the Canadian Research Chair in Bionanotechnology and is affiliated with the Department of Materials Science and Engineering, the Terrence Donnelly Center for Cellular and Biomolecular Research Chemistry, Chemistry and Chemical Engineering. His research interest is in the development of nano- and microtechnology for cancer and infectious disease diagnosis. He has received the BF Goodrich Young Inventors Award, Lord

Rank Prize Fund award in Optoelectronics (England), and Dennis Gabor Award (Hungary). Dr Chan received his BS degree from the University of Illinois in 1996 and PhD degree from Indiana University in 2001. He did his post-doctoral training at the University of California (San Diego).

Mr. Tang is currently a doctoral candidate under Dr. Warren Chan's supervision, and a recipient of the Queen Elizabeth II Scholarship in Science and Technology (Canada) and the International Graduate Scholarship (Taiwan). His research interests focus on understanding the interaction between biology and engineered nano-sized materials. His research has contributed to two research articles and two review articles. Prior to current PhD program, he had worked for CanCap Pharmaceutical (Canada), and the Development Centre for Biotechnology (Taiwan). His recommendation to the CEO of the later resulted in successful implementation of core services and an additional USD$1.5 million in government funding. Mr. Tang received his BS degree in biotechnology from National Chiao Tung University (Taiwan) in 2004 and MS degree in medical sciences from University of Toronto in 2006.

Session D1-W4-T2: Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)

Session Organizer & Chair

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Session D1-W4-T2: Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)

Web Caching Prefetching by ART2 Neural Network

Wenying Feng

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ABSTRACT

With today's popularity of Internet technologies, the number of web sites and pages has increased rapidly in recent years. Reducing web access latency is particularly important for online businesses and other applications. A commonly used and effective technique is web cache prefetching that preloads some data to the cache before it is actually requested, anticipating that these data are to be requested by the user in the near future so that they will be available locally rather than retrieved from remote sites. Successful prefetching will not only reduce the delays for user requests for Web objects, but also result in less overall network traffic and lighter loads on the Web servers.

Based on the Adaptive Resonance Theory 2 (ART2) of Neural Networks, we introduced a machine learning prefetching algorithms - pART2. The new algorithm has the advantages of accepting continuous inputs and producing better performance in some particular applications. The algorithm is implemented in Jave and tested using both Monte Carlo technique and real world data from a digital library.

BIOGRAPHY

Dr. Wenying Feng is a Professor in the Departments of Computing & Information Systems and Mathematics at Trent University, Ontario, Canada. She is also an Adjunct Professor at the School of Computing, Queen's University, Canada and an Adjunct Professor to the Graduate Program in Information Systems & Technology, York University, Toronto, Canada. With research interests in the areas of nonlinear analysis, differential equations, machine learning, system modeling and simulation, she has published more than 70 articles in refereed journals and conference proceedings. She has also served as program chairs, organ-

ized special tracks, and served as a member of the program committee for many international conferences.

Dr. Feng received her Ph.D. in Mathematics from the University of Glasgow in 1997 and has held a number of academic and industrial positions in the United States and Canada.

Session D1-W4-T2: Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)

Cloud Computing and Resource Allocation in Cloud

Ling Guan

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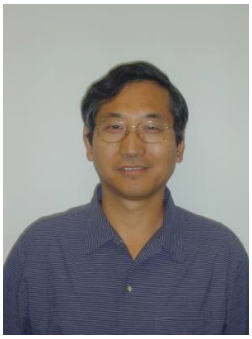
ABSTRACT

Cloud computing changes the way we think about computing technology. Cloud is a novel computing model that can provide on-demand computation, storage and communication resources as services in a dynamically scalable and virtualized manner. In the traditional computing, both data and software are fully contained on a personal computer; in cloud computing, the data and services provided reside in massively scalable data centers and can be ubiquitously accessed by users through Internet. Just as public utilities like electricity and water, computing resources and software services are delivered to users in cloud, which free users from certain hardware and software installation and maintenance tasks.

Cloud computing also offers benefits to application providers. For application providers, the increasing computing resource is a big headache, especially when considering the time variable workload. Cloud computing provides a solution to this situation. In cloud computing, application providers can rent required computing resources from cloud infrastructure providers and deploy different applications for users. When the workload is varying, the required computing resources can be elastically changed to satisfy the Quality of Service (QoS) requirements, which would prevent application providers from paying for the idle computing resources. Additionally, the hardware and software are well maintained by cloud infrastructure providers, and thus the application providers can just focus on the services they provided.

This talk gives an overview on the following aspects: 1) the definition of cloud computing and the market of cloud service; 2) the critical issues in cloud computing; 3) our recent research on optimal resource allocation for cloud; and 4) the future research directions in cloud computing.

BIOGRAPHY



Ling Guan received his Bachelor's Degree from Tianjin University, China, Master's Degree from University of Waterloo, Canada and Ph.D. Degree from University of British Columbia, Canada. From 1992 to 2001, he was on the Faculty of Engineering, University of Sydney, Australia. Since 2001, he has been a Tier I Canada Research Chair in Multimedia and Computer Technology, and a Professor of Electrical and Computer Engineering at Ryerson University, Toronto, Canada. He is the founder and director of Ryerson Multimedia Research Lab and Centre for Interactive Multimedia Information Mining. Dr. Guan has been working on image, video and multimedia signal processing, human-computer interaction, pattern recognition and machine intelligence, and authored/co-authored numerous scientific publications. He has served on half a dozen editorial boards of IEEE Transactions and Magazines and chaired the 2006 IEEE International

Conference on Multimedia and Expo in Toronto. He played the leading role in the inauguration of IEEE Pacific-Rim Conference on Multimedia in 2000 and served as the Founding General Chair. Dr. Guan is a Fellow of the IEEE, the Canadian Academy of Engineering and the Engineering Institute of Canada. He is an IEEE Circuits and System Society Distinguished Lecturer and a recipient of the 2005 IEEE Transactions on Circuits and Systems for Video Technology Best Paper Award.

Session D1-W4-T2: Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)

Autonomous Resilient Routing for Selective Forwarding Attack in Wireless Sensor Networks

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ABSTRACT

As Wireless Sensor Networks (WSNs) are being utilized in an increasing number of applications, the need for resilience to data-oriented attacks is becoming paramount. Selective forwarding is an attack which drops partial received packets and forwards others, making it challenging to distinguish malicious activity from changing wireless link quality. Countermeasures provide some resilience to attacks and failures, while supporting data collection objectives. This work develops an Autonomous Resilient Routing (ARR) scheme to maximize data delivery in the presence of selective forwarding attacks. Take the wireless link quality variants into consideration, each node autonomously evaluates its parent's forwarding reliability and duplicates data to an alternative parent only when deemed necessary. Simulation results demonstrate that ARR provides significant data recovery while incurring only modest overheads, given there exists some path between the valid sensor nodes and a sink. Furthermore, ARR exhibits superior performance with multiple sinks and when modified to handle multi-priority data.

BIOGRAPHY

S. Jay Yang received his BS degree in electronic engineering from the National Chiao-Tung University in Taiwan in 1995, and his MS and Ph.D. degrees in electrical and computer engineering from the University of Texas at Austin in 1998 and 2001, respectively.

He is currently an associate professor and the Department Head for the Department of Computer Engineering at Rochester Institute of Technology in Rochester NY, USA. Before joining RIT in 2002, he has worked as a Research Associate for Fujitsu Laboratory of America and NetQoS, and as an Intern for Bell Laboratory, Lucent Technologies. In summer 2005, he was selected as a Visiting Research Faculty for Air Force Research Laboratory, Rome NY. He has authored and co-authored more than 35 refereed articles in

the areas of networking performance modeling and security, information fusion, and swarm robots. His current research interests focus on threat and impact assessments of cyber attacks with machine learning, information fusion and optimization techniques.

Prof. Yang is a Co-Director of the Networking and Information Processing (NetIP) Laboratory at RIT, and an active member of the Center for Multisource Information Fusion based in western New York. He is a member of IEEE, and was a Co-chair for IEEE Joint Communications and Aerospace Chapter in Rochester NY in 2005, when the chapter was recognized as an Outstanding Chapter of Region 1. He has participated in the development of a multidisciplinary Ph.D. program in Computing and Information Sciences at RIT. He received Norman A. Miles Award for Academic Excellence in Teaching in 2007 and TxTEC Graduate Fellowship in 1999. He has been on the organization committees for various conferences, including ISIF/IEEE International Conference on Information Fusion in 2009 and 2011 International Conference on Social Computing, Behavioral-Cultural Modeling, & Prediction. He has also been a reviewer for numerous journals and conferences, including IEEE/ACM Transaction on Networking, IEEE Transaction on Information Forensics and Security, IEEE INFOCOM, and IEEE ICCCN.

Keynote

Chair

Da-Hsuan Feng, PhD (馮達旋教授**)**

Senior Vice President, National Tsing Hua University
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Keynote

Janice Stein, PhD

Director, Munk School of Global Affairs, The University of Toronto

BIOGRAPHY

Janice Gross Stein is the Belzberg Professor of Conflict Management in the Department of Political Science and the Director of the Munk School for Global Affairs at the University of Toronto. She is a Fellow of the Royal Society of Canada and an Honorary Foreign Member of the American Academy of Arts and Sciences.. She is the co-author, with Eugene Lang, of the prize-winning *The Unexpected War: Canada in Kandahar*. Her most recent book is *Diplomacy in the Digital Age*. She was the Massey Lecturer in 2001 and a Trudeau Fellow. She was awarded the Molson Prize by the Canada Council for an outstanding contribution by a social scientist to public debate. She has received an Honorary Doctorate of Laws from the University of Alberta, the University of Cape Breton, McMaster University, and the Hebrew University of Jerusalem. She is a member of the Order of Canada and the Order of Ontario.

Session D1-W1-T3: New Green Energy/Environment/Sustainability, Intelligent/Electric Vehicle

Session Organizer & Chair

Ching-Fuh Lin, PhD (林清富 教授)

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BIOGRAPHY

Prof. Ching-Fuh Lin obtained the B.S. degree from National Taiwan University in 1983, and the M.S. and Ph.D. degrees from Cornell University, Ithaca, NY, in 1989 and 1993, respectively, all in electrical engineering.

He is now the Director of Innovative Photonics Advanced Research Center (i-PARC), the Chairman of Graduate Institute of Photonics and Optoelectronics and a joint professor in the Graduate Institute of Photonics and Optoelectronics, Graduate Institute of Electronics Engineering, and Department of Electrical Engineering at National Taiwan University. His research interests include organic-inorganic composite thin-film solar cells and optoelectronic devices, single-crystal Si thin-film solar cells, Si-based photonics, and physics in broadband semiconductor lasers and optical amplifiers.

He is a Fellow of IEEE, a Fellow of SPIE, Member of Asia-Pacific Academy of Materials, and a member of OSA. He has published over 140 journal papers and more than 350 conference papers and hold over 30 patents. He is also the sole author of a book, Optical Components for Communications: Principles and Applications, published by Kluwer Academic Publishers (USA 2004), and co-author/edit a book, Organic, Inorganic and Hybrid Solar Cells – from Principles to Practices, to be published by John Wiley & Sons, Inc. and IEEE Press. He had obtained the Distinguished Research Award and several Class A Re-

search Awards from National Science Council of Taiwan, ROC, and the Outstanding Electrical Engineering Professor Award from the Chinese Institute of Electrical Engineering. He and his students had also been granted the 18th Acer Research Golden Award, 18th Acer Research Excellent Award, 14th Acer Research Excellent Award, Collins Thesis Awards for years of 1998, 2001, 2002, 2004, 2007, 2009, and 2010.

Prof. Lin has served as the Chair of IEEE LEOS Chapter Taipei Section, the Board member of the 17th IEEE Taipei Section, the Evaluation Committee member of Higher Education Evaluating & Accreditation Council of Taiwan, the Council member of the 10th Optical Engineering Society of ROC, and the Convener in the area of Electronics and Information for the Conventional Industry Technology Development Project in the Bureau of Industry, Ministry of Economics, ROC. He has also served as Project Instructors of the National Programs in the nano-science and nano- technology and the renewable energy (solar energy).

Session D1-W1-T3: **New Green Energy/Environment/Sustainability, Intelligent/Electric Vehicle**

Fabrication of Printable Organic Photovoltaics,

One Step Closer to Commercialization

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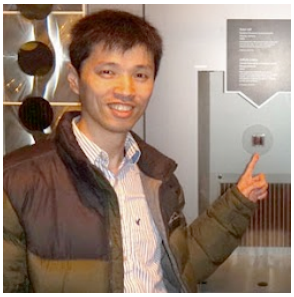
ABSTRACT

In this presentation, I will report the progress in the development of printable organic photovoltaics at National Research Council Canada. The efficiency of the polymer based heterojunction solar cells have been raising up to 8-9% which is almost comparable to the amorphous Si based solar cells. We developed the conjugated polymers and the producing technologies at NRC and reached the efficiency of 8.1% with 1.0 cm^2 active area of organic photovoltaic cell that is among the best in the world. We also demonstrated that the inverted organic photovoltaic cells performed an outstanding air-stability. Excellent stability of the inverted OPV cell has shown a great potential that inverted OPV cells can be produced using low-cost fabrication techniques, such as high speed, roll-to-roll printing technology for commercial product soon.

BIOGRAPHY



Dr. Ta-Ya Chu was born in Taiwan in 1974. He received his Ph.D. degree in Electrophysics from the National Chiao-Tung Universiy, Hsinchu, in 2006. Under the supervision of Professor Fred Chen, he developed a novel high efficient inverted bottom-emission organic light-emitting device (OLED). He was awarded scholarship as the most valuable researches by Chunghwa Picture Tubes, Ltd. in two consecutive years.

At the end of 2006, he joined Samsung SDI (Korea) as a Senior Engineer for the research and development of OLEDs mass production. After two years, he moved to Ottawa in Canada to service as a Research Officer at the National Research Council Canada (NRC) and expanded his research filed from the small molecular based to the polymer based organic electronics. He has been working on the development of organic photovoltaics at NRC since September 2008. He has contributed to more than thirty publications in

the fields of organic electronics and ten of them were published in *Appl. Phys. Lett.* One of his works published in *J. Am. Chem. Soc.* (v133, p4250, 2011) have been cited more than hundred times within one year.

Dr. Chu received the Outstanding Research Achievement Award by NRC in 2011. He has been invited to service as the member of International Scientific Committee for the world's biggest photovoltaic conference, EU PVSEC, in 2011 and 2012.

Session D1-W1-T3: **New Green Energy/Environment/Sustainability, Intelligent/Electric Vehicle**

Haibo Zeng, PhD

Assistant Professor, Department of Electrical and Computer Engineering, McGill University

Session D1-W1-T3: New Green Energy/Environment/Sustainability, Intelligent/Electric Vehicle

Fuel ethanol production: technology and process development

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ABSTRACT

Global warming is linked to the emission of green house gases (GHG). Carbon dioxide, one of the GHG, is mostly resulting from burning fossil fuel. Many measures including policies and technologies have thus been proposed or developed to reduce GHG emission. One of the technologies is to utilize renewable resources as feedstocks for energy production. In this presentation, fermentation technology specific to fuel alcohol production will be reviewed, and the latest very-high-gravity (VHG) ethanol fermentation processes developed in our laboratories will be highlighted.

VHG ethanol fermentation is a specific batch fermentation technique featuring high initial feedstock loading (i.e., glucose concentration greater than 250 g/L). A high feedstock loading translates to high ethanol production per batch, resulting in a substantial increase in annual ethanol productivity and profit gain. Biologically, high glucose feed adversely imposes osmotic stress to yeast, resulting in an extended lag phase. As fermentation proceeds, ethanol accumulated in the fermenter inhibits yeast propagation, leading to sluggish fermentation and incomplete glucose utilization. We have developed various novel VHG fermentation strategies to overcome the above-mentioned problems. These strategies include redox potential-controlled fermentation and CO_2-based feeding approaches during VHG ethanol production.

During the presentation, the correlation between yeast growth, ethanol production and fermentation redox potential will be firstly described[1]. Applications of redox potential to improve ethanol production are then followed[2,3,4] along with the selection of optimal VHG fermentation conditions using operating diagrams[5]. A VHG ethanol production process model was developed to evaluate among various redox potential-controlled processes[6]. During ethanol fermentation by yeast, CO_2 is also liberated. Understanding CO_2 liberation pattern will also provide in depth information about VHG ethanol fermentation.

1. Y.-H. Lin, W. Chien and K. Duan "Correlations between reduction-oxidation potential profiles and growth patterns of *Saccharomyces cerevisiae* during very-high-gravity fermentation", Process Biochemistry, 45(5):765-770, 2010.
2. C. Liu, Y.-H. Lin and F. Bai "Development of redox potential-controlled schemes for very-high-gravity fermentation", J Biotechnology, 153(1-2):42-47, 2011.
3. C. Liu, Y.-H. Lin and F. Bai "Ageing vessel design and optimization for continuous very-high-gravity ethanol fermentation processes", Process Biochemistry, 47(1):57-61, 2012.
4. S. Feng, S. Srinivasan and Y.-H. Lin "Redox potential-driven repeated batch ethanol fermentation under very-high-gravity conditions", Process Biochemistry, 47(3):523-527, 2012.

5. C. Liu, Y.-H. Lin and F. Bai "A kinetic growth model for *Saccharomyces cerevisiae* grown under redox potential-controlled very-high-gravity environment", Biochemical Engineering J, 56(1-2):63-68, 2011.
6. F. Yu and Y.-H. Lin "Techno-economic evaluation of redox potential-controlled ethanol fermentation processes", J Taiwan Institute of Chemical Engineers, in press, 2012.

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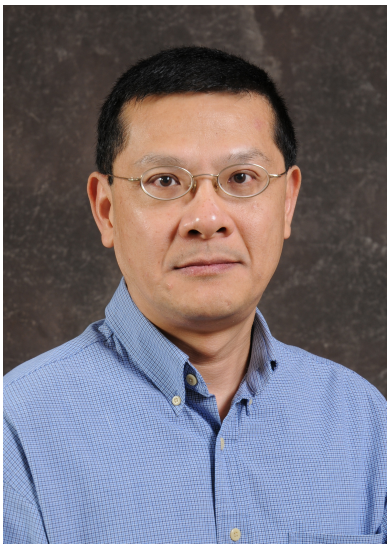

Dr. Yen-Han Lin was born and raised in Taiwan. He obtained his B.Sc. and M.Sc. degrees from the Department of Chemical Engineering, National Taiwan University of Science and Technology, and Ph.D. from Rensselaer Polytechnic Institute, New York, USA. He is a registered Professional Engineer in the Province of Saskatchewan, Canada. Currently, he is a Professor in the Department of Chemical and Biological Engineering, University of Saskatchewan, Saskatoon, SK, Canada. He has many years of experience in biochemical engineering centering in fermentation technology, bioprocess development, and fuel alcohol production. For more information, please visit his web page at homepage.usask.ca/~yel360.

*Session : **D1-W2-T3:*** **Medicine, Public Health, Biomedical Science and Engineering**

Session Organizer & Chair

Peter P. Liu, PhD

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BIOGRAPHY

Peter P. Liu, MD, FRCPC

Scientific Director, University of Ottawa Heart Institute
Professor of Medicine, University of Ottawa
Professor of Medicine & Physiology, Peter Munk Cardiac Centre, University of Toronto
President of International Society of Heart Failure of World Heart Federation

Dr. Liu graduated from the University of Toronto Faculty of Medicine. During his cardiology training, he also pursued a post-doctoral fellowship in cardiovascular imaging and immunology at the Massachusetts General Hospital of Harvard Medical School, and clinical epidemiology at McMaster University. In 1985 he joined the Division of Cardiology at the Toronto General Hospital, University of Toronto. Since 1999, he has been the Heart & Stroke/Polo Chair Professor at the University Health Network, and serves as the inaugural Director of the Heart & Stroke/Richard Lewar Centre of Excellence in Cardiovascular Research at the University of Toronto. Since 2005, he was the Scientific Director at CIHR's Institute of Circulatory & Respiratory Health, the major federal funding agency that supports biomedical research in Canada. At CIHR, he designed a number of innovative research programs and leveraged funding for several major research networks and consortia across the country and internationally. He served on the executive committee and provided research leadership for the Canadian Heart Health Strategy, Canadian Lung Health Framework, and National Sodium Reduction Strategies with the federal and provincial governments. Since this past July, Dr. Liu has also assume the role of Scientific Director of the University of Ottawa Heart Institute, a prestigious institution that is a leader in personalized medicine and imaging. He will be working with members and stakeholders to enhance further the excellence and global impact of

research and innovation of the Ottawa Heart Institute.

Dr. Liu focuses his own research on the pathophysiology and clinical outcomes of heart failure from bench to bedside. His team has elucidated the role of inflammation in changing heart structure and function, and potential novel treatment targets in heart failure. His laboratory has also identified how viruses and bacteria can accelerate heart failure and coronary artery disease, and is developing novel vaccines to prevent these complications. With support from Genome Canada, CIHR group and team programs, and Ontario Research Global Leadership Fund – he is also pursuing novel biomarkers and therapeutic targets for early cardiovascular disease identification and intervention. He has published over 320 peer reviewed articles in high impact journals, and his work has been cited over 20,000 times in the literature. In addition, he co-chaired a series of Canadian Cardiovascular Society Consensus Guideline Recommendations for heart failure care.

He is the recipient of numerous awards in recognition of his scientific contributions and accomplishments including the Rick Gallop Research Award Recognizing Research Excellence from the Heart & Stroke Foundation of Ontario (2003), the Research Achievement Award from the Canadian Cardiovascular Society (CCS, 2003), Visiting Research Professor Award from the Royal College of Physicians and Surgeons (2005), Extramural Award of Merit from the American College of Cardiology (2005), the Jean Davignon Cardiometabolic Award (2008), and Lifetime Achievement Award from CCS (2011), and Distinguished Lecture Award of the ICRH at CIHR (2012). He has served as the scientific program chair for the Canadian Cardiovascular Society, Heart Failure Society of America, International Human Proteomic Organization, and World Heart Federation.

Currently he is the Director of the National C-CHANGE Initiative, harmonizing and integrating cardiovascular preventive guidelines for both the professional and patients, and develops strategies for implementation. This just has been adopted as the national standards across all provinces in Canada for implementation by the Ministries of Health. He is also President of the International Society of Heart Failure of the World Heart Federation (WHF), and also serves on the Research and Policy Committees of WHF, coordinating global fight against heart disease and promoting its prevention.

*Session : **D1-W2-T3:*** **Medicine, Public Health, Biomedical Science and Engineering**

Engineering Liver on Lab Chip

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ABSTRACT

The formation, homeostasis, and regeneration of tissues, i.e., tissue dynamics, is the result of intricate temporal and spatial coordination of numerous individual cell fate processes, each of which is regulated not only by cell-autonomous processes but also by extracellular microenvironmental stimuli. Hence, the ability to approach tissue-mimetic reconstruction and manipulate the cellular microenvironment to facilitate cell-cell interactions, cell- extracellular-matrix interactions, and soluble stimuli is essential to maintain cell/tissue physiological functions and to engineer tissues for applications such as drug screening and regenerative medicine. In this talk, the research progress of our liver on Lab chip, which takes advantage of the electrokinetic force to reconstruct lobule-mimetic tissue from individual cell level, will be presented.

Hepatocytes, the main cell type in liver, are responsible for metabolic transformation of drugs as well as many other liver functions. They will rapidly lose their liver-specific functions when cultured by standard methods. A likely key requirement for maintaining liver functions *in vitro* is recreating the *in-vivo* microenvironment of hepatocytes, which includes signaling mechanisms mediated by cell-cell and cell-matrix interactions, soluble factors, and mechanical forces. Thus, one of significances in this liver-labchip research is the lobule-mimetic reconstruction of heterogeneous cells. The liver contains over a million classical liver lobules. Each lobule is morphologically shaped like a hexagon plate which is filled with cords of liver parenchyma cells, hepatocytes, radiating from the central vein and separated by sinusoid-like vascular endothelial lining cells. This unique radiate structure ensures the high metabolism reactions exchanging from blood to hepatocytes.

In this talk, our recent research development focusing on optoelectronic manipulation will be presented, too. An organic photoconductive material has been recently developed in our group to approach the light-driven optoelectronic forces. The cell manipulation and the microfluidic driving are developed via these light-driven optoelectronic forces. The further extending application towards Liver Lab Chip is under development in our group.

BIOGRAPHY

Cheng-Hsien Liu was born in Taiwan. He received his Ph.D. degree in mechanical engineering from Stanford University in 2000. For former degrees, Dr. Liu received the B.S. degree in power mechanical engineering from the National Tsing Hua University, Taiwan, R.O.C., in 1987, the M.S. degree in mechanical engineering from the Lehigh University, Bethlehem, P.A., in 1992, the M.S. degree in electrical engineering from Stanford University, CA, in 1995.

He presently is a professor in the Power Mechanical Engineering Department at National Tsing Hua University. Since Autumn 2000, he had been with National Tsing-Hua University, Taiwan, Republic of China, as an Assistant Professor in the Power Mechanical Engineering Department. In 1999-2000, he worked as a senior Electrical Engineer at Halo Data Devices Inc., San Jose, where he focused on the development of micro-drives for portable information storage applications. While at Stanford, he worked with Dr. Kenny at Stanford Microstructures and Sensors Laboratory and focused his Ph.D. work on high-performance tunneling MEMS sensors. Dr. Liu currently oversees graduate students in the Micro-Systems and Control Laboratory, whose research activities cover a variety of areas such as biomimetic array chip for bio-object manipulation targeting for tissue engineering/ drug screening applications, Bio Lab on a chip, Micro Total Analysis Systems, Liver on Lab Chip, Biomedical Instruments, microphotonics and microsystem robust control.

Dr. Liu has been the members of American Society of Mechanical Engineers, IEEE, The International Society for Optical Engineering, American Chemical Society, and Optical Society of America. Dr. Liu served as the vice chairman of Power Mechanical Engineering Department, National Tsing Hua University, Taiwan from 2006 to 2007. He received A. Kobayashi Young Investigator Award in Experimental Science from International Conference on Computational and Experimental Engineering and Sciences in 2000, the award of Outstanding Chemical Engineering Article of the Year 2010, the award for University Special Talents from National Science Council, the Academic Excellent Award from National Tsing Hua University (2006~2012), Outstanding Research Program Award from National Science and Technology Program in the Biomedical field (2012), 2011 Outstanding Research Award from National Science Council (NSC) in 2012.

***Session : D1-W2-T3:* Medicine, Public Health, Biomedical Science and Engineering**

Targeting Tumor Microenvironment for Cancer Detection and Therapeutic Efficacy Evaluation

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ABSTRACT
Tumor microenvironment plays a critical role in cancer angiogenesis, proliferation and metastasis. The unique tumor microenvironment is comprised of various cancer-related biomarkers, which are generally absent in normal tissues. Molecular imaging of the biomarkers in tumor microenvironment can provide accurate earlier detection and diagnosis of malignant tumors and non-invasive evaluation of anticancer therapeutic efficacy. Magnetic resonance imaging (MRI) is a powerful clinical imaging modality with high spatial resolution and no ionization radiation. MRI provides both anatomical and physiological information of soft tissues. Contrast enhanced MRI can produce high-resolution image contrast between diseased tissue and normal tissue and can measure the physiological properties of tumor tissue. We have designed and developed novel peptide targeted MRI contrast agents for detecting a cancer-related biomarker expressed in the extracellular matrix of malignant tumors, and polydisulfide-based biodegradable macromolecular MRI contrast agents for evaluating tumor angiogenesis and the efficacy of cancer therapies. The effectiveness of these novel MRI contrast agents has been validated in animal tumor models. The targeted contrast agents specifically bind to the biomarker in tumor extracellular matrix, resulting in strong and prolonged contrast enhancement in the tumor tissue, not in normal tissues. The biodegradable macromolecular contrast agents are effective for characterizing tumor angiogenesis and non-invasive evaluation of tumor response to cancer therapies, including angiogenesis therapy, with DCE-MRI. MRI with these novel MRI contrast agents is promising for earlier and accurate cancer detection and for non-invasive and timely assessment of therapeutic efficacy in cancer treatment.

BIOGRAPHY

Dr. Zheng-Rong Lu is M. Frank and Margaret Domiter Rudy Professor of Biomedical Engineering at the Department of Biomedical Engineering, Case School of Engineering, Case Western Reserve University. Dr. Lu received his B.S. and M.S. in Chemistry from Lanzhou University, and Ph.D. in Chemistry from

Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences at Lanzhou, China. Dr. Lu was an Associate Professor of Chemistry in 1992 and Professor of Chemistry in 1994 at Wuhan University in China. In 2002, Dr. Lu was appointed to Assistant Professor in the Department of Pharmaceutics and Pharmaceutical Chemistry at the University of Utah. Dr. Lu was promoted to tenured Associate Professor in 2006. Dr. Lu's research involves molecular imaging, MRI contrast agents, image-guided photodynamic therapy, non-invasive methods for cancer treatment assessment, polymeric drug delivery systems for retinal diseases and multifunctional delivery systems for nucleic acids. He has over 100 peer-reviewed scientific publications, five book chapters and 70 abstracts and four US patents. He is a Principal Investigator of major grants from the NIH. Dr. Lu serves on the scientific advisory board of Pharmaceutical Research and Molecular Pharmaceutics. Currently, Dr. Lu serves as a member of the NIH Clinical Molecular Imaging and Probe Development Study Section.

*Session : **D1-W2-T3:*** **Medicine, Public Health, Biomedical Science and Engineering**

Revealing Biological Contexts in Signed Molecular Network

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ABSTRACT

Networks have become a key approach to understanding biological systems. Many biological networks are signed undirected networks, such as gene co-expression networks or genetic interaction networks, which consist of both positive and negative links. However, most of the previous studies either ignore the signs of links or focus on only one type of them. Considering the intrinsic differences between positive and negative links, we speculated that the interconnections among positive and negative links should show distinct features, reflecting their underlying molecular mechanisms. We have defined four different measures of link clustering coefficients to explore the topological structures of signed undirected networks. The results showed that signed molecular networks exhibited distinct structural characteristics with respect to corresponding unsigned networks. Positive links are more adhesive and tend to cluster together, while negative links are more dispersive and usually behave like bridges between positive clusters. Applying these new measures to gene co-expression networks and genetic interaction networks allow us to distinguish links with different biological contexts and identify functional modules with their inter-relationships revealed.

BIOGRAPHY

Hsuan-Cheng Huang received his B.A., M.A., and Ph.D. degrees in physics from National Taiwan University in 1992, 1994 and 1998, respectively. He was engaged in experimental high-energy physics research at Taiwan and at High Energy Accelerator Research Organization, Japan, and awarded NSC Distinguished Postdoctoral Fellowship in 2003. Encouraged by the emerging of systems biology, Dr. Huang joined National Yang-Ming University in 2004 and is currently a Professor in the Institute of Biomedical Informatics and Center for Systems and Synthetic Biology. In 2007, he received the NSC Wu Ta-You Memorial Award, an honor for excellent young investigators in Taiwan. He also serves as an Associate Editor and Deputy Section Editor of BMC Systems Biology and a Board Member in Taiwan Society for Bioinformatics and Systems Biology. His research interests include bioinformatics, computational and systems biology, and network biology. Currently, Dr. Huang endeavors his research efforts to computational

analysis and modeling of biological networks, and applies them to unravel molecular mechanisms of cancer cell response, microRNA regulation, as well as essential genes in microorganisms.

*Session : **D1-W2-T3:*** **Medicine, Public Health, Biomedical Science and Engineering**

Bone Marrow Tissue Engineering

J.H. David Wu, PhD (吳政惠教授**)**

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ABSTRACT

Bone marrow is the hematopoietic tissue and a primary lymphoid organ. Its intricate, three-dimensional architecture facilitates cell-cell and cell-matrix interactions and provides a microenvironment supporting self-renewal and multilineal differentiation of the hematopoietic stem cells. We have developed an *ex vivo* bone marrow bioreactor, which supports three-dimensional growth configuration with high cell density and intimate physical contact between hematopoietic and stromal cells. In contrast to the conventional culture system, the 3-D culture system supports multilineal hematopoiesis, including the development of myeloid, erythroid, and lymphoid lineages. The bone marrow model thus provides a more physiologically meaningful approach for delineating the hematopoietic microenvironment important for stem cell self-renewal and differentiation, potentially leading to novel bone marrow technologies. One important application is to use the 3-D bone marrow culture system for drug discovery and testing.

BIOGRAPHY

Professor Wu was born in Taiwan. He received a BS and MS degrees in Biochemical Science and Technology (formerly known as Agricultural Chemistry) from the National Taiwan University in 1976 and 1980, respectively. He earned his MS and PhD degrees in Biochemical Engineering from MIT in 1982 and 1987, respectively.

He is a *Professor* of Chemical Engineering and of Biomedical Engineering at the University of Rochester in Rochester, NY. He is a leader in studying the biomass-degrading enzyme system of *Clostridium thermocellum*, a key bacterium in "Consolidated Processing" leading to bio-ethanol production. He directs a DOE-funded consortium to develop biomolecular strategies toward biofuel production employing this bacterium. His work has led to the discoveries of the modular structure of the now well-known cellulosomal scaffolding protein, the unique Family 48 of glycosyl hydrolases, the novel 3-D structure of the cellulosomal dockerin, and the first cellulase transcriptional regulator and operon in *C. thermocellum*. At the University of Rochester, he developed a novel 3-D bone marrow culture system conducive to multi-lineal

blood cell differentiation. The 3-D culture system has been used as a model in three NIH- or BARDA-funded centers on developing countermeasures against bioterrorism, including vaccines and anti-radiation drugs. His research group continues to investigate the cellulosome mechanism, and transcription regulation concerning biomass degradation and bioethanol fermentation at the genome scale as well as molecular events governing blood cell formation.

Professor Wu is a Fellow of *the American Academy of Microbiology (AAM)*, a Fellow of *the Society for Industrial Microbiology (SIM)*, and a Fellow of *the American Institute for Medical and Biological Engineering*. He is a recipient of the SIM Waksman Outstanding Educator Award. He has twice won the awards for excellence in teaching from the Undergraduate Engineering Council of the University of Rochester. He served as an editor for *Industrial Biotechnology* and was on the editorial boards of *the Journal of Bioscience and Bioengineering* and *Applied Microbiology and Biotechnology.* He is also an editor for *the ASM Manual of Industrial Microbiology and Biotechnology* (Second Edition). He served as the ASM Div. O Chair in 1997/1998 and was the Divisional Lecturer in 2002. He has served as a reviewer for various federal programs on bioenergy or tissue engineering, including those of DOE, DOE-GTL, NSF, NIH, and NREL. He also served as a Scientific Advisor to NYSTAR (the New York State Foundation for Science, Technology & Innovation), and a Program Co-Chair for the SIM Annual Meeting.

***Session : D1-W3-T3:* New Materials Science and Engineering, Nanotechnology**

Session Organizer & Chair

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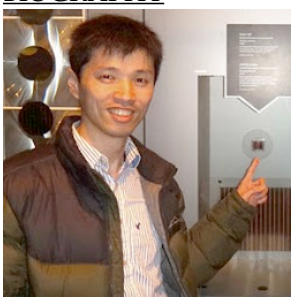
BIOGRAPHY



Dr. Ta-Ya Chu was born in Taiwan in 1974. He received his Ph.D. degree in Electrophysics from the National Chiao-Tung Universiy, Hsinchu, in 2006. Under the supervision of Professor Fred Chen, he developed a novel high efficient inverted bottom-emission organic light-emitting device (OLED). He was awarded scholarship as the most valuable researches by Chunghwa Picture Tubes, Ltd. in two consecutive years.

At the end of 2006, he joined Samsung SDI (Korea) as a Senior Engineer for the research and development of OLEDs mass production. After two years, he moved to Ottawa in Canada to service as a Research Officer at the National Research Council Canada (NRC) and expanded his research filed from the small molecular based to the polymer based organic electronics. He has been working on the development of organic photovoltaics at NRC since September 2008. He has contributed to more than thirty publications in the fields of organic electronics and ten of them were published in *Appl. Phys. Lett.* One of his works published in *J. Am. Chem. Soc.* (v133, p4250, 2011) have been cited more than hundred times within one year.

Dr. Chu received the Outstanding Research Achievement Award by NRC in 2011. He has been invited to service as the member of International Scientific Committee for the world's biggest photovoltaic conference, EU PVSEC, in 2011 and 2012.

*Session : **D1-W3-T3:*** **New Materials Science and Engineering, Nanotechnology**

Electrically Conductive Bacterial Nanowires: Fundamentals and Applications

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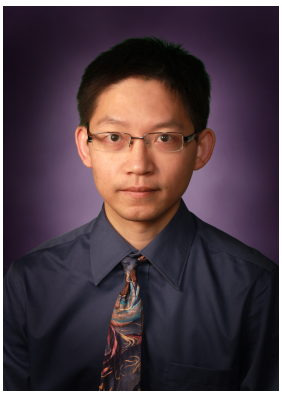
ABSTRACT

Electron transfer is fundamental to metabolism of biological systems. Microorganisms extract electrons by oxidizing a wide range of electron sources and transport them to electron receptors. Extracellular electron transfer takes place in dissimilatory metal-reducing bacteria (DMRB) when electron acceptors are not soluble and not accessible to intracellular enzymes. Various mechanisms of extracellular electron transfer have been reported for DMRB. Recent reports suggested that extracellular electron transfer may be facilitated by conductive pilus-like appendages called bacterial nanowires. This function of bacterial nanowires implies many applications in microbial fuel cells, biosensors, bionanoelectronics and conductive biomimetic nanomaterials. However there is no evidence presented to verify electron transport along the length direction of bacterial nanowires. In addition, understanding of mechanical properties of such conductive bacterial nanowires is also of significance to abovementioned applications. Here we apply multiple advanced nanotechnologies to study electrical and mechanical properties of such conductive bacterial nanowires. Our data establish bacterial nanowires as a viable strategy of extracellular electron transport, with broad implications for microbial fuel cells (MFCs), biosensors, solar cells, bionanoelectronics, environmental remediation and water treatment.

BIOGRAPHY



Jun Yang received his Bachelor degree in 1998 and Master degree in 2001 from Beijing Institute of Technology, and Ph.D. degree in Mechanical Engineering from University of Alberta in 2004.

He completed his postdoctoral training in Mechanical/Biomedical Engineering from 2004 to 2005 at Georgia Institute of Technology. In 2005, he joined The University of Western Ontario. Now he is an associate professor in Department of Mechanical and Materials Engineering, and Biomedical Engineering Program, Western University (The University of Western Ontario). He is also an honorary research scientist of Surface Science Western at Western University. Dr. Yang's research interests include Green Energy/Technologies, MEMS/NEMS, Nanotechnology, AFM, Lab-on-a-chip, Nanomaterials, Biophysics and Surface Science.

Dr. Yang was a recipient of the 2006 PetroCanada Young Innovators Award, 2009 Early Researcher Award, and 2012 Faculty Scholar Award.

Session : D1-W3-T3: **New Materials Science and Engineering, Nanotechnology**

Nanomanufacturing: Manipulation and Characterization of Nanomaterials inside SEM

Yu Sun, PhD (孫鈺 教授**)**

Canada Research Chair in Micro and Nano Engineering Systems
Associate Professor, Department of Mechanical and Industrial Engineering
The University of Toronto

*Session : **D1-W3-T3:*** **New Materials Science and Engineering, Nanotechnology**

Huey-Liang Hwang, PhD (黃惠良 教授**)**

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ABSTRACT

In this talk I will explain the start-up of my career with photovoltaics(PV) since 1972 in Brown University, and over the years, how I established my academic activities in different areas of solar cells and how are they linked to the PV developments in Taiwan. Also, I will elaborate my research and developments on GAMES (Giant Area Microelectronics including solar cells, Medical Imaging,and Touch panels, etc.)using the PV concepts. The Color PV Systems installed in China pavalion of 2010 Shanghai EXPO highlight this developments. Therefore, starting from photovoltaics, I started business in different areas in Hsinchu Science Park to realize the concepts from Innovations to Incubations, which led to their successful commercializations. In the last part, I will brief the current research activities both in Innovation Centers located in Shanghai, Hsinchu and Novosibirsk, and research like SPA novel structures for Si thin film solar cells, the initiation of grating surface structures and advanced passivations in crystalline Si cells for improvement in their energy conversion efficiencies. Finally, as the pioneer of CIGS solar cells, I will describe our activities how to overcome the difficulties encountered in the industrialization of this promising thin film PV industry.

BIOGRAPHY

Huey-Liang Hwang (黃惠良) was born in Mainland China in 1946. He received the B.S.E. and M.S.E. degree in Electrical Engineering from National Cheng Kung University, Tainan, Taiwan, ROC in 1969 and 1971, respectively. In 1976 he was awarded the Ph.D degree in Solar Cells from Brown University, Providence R.I., USA. Since then he joined the faculty of the Electrical Engineering Department of National Tsing Hua University, Hsin-chu,Taiwan. His research areas include Giant Area Microelectronics (solar cells, displays, medical imaging devices and etc.) and ULSI. He was a pioneer researcher in Ternary Chalcopyrite Semiconductors and he has published more than 440 papers in scientific journals and conference proceedings. He was the Conference Chairmen of the first International Symposium on Electronic Devices and Materials(1980), Non-stoichiometry in Semiconductors(1991), 7th International Conference on

Solid Films and Surfaces (1994) and 12th International Conference on Ternary and Multinary Compounds(2000).

Dr. Hwang was elected Fellow of IEEE in 1994 for "contributions in fundamental understanding of photovoltaic and semiconductor materials and devices", he was elected Fellow of National Science Council of Republic of China for his distiguished research, in 1996 he was also elected Fellow of American Vacuum Society in 1998 for "contributions for pioneering and sysmatical work on thin film photovoltaic materials and the fundamental understanding of hydrogenated Si films". Dr. Hwang was elected Member of Asia Pacific Academy of Materials (APAM) in 1998, and in 2011 he was elected President of APAM.

Dr. Hwang was the founders of the Electrical Engineering Departments of National Tsing Hua University and National Chung Hsing University, Tze-chiang Foundation of Science and Technology (the most re-nowned high tech engineers training center in Taiwan), and Sinonar Corp. (the 1st Amorphous Si Solar Cell manufacturer in Taiwan) 、Cando Corp. (Cando is the world front ranking manufacturer in Color Filter & touch panels)、IDTI (Integrated Digital Technology Inc, the 1st LCD Design House in Taiwan) , Lofsolar (the world uniue color solar cell corp.) all of the four companies are located in Hsin-Chu Science Industrial Park. He was the Visiting Professors of the University of Stuttgart, University of Tokyo, Danish Technical University, Stanford University and Hong Kong University of Science and Technology (HKUST). He was nominated as the 1st Y.Z. Hsu Scientific (the 1st Chair Professor of Nano Science in Taiwan) since 2002, and Tsing Hua Chair Professor of Electrical Engineering and Computer Science since 2003. Since Feburary 2012 he was appointed as the Star River Chair Professor and Director of Photovoltaic Research Center of Shanghai Jiaotong University.

Session : D1-W4-T3: **Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)**

Session Organizer & Chair

Li-Chun Wang, PhD (王蒞君 教授**)**

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BIOGRAPHY

Li-Chun Wang (M'96 – SM'06 – F'11) received the B.S. degree from National Chiao Tung University, Taiwan, R. O. C. in 1986, the M.S. degree from National Taiwan University in 1988, and the Ms. Sci. and Ph. D. degrees from the Georgia Institute of Technology , Atlanta, in 1995, and 1996, respectively, all in electrical engineering.

From 1990 to 1992, he was with the Telecommunications Laboratories of the Ministry of Transportations and Communications in Taiwan (currently the Telecom Labs of Chunghwa Telecom Co.). In 1995, he was affiliated with Bell Northern Research of Northern Telecom, Inc., Richardson, TX. From 1996 to 2000, he was with AT&T Laboratories, where he was a Senior Technical Staff Member in the Wireless Communications Research Department. In August 2000, he has joined the Department of Electrical Engineering of National Chiao Tung University in Taiwan and has been promoted to the full professor since 2005.

His current research interests are in the areas of radio resource management and cross-layer optimization techniques for wireless systems, heterogeneous wireless network design, and cloud computing for mobile applications.

He was elected to the IEEE Fellow grade in 2011 for his contributions in cellular architectures and radio resource management in wireless net- works. Dr. Wang was a co-recipient (with Gordon L. St¨uber and Chin-Tau Lea) of the 1997 IEEE Jack Neubauer Best Paper Award for his paper "Architecture Design,Frequency Planning, and Performance Analysis for a Microcell/Macrocell Overlaying System," IEEE Transactions on Vehicular Technology, vol. 46, no. 4, pp. 836-848, 1997. He has published over 180 journal and international conference papers. He served as an Associate Editor for the IEEE Trans. on Wireless Communications from 2001 to 2005, the Guest Editor of Special Issue on "Mobile Computing and Networking" for IEEE Journal on Selected Areas in Communications in 2005 and on "Radio Resource Manage-

ment and Protocol Engineering in Future IEEE Broadband Networks" for IEEE Wireless Communications Magazine in 2006. He is holding nine US patents.

Session : D1-W4-T3: **Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)**

Digital Image Forensics: There is More to a Picture Than Meets the Eye

Siwei Lyu, PhD (吕思伟)

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ABSTRACT

The past decade has witnessed remarkable advances in digital image processing and computational photography, resulting in sophisticated image-editing software systems. the ease of digital image manipulation has also posed many new challenges. In particular, digital images have become more vulnerable to malicious tampering compared to their non-digital counterparts. This circumstance galvanize rapid developments of research in digital image forensics.

In this talk, I will focus on my recent works in detecting several types of digital image tampering operations, including:

- region duplication, where regions in the same image is copied, transformed, and pasted to new locations to conceal the original image contents;
- image splicing, where regions from an image is pasted into a different image;
- photographic or photorealistic, where the task is to differentiate a real photograph from an image made from computer graphics software.

The unifying theme of these techniques is to use statistical analysis of normal natural photographic image signals to show abnormalities of tampered images. I will describe the mathematical and algorithmic aspects of these methods, and demonstrate their effectiveness on realistic image forgeries.

BIOGRAPHY

Siwei Lyu was born in Shenyang, Liaoning Province, China, in 1973. He received his B.S. degree in information science from Peking University, China, in 1997, and his M.S. degree in computer science from Peking University, China, in 2000. He received his Ph.D. degree in computer science from Dartmouth College, Hanover, New Hampshire, USA in 2005.

From 1998 to 2000, he worked at the Founder Research and Development Center (Beijing, China) as a Software Engineer. From 2000 to 2001, he worked at Microsoft Research Asia (then Microsoft Research China) as an Assistant Researcher. From 2005 to 2008, he was a Post-Doctoral Research Associate at the Howard Hughes Medical Institute and the Center for Neural Science of New York University. Starting in 2008, he holds the position of Assistant Professor at the Computer Science Department of University at Albany, State University of New York, Albany, New York, USA. His scientific expertise include natural image statistics, computational visual neural science, digital image forensics, machine learning, and computer vision.

Prof. Lyu is a member of ACM and IEEE Signal Processing Society. He is the recipient of the Alumni Thesis Award of Dartmouth College in 2005, IEEE Signal Processing Society Best Paper Award in 2010, and the US National Science Foundation Early Faculty CAREER Award in 2010. He has authored and contributed to two books on digital image forensics, and held two U.S. and one E.U. patents. He has published more than 30 conference and journal articles in the research fields of natural image statistics, computational visual neural science, digital image forensics, machine learning and computer vision.

Session : D1-W4-T3: **Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)**

Interactive Video Object Cutout from Live Sequences

Minglun Gong

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ABSTRACT

Video object cutout aims to extract objects of interest from their surrounding backgrounds in input video sequences. It is a key process in many video processing applications, such as video surveillance and video editing. Over the years there have been significant amount of efforts on this topic, nevertheless there still lacks a simple yet effective algorithm that can process live videos of objects with fuzzy boundaries captured by freely moving cameras. This talk presents an algorithm achieving this goal. The key idea is to train and maintain two competing classifiers at each pixel location, which model local color distributions for foreground and background, respectively. As a result, our algorithm can deal with a variety of videos with complex backgrounds and freely moving cameras with minimum user interactions. Areas with fuzzy boundaries, such as hair and feather, are further processed using a novel matting technique, which is designed to extract the alpha mattes in 3D color space. Finally, by introducing novel acceleration techniques and by exploiting the parallel structure of the algorithm, realtime processing speed is achieved for VGA-sized videos.

BIOGRAPHY

Born in Harbin China, Minglun Gong obtained his B.Engr. from the Harbin Engineering University in 1994, his M.Sc. from the Tsinghua University in 1997, and his Ph.D. in computer science from the University of Alberta in 2003. After graduation, he was a faculty member at the Laurentian University for four years before joined the Memorial University (St. John's, Canada), where he currently works as an Associate Professor. He is also an Adjunct Professor at the University of Alberta (Edmonton, Canada) and a Visiting Professor at Shenzhen Institute of Advance Technology (Shenzhen, China).

Dr. Gong's research interests cover various topics in the broad area of visual computing (including computer graphics, computer vision, visualization, image processing, and pattern recognition). So far, he has published over 70 referred technical papers in refereed journals and conference proceedings and submitted 2 patent applications. He has served as program committee member for top-tier conferences, such as

ICCV and CVPR, and reviewer for prestigious journals including IEEE TPAMI and IJCV. He was the recipient of the Izaak Walton Killam Memorial Award and the CFI New Opportunity Award.

Session : D1-W4-T3: Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)

Trends and Challenges in Supercomputing

Charng-Da Lu

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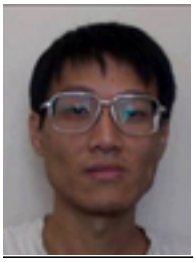
Abstract
In this talk I would like to share exciting technological development in modern high-performance computing (HPC), including multi-core, many-core, HPC in the cloud, graphics processing units (GPU), and other computational accelerators. I would also discuss challenges in building 100-1000X faster, "exascale" supercomputers, such as power consumption efficiency, applications and software scalability, hardware reliability, and R&D cost.

BIOGRAPHY



Charng-Da Lu obtained his PhD in Computer Science (with a concentration on High-Performance Computing) and MS in Mathematics from the University of Illinois at Urbana-Champaign in 2007. He then worked as a quantitative software developer in a New York financial firm until 2010. Since June 2010, he is a Computational Scientist at the Center for Computational Research at SUNY at Buffalo, focusing on design and implementation of application kernels, benchmarks, and performance measurement/analysis tools for the NSF-funded TeraGrid/XSEDE Technology Audit Service project.

Session : ***D2-W1-T1:*** **New Green Energy/Environment/Sustainability, Intelligent/Electric Vehicle**

Session Organizer & Chair

Yen-Han Lin

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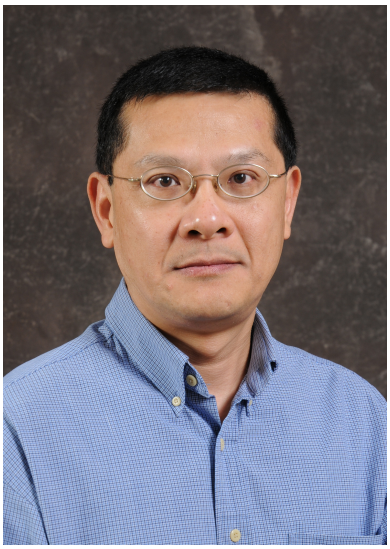
BIOGRAPHY



Dr. Yen-Han Lin was born and raised in Taiwan. He obtained his B.Sc. and M.Sc. degrees from the Department of Chemical Engineering, National Taiwan University of Science and Technology, and Ph.D. from Rensselaer Polytechnic Institute, New York, USA. He is a registered Professional Engineer in the Province of Saskatchewan, Canada. Currently, he is a Professor in the Department of Chemical and Biological Engineering, University of Saskatchewan, Saskatoon, SK, Canada. He has many years of experience in biochemical engineering centering in fermentation technology, bioprocess development, and fuel alcohol production. For more information, please visit his web page at homepage.usask.ca/~yel360.

Session : ***D2-W1-T1:*** **New Green Energy/Environment/Sustainability, Intelligent/Electric Vehicle**

Refining the sunshine: the sustainability of microalgal biofuels

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ABSTRACT

The sun is the ultimate source of energy for the mankind and the energy future of the globe will eventually rely on how efficient we can device machineries to upgrade solar energy to fuels that are convenient and economical to use. Microalgae, photosynthetic microorganisms that have superb photosynthetic efficiency and growth rate, have long been regarded as the most promising energy crops for solar energy capturing and CO_2 fixation. However, there are significant hurdles to overcome to make microalgal biofuels commercially viable. This talk aims to shed some light on this intriguing issue, which is closely related to some of the most compelling challenges concerning the future of the humankind: food, energy, and environment.

BIOGRAPHY

Dr. Christopher Q. Lan was born in China and immigrated to Canada in 1997. He obtained his PhD degree in Chemical Engineering from the Western University in 2001. Dr. Lan is currently working on three different fields: microalgae for biofuel production and CO_2 sequestration, recombinant protein expression and purification, personal cooling using vacuum desiccant cooling technology, and desalination using advanced membrane processes.

Dr. Lan joined the Department of Chemical and Biological Engineering, University of Ottawa as Assistant Professor in 2003 and was promoted to his current position in 2009. The positions he worked before joining the University of Ottawa include Postdoctoral Research Associate with the University of California at Davis, USA; Lead Fermentation Scientist with Rebus Biotechnology at Calgary, Canada; Visiting Scholar with the University of Hong Kong at Hong Kong, China; and Lecturer with the Huazhong University of Science and Technology at Wuhan China.

Session : ***D2-W1-T1:*** **New Green Energy/Environment/Sustainability, Intelligent/Electric Vehicle**

Zero-Energy Building and Building Energy Efficiency

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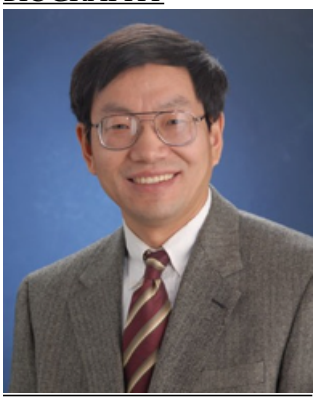
ABSTRACT

Residential and commercial buildings account for nearly 40% of U.S. energy consumption. Using commercially available, cost-effective technologies, building energy consumption could be reduced dramatically. In the past decade, building professionals have invested a lot of time and effort to develop means and methods to track and reduce the energy consumed by buildings. Such methods include energy auditing, energy management, commissioning, retro-commissioning, and numerous other energy conservation programs. Significant energy savings have been observed in a case study.

A zero-energy building is a building with zero net energy consumption. A zero energy building combines high levels of energy efficiency with renewable energy systems to annually return as much energy to the utility as it takes from the utility – resulting in a net-zero energy consumption for the building. The zero-energy design principle is becoming more promising and practical to adopt due to the increasing costs of fossil fuels and their negative impact on the environment. The Solar Decathlon is a biennial competition sponsored by the U.S. Department of Energy (DOE) and the National Renewable Energy Laboratory (NREL), aspiring to zero energy design. There are 20 teams of college and university students selected from around the world for each competition. Each team will uniquely design, build and operate an energy efficient, fully solar-powered home for this competition. Each home will utilize energy efficient technology and demonstrate that it will be powered entirely by the sun, and at the same time, does not have to sacrifice indoor comforts and aesthetics.

BIOGRAPHY



Dr. Xinlei Wang was born in Yiwu, Zhejiang Province, China on August 7, 1963. He received his B.S. and M.S. in Mechanical Engineering from Zhejiang University, Hangzhou, China, in 1984 and 1987, respectively. He received his second M.S. in Agricultural Engineering from the University of Saskatchewan, Saskatoon, Canada, in 1996. He received his Ph.D. in Agricultural Engineering from the University of Illinois at Urbana-Champaign in 2000.

He worked as a lecturer in the Department of Energy Engineering at Zhejiang University from 1987 to 1994. Prior to joining the University of Illinois at Urbana-Champaign in 2002, he worked as a senior development engineer for International Truck and Engine Corporation on diesel emission control in Melrose Park, Illinois. He has more than 90 publications in his research field and has two U.S. patents. He currently serves an Associate Editor for the *Transactions of the ASABE* and *Applied Engineering in Agriculture* in the American Society of Agricultural and Biological Engineers (ASABE). His current research interests include renewable energy, building energy efficiency, air quality, and emission control.

Dr. Wang is a member of the International Society of Automotive Engineers (SAE), the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE), the American Society of Agricultural and Biological Engineers (ASABE), and the American Society for Engineering Education (ASEE). He received the Everitt Award for Teaching Excellence from the College of Engineering at the University of Illinois at Urbana-Champaign in 2010, the Distinguished Service Award from ASHRAE in 2011, and the Faculty Award for Excellence in Teaching from the College of Agricultural, Consumer, and Environmental Sciences at the University of Illinois at Urbana-Champaign in 2012.

Session : ***D2-W1-T1:*** **New Green Energy/Environment/Sustainability, Intelligent/Electric Vehicle**

Combining Solid Oxide Fuel Cells and Compressed Air Energy Storage for Load-Following Power Production with Near-Zero CO_2 Emissions

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ABSTRACT

Solid oxide fuel cells (SOFCs) are a promising future technology which provides not only a more efficient way of generating electricity from fossil fuels than combustion cycles, but an inherently easier way of capturing CO_2 than using existing solvent-based methods. This is because SOFCs are oxygen conductors, rather than proton conductors, which prevents the mixing of nitrogen in the air with fuel waste (CO_2 and H_2O), making it much easier to capture the CO_2 by simply condensing the water from the fuel exhaust. As a result, SOFC-based processes could play a major role of significantly reducing CO_2 emissions from fossil-based power plants in the future.

However, for municipal electricity generation, the power produced must meet a constantly changing demand, which typically can experience wide swings across daily, weekly, and seasonal cycles. As a result, "base-load" power plants such as pulverized coal, nuclear energy, and natural-gas combined cycles which typically operate at a fixed rate throughout the day are typically supplemented with energy from natural-gas fired power plants which can provide "peaking" power (wide swings in power output in short periods of time) in order to respond to real changing demands. Unfortunately, natural-gas firing is a combustion-based process which produces CO_2 emissions.

While SOFC systems can produce electricity with essentially zero CO_2 emissions, they will typically only run at "base-load" levels. This means that even if these were implemented, natural-gas firing would still be required for peaking capabilities. However, we propose the integration of a SOFC system with compressed air energy storage (CAES) in which pressurized cathode exhaust (a waste stream) is used as the storage fluid. The SOFC/CAES is able to take advantage of certain synergies which improves upon existing systems using CAES to handle the peaking problem. As a result, the integrated SOFC/CAES system is able to provide peaking electricity from fossil fuels with nearly zero CO_2 emissions, meeting the changing demand at nearly all times over an entire year with minimal overproduction. This minimizes the amount of natural gas combustion that must take place. If widely implemented as a replacement to gas firing, the CO_2 emissions of the power sector as a whole can be reduced by an order of magnitude or more, and the amount of fossil fuels consumed can also be reduce significantly.

BIOGRAPHY

Thomas A. Adams II, a native of suburban Chicago in the United States, received dual bachelor's degrees in chemical engineering and computer science from Michigan State University (East Lansing, Michigan, USA) in 2003. He then went on to study at the University of Pennsylvania (Philadelphia, Pennsylvania, USA) where he earned a PhD in 2008 in chemical and biomolecular engineering under the tutelage of Prof. Warren D. Seider. His thesis was entitled "Semicontinuous Processes with Chemical Reaction." He then completed a postdoctoral appointment at the Massachusetts Institute of Technology supervised by Prof. Paul I. Barton in the area of energy systems engineering.

His prior work experience includes seven years in the power industry as a software engineer for T-Enterprises, Inc (DeWitt, Michigan, USA), and the process systems engineering department at Pharmacia (Portage, Michigan, USA), now owned by Pfizer, Inc. He is currently Assistant Professor of Chemical Engineering at McMaster University (Hamilton, Ontario, Canada), which he began in 2010. His key research interests are in the area of sustainable energy conversion, including solid oxide fuel cells, CO_2 capture technologies, modeling and simulation techniques, polygeneration, water conservation, novel gasification technologies for coal and biomass, and semicontinuous chemical processing. His most significant contributions are the development and analysis of new solid oxide fuel cell / CO_2 capture process which produces electricity with zero emissions and significantly reduced water consumption. This work has been featured in major media publications such as Scientific American, Wired, Popular Science, The Discovery Channel, Power Magazine, WBUR National Public Radio, Energy Futures, the Daily Kos, and others.

Prof. Adams is an active member of the American Institute of Chemical Engineers, the McMaster Advanced Control Consortium, and the McMaster Institute for Energy Studies. He is currently on the scientific advisory board of HydroConfidence, Inc. (Pennsylvania, USA), a shale gas services company specializing in environmental protection. Key awards received include a National Science Foundation Graduate Fellowship and the AIChE Topp Othmer National Award.

*Session : **D2-W2-T1:*** **Medicine, Public Health, Biomedical Science and Engineering**

Session Organizer & Chair

Hsueh-Fen Juan

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BIOGRAPHY

Hsueh-Fen Juan was born in 1969, Miao-Li, Taiwan. She received her BS and MS degree in Botany and PhD in Biochemical Sciences from National Taiwan University (NTU) in 1999. She worked as a research scientist in the Japan International Research Center for Agricultural Sciences (Tsukuba, Japan) during 2000-2001 and a postdoctoral research fellow in the Institute of Biological Chemistry, Academia Sinica (Taipei, Taiwan) during 2001-2002.

She started her academic career in the Department of Chemical Engineering, National Taipei University of Technology as an assistant professor and in the Department of Computer Science and Information Engineering at NTU as an adjunct assistant professor in 2002. She moved to NTU in 2004 as an assistant professor in the Department of Life Science and the Institute of Molecular and Cellular Biology. She was promoted to be an associate professor in 2006 and full professor in 2009. Dr. Juan is currently working on cancer systems biology, integrating transcriptomics, proteomics and bioinformatics for biomarker and drug discovery.

Prof. Juan has developed a number of novel methods to advance systems-biology research and applied such approach for drug discovery and elucidating molecular mechanism of drug responses in cancer cells. In the past five years, she has published more than 36 journal papers including prestigious journals such as *Proc. Natl. Acad. Sci. USA*, *Oncogene*, *J. Proteome Res.*, *Proteomics*, *Bioinformatics,* and edited a scientific book entitled as *Systems Biology: Applications in cancer-related research* (2012). She also serves as the reviewer of thirty various journals like *Molecular and Cellular Proteomics* (ASBMB), *Proteomics* (Wiley-VCH), *BMC Bioinformatics*, and has organized several international systems biology and bioinformatics symposiums. In 2008, she was awarded as Taiwan's Ten Outstanding Young Persons. In 2011, she received FY2011 JSPS Invitation Fellowship Program for Research in Japan. She currently serves as the Board Member in the Taiwan Society for Biochemistry and Molecular Biology, Taiwan Proteomics Society, Taiwan Bioinformatics and Systems Biology Society.

*Session : **D2-W2-T1:*** **Medicine, Public Health, Biomedical Science and Engineering**

Developing Novel Molecular Probes for Bacterial Detection

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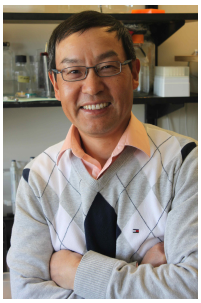
ABSTRACT

Prevalence of food-borne pathogens, emergence of drug-resistant bacteria and viruses, and threat of bioterrorism are amongst the most pressing concerns of our time. Early detection of pathogens is a crucial step in preventing large-scale outbreaks. In this presentation I will discuss a novel approach for the detection of a specific bacterium by isolating fluorogenic DNAzymes (catalytic DNAs) from a random-sequence DNA library using the unpurified complex extracellular mixture left behind by this microbe. We have shown that thus derived DNAzymes can be used to set up a simple "mix-and-read" bacterial detection assay. We have further demonstrated that our method has the capability to detect a single live cell. The most appealing feature of the method is that both probe isolation and subsequent assaying procedures bypass tedious and time-consuming target identification steps. We believe our method can easily be implemented for any pathogenic bacteria and viruses.

BIOGRAPHY



Yingfu Li was born and raised in Anhui, China. He received his BSc in chemistry at Anhui University in 1983, and his MSc in applied chemistry at Beijing Agriculture University in 1989, under the supervision of Professor Changhai Zhou. He moved to Canada in 1992, and in 1997, he graduated with a PhD in chemistry and biochemistry at Simon Fraser University under the supervision of Professor Dipankar Sen. He then did his postdoctoral research with Professor Ronald Breaker at Yale University. In 1999, he joined McMaster University as an assistant professor in the Department of Biochemistry and Biomedical Sciences and the Department of Chemistry and Chemical Biology. He was promoted to the rank of associate professor in 2005 and full professor in 2010. His research interests include basic and applied research concerning catalytic DNAs (DNAzymes), DNA and RNA aptamers, riboswitches, non-coding RNAs and bacterial toxins.

*Session : **D2-W2-T1:*** **Medicine, Public Health, Biomedical Science and Engineering**

A human ubiquitin conjugating enzyme (E2) - HECT E3 ligase structure-function screen

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ABSTRACT

Protein ubiquitylation is a highly diverse and dynamic process involved in nearly every function in the cell. The process is mediated by E1-the ubiquitin activating enzyme, E2-the ubiquitin conjugating enzyme and E3- the ubiquitin ligase. we have conducted a systematic structure-function analysis of the human ubiquitin E2 conjugating proteins, consisting of the determination of fifteen new high-resolution three-dimensional structures of E2 catalytic domains, and autoubiquitylation assays for 26 Ub-loading E2s screened against a panel of nine different HECT (homologous to E6-AP carboxyl terminus) E3 ligase domains. Integration of our structural and biochemical data revealed several E2 surface properties associated with Ub chain building activity; (i) net positive or neutral E2 charge, (ii) an acidic trough located near the catalytic Cys, surrounded by an extensive basic region, and (iii) similarity to the previously described HECT binding signature in UBE2L3(UbcH7). Mass spectrometry was used to characterize the autoubiquitylation products of a number of functional E2-HECT pairs, and demonstrated that HECT domains from different subfamilies catalyze the formation of very different types of Ub chains, largely independent of the E2 in the reaction. Our dataset represents the first comprehensive analysis of E2-HECT E3 interactions, and thus provides a framework for better understanding the molecular mechanisms of ubiquitylation.

BIOGRAPHY

Dr. Yi Sheng is currently an Assistant Professor at Department of Biology, York University. She received the Ph.D degree from University of Toronto at Department of Laboratory Medicine and Pathobiology in 2003. From 2003 to 2007, she carried out postdoctoral research with Dr. Cheryl Arrowsmith at Ontario Cancer Institute as a Terry Fox cancer research fellow and Leukemia and Lymphoma Research fellow, focusing on the regulation of p53 ubiquitylation pathway. She started her own research laboratory at York University in 2008. The focuses of her research include understanding the molecular mechanisms of the ubiquitylation pathway and the roles of ubiquitylation in normal and disease states. She has published

several seminar work elucidating the molecular bases underlying p53 (de)ubiquitylation by USP7 and Pirh2 in the journals including Mol Cell, Nat Strut Mol Biol, and J Biol Chem. Her research is supported by NSERC and CIHR.

*Session : **D2-W2-T1:*** **Medicine, Public Health, Biomedical Science and Engineering**

Next Generation MRI Contrast Agent

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ABSTRACT

Magnetic resonance imaging (MRI) is a noninvasive and versatile imaging modality that is increasingly applied in clinical diagnosis and basic biomedical research to obtain anatomic and functional information. Conventional MRI relies on nuclear magnetic resonance (NMR) signal predominantly from the ^{1}H nuclei of water, the most abundant molecule in vivo. The contrast and sensitivity of MRI can be improved by administration of paramagnetic MRI contrast agent (CA), which can shorten the nuclear spin relaxation time (T_1 or T_2) of water. The current clinical MRI T_1 CAs are predominantly based on low molecular weight gadolinium (Gd) complexes, which typically exhibit lower relaxivity at higher magnetic fields. Recently, several Gd CAs have been implicated in nephrogenic systemic fibrosis (NSF), a severe side effect related to Gd toxicity. Therefore, safer and more efficient MRI CAs are highly desirable.

I will describe our recent efforts on developing Gd-free contrast agents with high sensitivity, low toxicity and optimized pharmacokinetic properties. In addition, new strategies in developing "smart" MRI CAs, which are responsive to certain molecular and cellular events, such as pH change and enzyme activity, will also be discussed. These next generation MRI CAs have great potential to be applied to detect diseases at early stage and to monitor the efficacy of treatment with high specificity.

BIOGRAPHY

Xiao-an was born in China in 1973. His education background is listed below:

1991-1995, B.S. in pharmacy, Shanghai Medical University (上海医科大学now merged with Fudan University 复旦大学), P. R. China

1997-2000, M.S. in medicinal chemistry, Shanghai Institute of Pharmaceutical Industry (SIPI 上海医药工业研究院), P. R. China

2000-2005, Ph.D. in chemistry, Department of Chemistry, Universität Basel, Switzerland

Currently he is an Assistant Professor jointly appointed in the department of chemistry, department of physical and environmental sciences and department of biological sciences at the University of Toronto Scarborough. Before he moved to Canada in 2009, he was a postdoctoral fellow in the department of chemistry and McGovern institute for brain research at MIT (Boston, USA). His current research interest is to develop chemical probes for biomedical imaging.

Prof. Zhang is a member of Chemical Institute of Canada and American Chemical Society.

List below are his selected honors:

Connaught New Researcher Award, 2011
Swiss National Science Foundation Fellowship, 2005
Roche Research Foundation Fellowship, 2005
Summa cum laude Ph.D. Thesis, 2005

and representative publications:

(1) Enhui Pan[1], Xiao-an Zhang[1], Zhen Huang, Artur Krezel, Min Zhao, Christine E. Tinberg, James McNamara, and Stephen J. Lippard, Vesicular Zinc Promotes Presynaptic and Inhibits Postsynaptic Long Term Potentia-tion of Mossyfiber-CA3 Synapse. ***Neuron*** (Cell Press) 2011, 71, 1116-1126 ([1]Joint first authors)

(2) Subrata Ghosh, Pilhan Kim, Xiao-an Zhang, Andy Yun, Anna Moore, Stephen Lippard, and Zdravka Medarova, A Novel Imaging Approach for Early Detection of Prostate Cancer Based on Endogenous Zinc Sensing. ***Cancer Res.*** 2010, 70(15), 6119-6127 (Highlighted as Editor's Choice in ***Science***, 2010, 329, 885)

(3) Taekwan Lee, Xiao-an Zhang, Shanta Dhar, Henryk Faas, Stephen J. Lippard, and Alan Jasanoff, In Vivo Imaging with a Cell-Permeable Porphyrin-Based MRI Contrast Agent. ***Chem. & Bio***. (Cell Press) 2010, 17, 665-673

(4) Tatjana Atanasijevic, Xiao-an Zhang, Stephen J. Lippard, and Alan Jasanoff, MRI Sensing Based on the Displacement of Paramagnetic Ions from Chelated Complexes. ***Inorg. Chem.*** 2010, 49(6), 2589-2591

(5) Xiao-an Zhang, Dugan Hayes, Sarah J. Smith, Simone Friedle, and Stephen J. Lippard, New Strategy for Quantifying Biological Zinc by a Modified Zinpyr Fluorescence Sensor. ***J. Am. Chem. Soc***., 2008, 130(47), 15788-15789

(6) Xiao-an Zhang, Katherine Lovejoy, Alan Jasanoff, and Stephen J. Lippard, Water-Soluble Porphyrins as a Dual-Function Molecular Imaging Platform for MRI and Fluorescence Zinc Sensing. ***Proc. Natl. Acad. Sci. USA***, 2007, 104(26), 10780-10785 (Highlighted in ***ChemTract***, 2007, 20, 395).

*Session : **D2-W2-T1:*** **Medicine, Public Health, Biomedical Science and Engineering**

Synthetic biology approach for building artificial cell

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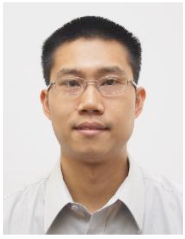
ABSTRACT

The field of synthetic biology has recently emerged as a result of achieving a critical mass in our knowledge of biology. While many biological molecules and systems are still too complex to be rationally designed *de novo*, the continued efforts in isolation and characterization of individual biological components offer the possibility of integrating them into biologically inspired devices that exhibit novel functionalities. Rather than deconstructing existing biological systems, our vision is to assemble biological parts into systems.

As a first step in this direction, we seek to emulate biological systems that would have immediate benefit and also serve as a test-bed for such design strategy. To this end, we have identified platelets as a tractable first target. Platelets are anucleate cells that are pre-programmed to execute a fixed pattern of behaviors that lead to the activation of the clotting cascade. Our synthetic biology approach requires more than reconstitution of the parts that make up a platelet. Rather, we propose designing an artificial platelet that is based on mimicking the functionality of a natural platelet, through a novel combination of biological components. I will describe the critical part of generating vesicles with defined protein and lipid content using microfluidic jetting. Finally, I will describe a plan for building artificial platelets.

BIOGRAPHY



Prof. Liu was born in Taiwan and moved to Canada with his family when he was a teenager. He obtained his bachelor's degree in Honours Biochemistry from The University of British Columbia in 2001. From 2002-2007, Prof. Liu performed his doctoral research in Biophysics at University of California-Berkeley where developed interests in membrane biophysics and cell motility. Upon graduation, Prof. Liu began his post-doctoral research in the Department of Cell Biology at The Scripps Research Institute where he studied the dynamics of endocytosis in living cells. In 2012, Prof. Liu started his research group at University of Michigan-Ann Arbor where holds a position in the Department of Mechanical Engineering, the Department of Biomedical Engineering, and the Cellular and Molecular Biology Program.

He has developed strong interests in systems biology and synthetic biology during his previous research experience and is working at the interface of biology and engineering. His previous works were published in *Nature Physics*, *Journal of Cell Biology*, and *Biophysical Journal*. Prof. Liu is a member of the Biophysical Society, American Society of Cell Biology, and American Heart Association.

Session : D2-W3-T1: New Materials Science and Engineering, Nanotechnology

Session Organizer & Chair

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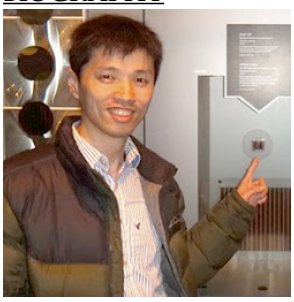
BIOGRAPHY



Dr. Ta-Ya Chu was born in Taiwan in 1974. He received his Ph.D. degree in Electrophysics from the National Chiao-Tung Universiy, Hsinchu, in 2006. Under the supervision of Professor Fred Chen, he developed a novel high efficient inverted bottom-emission organic light-emitting device (OLED). He was awarded scholarship as the most valuable researches by Chunghwa Picture Tubes, Ltd. in two consecutive years.

At the end of 2006, he joined Samsung SDI (Korea) as a Senior Engineer for the research and development of OLEDs mass production. After two years, he moved to Ottawa in Canada to service as a Research Officer at the National Research Council Canada (NRC) and expanded his research filed from the small molecular based to the polymer based organic electronics. He has been working on the development of organic photovoltaics at NRC since September 2008. He has contributed to more than thirty publications in the fields of organic electronics and ten of them were published in *Appl. Phys. Lett.* One of his works published in *J. Am. Chem. Soc.* (v133, p4250, 2011) have been cited more than hundred times within one year.

Dr. Chu received the Outstanding Research Achievement Award by NRC in 2011. He has been invited to service as the member of International Scientific Committee for the world's biggest photovoltaic conference, EU PVSEC, in 2011 and 2012.

*Session : **D2-W3-T1:*** **New Materials Science and Engineering, Nanotechnology**

3D Nanowire Architectures for Highly-Efficient Photoelectrochemical Anodes

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ABSTRACT

Efficient, stable, chemically inert, low-cost and non-toxic photoelectrochemical (PEC) electrodes are essential to the success of photocatalyzed water splitting reactions. Light absorption, charge generation and separation, and the matching of interfacial redox reactions represent the three most fundamental aspects of problems we face in this arena. High density tree-like three-dimensional NW networks are ideal for high-performance PEC electrodes that could offer long optical paths for efficient light absorption, high quality one-dimensional (1D) conducting channels for rapid electron-hole separation and charge transport, as well as high surface areas for fast interfacial charge transfer and electrochemical reactions. We developed a surface-reaction-limited pulsed chemical vapor deposition (SPCVD) technique that grew titanium dioxide (TiO2) nanorods (NRs) inside anodic aluminum oxide (AAO) nanochannels and dense Si NW arrays. The SPCVD technique effectively decouples the crystal growth from precursor vapor concentration, thus makes the conform growth of dense NW arrays inside highly-confined submicron-sized spaces possible. Dramatic increases of photocurrent and PEC efficiency were obtained when the 3D TiO2 NR-Si NW architectures were applied as PEC anodes. A 3D NW architecture consisting of 20-μm long wet-etched Si NWs and dense TiO2 NRs yielded a PEC efficiency of 2.1 %, which is three times higher than that of TiO2 film-Si NWs having a core-shell structure. This result suggests that the 3D NW architecture is superior to straight NW arrays for PEC electrode design. The efficiency could be further improved by optimizing the number of over-coating cycles and the length/density of NW backbones. Adjust the SPCVD condition can further engineer the composition of TiO2 NWs, and thus allows PEC activity under visible light range. By implementing these 3D NW networks into electrode design, one may be able to advantageously impact PEC and photovoltaic device performance.

BIOGRAPHY

Dr. Xudong Wang received his PhD degree from the department of Materials Science and Engineering at Georgia Tech in 2005. He is currently an assistant professor in the department of Materials Science and Engineering at University of Wisconsin – Madison. His research interests include understanding the coupling effect between piezoelectric polarization and semiconductor functionalities, and studying the growth mechanisms and developing assembly techniques of oxide nanostructures for mechanical and solar energy harvesting. He has published 57 papers in peer reviewed scientific journals, contributed 7 book chapters in his research field, and holds 5 patents on nanomaterial processing and nanomaterial-enhanced energy harvesting. His publications have been cited over 4,000 times by peers and his current h-index is 28. He is the recipient of NSF CAREER Award, DARPA Young Faculty Award, 3M Non-Tenured Faculty Award, Ross Coffin Purdy Award, Technology Review Young Innovators Under 35 Award, and KAUST research fellow.

*Session : **D2-W3-T1:*** **New Materials Science and Engineering, Nanotechnology**

Nanofabrication by nanoimprint and electron beam lithography and applications

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ABSTRACT

E-beam lithography (EBL) and nanoimprint lithography (NIL) are two most popular nanolithography techniques. EBL is based on material (called resist) property modification by its exposure to focused electron beam; whereas NIL relies on the mechanical conformation of a low viscosity resist to the structures of a mold. NIL offers high resolution (2nm), high throughput (up to one wafer/minute), low cost and high pattern transfer fidelity, though the mold has to be fabricated by the slow and expensive EBL. In the talk, I will first present our work on NIL using fluoro-polymer and hard/soft bi-layer mold that have advantages over conventional silicon mold. Then I will present EBL resist with a focus of polystyrene that can achieve ultra-high sensitivity or ultra-high resolution. Next, I will cover a few applications of nanostructures fabricated by NIL and EBL, including metallic nanostructures for chemical/bio-sensor based on surface enhanced Raman spectroscopy (SERS), and for the detection of DNA hybridization by surface plasmon resonance (SPR), as well as application of grating structure of polystyrene (biocompatible) for guided cell growth with a goal for tissue repair.

BIOGRAPHY

Dr. Bo Cui was born in Liaoning Province, China, in 1971. He received his BS in physics from Peking University (北京大学), China, in 1994. After two years of graduate study in the same department, he moved to the University of Minnesota, then to Princeton University in 1998, where he earned his Master's degree in 2000 and PhD in 2003 from the Nanostructure Laboratory, Department of Electrical Engineering.

After completing his PhD, he joined the National Research Council of Canada, Industrial Materials Institute in Montreal in 2003 as a staff scientist. In 2008 Dr. Bo Cui joined the Department of Electrical and

Computer Engineering, University of Waterloo (Waterloo, Ontario, Canada) as an Assistant Professor. He currently leads the Waterloo Nanofabrication Group with 10 graduate students and one postdoc. His research focus on the development of nanofabrication technologies and applications.

Dr. Cui is the member of IEEE, AVS (American Vacuum Society), and OSA (Optical Society of America). He is the recipient of the Dobbin Scholarship ($7000) in 2011. He is the author for 50 journal publications, two patents, two book chapters titled "Nanoimprint lithography and its application in tissue engineering and bio-sensing" and "Ultrafast fabrication of metal nanostructures using pulsed laser melting"; and he also edited one book titled "Recent advances in nanofabrication techniques and applications".

Session : D2-W3-T1: **New Materials Science and Engineering, Nanotechnology**

Chalcogenide Glass Resonant Cavity Devices for On-chip Infrared Sensing

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ABSTRACT

Optical resonant cavity devices significantly enhance light-matter interactions and thus they serve as ideal platforms for applications including molecular detection. Chalcogenide glasses are well known for their excellent mid-infrared transparency and are thus an ideal material candidate for on-chip spectroscopic sensing. My talk will review my group's work on chalcogenide glass-based optical chemical sensor development, as well as new sensing mechanisms potentially enabling single molecule detection.

BIOGRAPHY

Juejun (JJ) Hu received his PhD from MIT in 2009 and is currently an assistant professor in the Department of Materials Science & Engineering at the University of Delaware starting fall 2010. Dr. Hu's primary research interest focuses on the enhanced photon-matter interactions in nano-photonic structures, with an emphasis on on-chip spectroscopy and chemical sensing applications using novel infrared glasses. His research also covers materials and devices for magneto-optics, photovoltaics, opto-mechanics, and solid state light emitters. Dr. Hu has authored and co-authored over 30 refereed journal publications since 2006 and has been awarded 5 U.S. patents.

*Session : **D2-W4-T1:*** **Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)**

Session Organizer & Chair

Chi-Hsiang Yeh, PhD (葉啟祥 教授)

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*Session : **D2-W4-T1:*** **Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)**

Combining Quantitative Location Information and Qualitative Connectivity Information for Clustering in Wireless Sensor Networks

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ABSTRACT

Wireless Sensor Networks (WSNs) have become an important research area both in theory and in practice. Applications of WSNs include military systems, such as battle field surveillance and enemy tracking. WSNs have also been used in many civilian applications, including environment observations, habitat monitoring, health care, traffic control, etc.

Clustering is one of the most popular and important protocols in WSNs. In clustering, two sensor nodes tend to be grouped together when they are in close distance. In most studies, geographic location information of each sensor is needed for calculating distances, and Global Positioning System (GPS) is the most common way to get the location information. However, GPS faces a certain possibility of failure and the cost of a sensor node becomes higher with GPS equipped. Hence, GPS is not always used for some applications due to the cost reason or environmental effects. Alternatively, some studies adopted Received Signal Strength (RSS) to estimate the distance between sensor nodes. But some studies show that RSS is not a reliable distance estimator in practice due to the complicated nature of wireless communication environment.

In order to mitigate the aforementioned problems of GPS and RSS, we propose a hybrid clustering protocol–Hybrid Distributed Hierarchical Agglomerative Clustering (H-DHAC)–which combines both quantitative location data and qualitative connectivity data in clustering for WSNs. With H-DHAC, there is no need to have GPS location data for every sensor node. Specifically, H-DHAC can work with any percentage of GPS availability (0%–100%) for sensor nodes, thus it provides robustness when facing unpredictable GPS failures for sensor nodes and it reduces the cost of the system, as not all sensor nodes have to be equipped with GPS. The simulation results show that H-DHAC has a lower percentage of compromise in performance in terms of network life time and the total amount of transmitted data. In addition, the performance of H-DHAC is still better than the well known clustering protocols–LEACH and LEACH-C–even for cases where many sensor nodes do not have the location information.

BIOGRAPHY

Chung-Horng Lung received his B.Eng. degree in Computer Science and Engineering from Chung-Yuan University, Taiwan, in 1983, and the M.S. and Ph.D. degrees in Computer Science and Engineering from Arizona State University in 1988 and 1994, respectively. His research interests include: software engineering, cloud computing, communication networks, and wireless ad hoc and sensor networks.

In September 2001, he joined the Department of Systems and Computer Engineering, Carleton University, Ottawa, Canada, where he is now an Associate Professor. He was with Nortel Networks from 1995 to 2001. At Nortel, he worked in the Software Engineering Analysis Lab (SEAL) as a senior software engineer/architect and IP/MPLS Solutions for network traffic engineering. He worked in the Electronics Research and Service Organization (ERSO), Industrial Technology Research Institute (ITRI) of Taiwan, in 1985. He also worked as an instructor in Taiwan and Arizona State University.

Dr. Lung is a member of IEEE and ACM. He has received several Best Paper awards and several awards at Nortel Networks, including President's Award in 1996 and 1999, and Award of Excellence, Advanced Software & Network Technology in 1998.

*Session : **D2-W4-T1:*** **Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)**

Survivable Virtual Infrastructure Management in Virtualized Data Centers

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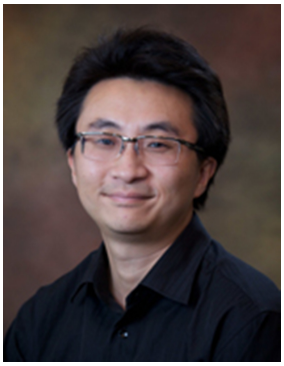
ABSTRACT

In a virtualized data center, survivability can be enhanced by creating redundant Virtual Machines (VMs) as backup for VMs such that after VM or server failures, affected services can be quickly switched over to backup VMs. To enable flexible and efficient resource management, we propose to use a service-aware approach in which multiple correlated VMs and their backups are grouped together to form a Survivable Virtual Infrastructure (SVI) for a service or a tenant. A fundamental problem in such a system is to determine how to map each SVI to a physical data center network such that operational costs are minimized subject to the constraints that each VM's resource requirements are met and bandwidth demands between VMs can be guaranteed before and after failures.

This problem can be naturally divided into two sub-problems: VM Placement (VMP) and Virtual Link Mapping (VLM). In this talk, a general optimization framework will be presented for this mapping problem. Then we will present an efficient algorithm for the VMP subproblem as well as a polynomial-time algorithm that optimally solves the VLM subproblem, which can be used as subroutines in the framework. We will also present an effective heuristic algorithm that jointly solves the two subproblems. It has been shown by extensive simulation results based on the real VM data traces collected from the green data center at Syracuse University that compared with the First Fit Descending (FFD) and single shortest path based baseline algorithm, both our VMP+VLM algorithm and joint algorithm significantly reduce the reserved bandwidth, and yield comparable results in terms of the number of active servers.

BIOGRAPHY



Dr. Jian Tang received both his Bachelor degree in Communication Engineering and Master degree in Computer Applications from Beijing University of Posts and Telecommunications, Beijing, China in 1998

and 2001 respectively. He earned his Ph.D degree in Computer Science from Arizona State University, Tempe, AZ, USA in 2006. His research interests lie in the areas of computer networking and cloud computing, with emphases on resource allocation, QoS provisioning and survivability.

He is currently an Assistant Professor in the Department of Electrical Engineering and Computer Science at Syracuse University, Syracuse, NY. He was an Assistant Professor in the Department of Computer Science at Montana State University in 2006-2010. He has published over 60 papers in premier journals and conferences.

Dr. Tang is a member of IEEE. He received an NSF CAREER award in 2009. He served as a co-chair for the Wireless Networking Symposium of the IEEE Global Communications Conference (Globecom) 2010 and the Wireless Networks Symposium of the International Conference on Computing, Networking and Communications (ICNC) 2012. He has also served as a Technical Program Committee member for many conferences including IEEE Infocom 2010-2013, ICC 2006-2012 and Globecom 2006-2012.

*Session : **D2-W4-T1:*** **Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)**

Securing Entropy Sources in Cloud Computers

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ABSTRACT

As more and more data sensitive applications migrate to the cloud, it's important to ensure that consolidation of computing resources doesn't compromise data security. Most of the standard security practices of computer systems are based on assumptions that may hold true for physical machines, but don't translate immediately into the domain of virtualized machines. As such, it is important to reconsider the well accepted security practices which were built around physical machines, and whether blind application of such practices results in the possibility of a data breach, machine control, or other vulnerabilities.

This work explores the security weaknesses of cloud computing networks in regard to services that require a good source of cryptographically strong random numbers. Generally a computer will have two sources of random numbers (computer entropy), a hardware based random number generator that is built into its processor, and an operating system based random number generator relying on unpredictable sources, such as interrupt timing. Because of cloud computers reliance on virtualization, access to the former source is restricted, and virtualization can have unforeseen effects on the latter source.

Two types of related attacks on this weakness are presented, one based on depleting a shared entropy pool so processes waiting on reads of the entropy pool (collection of random numbers) are blocked continuously, and one based on poisoning the entropy pool of a cloud computer instance by generating interrupts at known intervals, and performing the same data transformation techniques used by the random number generation routines provided by the operating system. Finally, a system for increasing the secure entropy of cloud instances is introduced.

BIOGRAPHY

Dr. Yu Chen is an Assistant Professor of Electrical and Computer Engineering at the State University of New York (SUNY) – Binghamton. He received the Ph.D. in Electrical Engineering from the University of Southern California (USC), Los Angeles, USA, in 2006.

He is currently an Assistant Professor at Department of Electrical & Computer Engineering, State University of New York (SUNY) - Binghamton, Binghamton, New York, USA. His research interest lies in Cyber Security, Network Infrastructure, Cyber-Physical Systems (CPS) and Computer Architectures. Particularly, his current work covers wired/wireless networks and Cloud/Grid computing systems; cyber infrastructure security; trust, security and privacy in wireless and pervasive computing; and security-oriented reconfigurable/embedded hardware based accelerators. He has authored or co-authored more than 60 research papers in refereed journals, conferences, and book chapters. He is a member of ACM, IEEE (Computer Society & Communication Society), and SPIE.

*Session : **D2-W4-T1:*** **Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)**

Video over Infrastructure-Based Cognitive Radio Networks

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ABSTRACT

Cognitive Radio (CR) represents an exciting new communication paradigm with advanced spectrum management enabling improved channel utilization and overall available bandwidth. The bandwidth demanding multimedia applications are excellent candidates to fully exploit the potential of CR. However, research efforts have been focused mainly on spectrum access; the application specific performance issues have been relatively less touched. A novel aspect of view considering spectrum access and application level performance as a whole is desired to achieve optimal user experience.

In this talk, the important problem of enabling video services over CR networks will be addressed. Starting with a brief review of current research status and the framework of dynamic spectrum access, we will emphasize on an opportunistic approach for efficient video multicasting. Through aggressive transmission parameter decision, effective data loss protection, and maximal resource utilization, we are able to realize the advantage of multi-user and multi-group diversity in all aspects over challenging CR environments. The talk will be concluded with a discussion of open issues and future directions in this research area.

BIOGRAPHY

Chih-Wei Huang received the B.S. degree from National Taiwan University, Taipei, in 2001, the M.S. degree from Columbia University, New York, in 2004, and the Ph.D. degree from University of Washington, Seattle, in 2009, all in electrical engineering.

He joined the Department of Communication Engineering, National Central University, Jhongli, Taiwan, in 2010. He is currently an Assistant Professor heading the Information Processing and Communications (IPC) Laboratory. From 2006 to 2009, he was an intern researcher at Siemens Corporate Research and Microsoft Research. He is the author of papers in a broad range of areas,

including wireless networking, multimedia communications, digital signal processing, and information retrieval.

*Session : **D2-W1-T2:*** **New Green Energy/Environment/Sustainability, Intelligent/Electric Vehicle**

Session Organizer & Chair

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BIOGRAPHY

Prof. Ching-Fuh Lin obtained the B.S. degree from National Taiwan University in 1983, and the M.S. and Ph.D. degrees from Cornell University, Ithaca, NY, in 1989 and 1993, respectively, all in electrical engineering.

He is now the Director of Innovative Photonics Advanced Research Center (i-PARC), the Chairman of Graduate Institute of Photonics and Optoelectronics and a joint professor in the Graduate Institute of Photonics and Optoelectronics, Graduate Institute of Electronics Engineering, and Department of Electrical Engineering at National Taiwan University. His research interests include organic-inorganic composite thin-film solar cells and optoelectronic devices, single-crystal Si thin-film solar cells, Si-based photonics, and physics in broadband semiconductor lasers and optical amplifiers.

He is a Fellow of IEEE, a Fellow of SPIE, Member of Asia-Pacific Academy of Materials, and a member of OSA. He has published over 140 journal papers and more than 350 conference papers and hold over 30 patents. He is also the sole author of a book, Optical Components for Communications: Principles and Applications, published by Kluwer Academic Publishers (USA 2004), and co-author/edit a book, Organic, Inorganic and Hybrid Solar Cells – from Principles to Practices, to be published by John Wiley & Sons, Inc. and IEEE Press. He had obtained the Distinguished Research Award and several Class A Re-

search Awards from National Science Council of Taiwan, ROC, and the Outstanding Electrical Engineering Professor Award from the Chinese Institute of Electrical Engineering. He and his students had also been granted the 18th Acer Research Golden Award, 18th Acer Research Excellent Award, 14th Acer Research Excellent Award, Collins Thesis Awards for years of 1998, 2001, 2002, 2004, 2007, 2009, and 2010.

Prof. Lin has served as the Chair of IEEE LEOS Chapter Taipei Section, the Board member of the 17th IEEE Taipei Section, the Evaluation Committee member of Higher Education Evaluating & Accreditation Council of Taiwan, the Council member of the 10th Optical Engineering Society of ROC, and the Convener in the area of Electronics and Information for the Conventional Industry Technology Development Project in the Bureau of Industry, Ministry of Economics, ROC. He has also served as Project Instructors of the National Programs in the nano-science and nano- technology and the renewable energy (solar energy).

Session : ***D2-W1-T2:*** **New Green Energy/Environment/Sustainability, Intelligent/Electric Vehicle**

Catalytic reforming of ethanol into methane using near- and super-critical water and its potential application as a fuel for internal combustion engines

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ABSTRACT

Reforming of ethanol with near- and super-critical water at 350-500°C with a water-to-ethanol (W/E) molar ratio from 1.0 to 10.0 using both homogeneous- and heterogeneous-type of catalysts including K_2CO_3, $Ca(OH)_2$, $FeSO_4$ and RuO_2 was investigated in a batch reactor. While alkaline catalysts catalyzed H_2 formation, RuO_2 was found to be highly active for conversion of ethanol into CH_4 in supercritical water. At 500°C, 60 min and a W/E molar ratio of 3.0 with RuO_2, complete and nearly stoichiometric conversion of ethanol into CH_4 was achieved.

Reforming of ethanol into methane with supercritical water (SCW) over γ-Al_2O_3-supported mettalic catalysts was also performed in a continuous-flow tubular reactor. Experiments were conducted at 500°C, 25 MPa, and 25.2 h^{-1} (WHSV) with 46 wt% substrate-water solution. Different reaction conditions such as different catalyst metal loadings/compositions (of Ni and Ru), different feed compositions, different reaction temperatures and pressure were investigated. Among all catalysts tested, the best catalyst was a bimetallic catalyst of $RuNi/Al_2O_3$, producing close to theoretical amount of methane (around 1.5 moles per mole of ethanol fed) with a lifetime of more than 9 hours. The mono-metallic catalyst of Ni/Al_2O_3 produced similar gas yields, but the catalyst was deactivated after about 4h on-stream. Surprisingly, the mono-metallic catalyst of Ru/Al_2O_3 catalyst showed very low activity. The catalyst deactivation mechanism was also discussed in this study, with respect to water oxidation of nickel, and carbon deposition on the catalyst surface.

BIOGRAPHY

Dr. Chunbao (Charles) Xu (徐春保), born in Jiangxi Province(江西省), P.R. China in 1971, received his B.Eng. degree in Metallurgical Engineering from Anhui University of Technology (formerly East China Institute of Metallurgy), Anhui Province, China in 1993. Dr. Xu earned two PhD degrees, one in Metallurgical Engineering from The University of Science and Technology Beijing, China in 1998, and the other in Chemical Engineering from The University of Western Ontario, Canada in 2004.

He was a **Postdoctoral Fellow** (funded by Japan Society for Promotion of Science, JSPS) and **Research Associate** (appointed by the Japanese Government Ministry of Education, Culture, Sports, Science and Technology (Monbukagakusho or MEXT) at Tohoku University, Japan during 1998 and 2001. After working at University of Alberta and Syncrude Canada Research Center as a **Postdoctoral Researcher**, he was appointed a tenure-track **Assistant Professor** in Chemical Engineering at Lakehead University in 2005, and promoted to **Associate Professor** with tenure in 2008. He was the **Director of Green Energy Laboratory** at Lakehead University. He became an **Associate Professor** of Chemical Engineering and **NSERC/ FPInnovations Industrial Research Chair** in Forest Biorefinery at Western University (or UWO) in May 2011, and is leading the Industrial Bioproducts Laboratory funded by Canada Foundation for Innovation. He is an emerging young researcher and building an international stature in the field of forest biorefinery - production of bio-energy, bio-fuels, bio-based chemicals and materials from forest biomass and forestry residues.

Dr. Xu has been an active member of Chemical Institute of Canada (CIC) and Canadian Society for Chemical Engineering (CSChE) and American Chemical Society (ACS) since 2006, and became a licensed Professional Engineer with Professional Engineers Ontario in 2008. He was awarded the Japan Institute of Energy Outstanding Young Scientists Award in 1999, Lakehead University Contribution to Research Award in 2007, and more recently the prestigious Syncrude Canada Innovation Award in 2011 by CSChE ((presented to a young Canadian chemical engineer under the age of 40 who has made a distinguished contribution to the field of chemical engineering while working in Canada). Dr. Xu has a Chinese patent awarded, 2 US/Canadian patents in process, and 2 invention disclosures. Dr. Xu has published 3 book chapters and more than 120 papers in journals and conferences, including close to 70 peer-reviewed journal papers. Dr. Xu is currently serving as a co-editor-in-chief for the *International Journal of Chemical Reactor Engineering* (IJCRE), an international peer reviewed journal published by De Gruyter.

Session : ***D2-W1-T2:*** **New Green Energy/Environment/Sustainability, Intelligent/Electric Vehicle**

Hydrothermal Conversion of Lignocellulosic Biomass to Alkanes and 5-HMF

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ABSTRACT

The production of renewable and carbon-neutral biofuels and bioproducts from biomass contributes to the reduction of our dependency on petroleum and greenhouse gas emissions. Among all the thermochemical approaches, hydrothermal conversion technology does not require predrying of the feedstock and can take place at a temperature around 350 ^{o}C or lower with catalysts. It can be employed to produce not only biofuels but also various valuable chemicals.

A new process based on aqueous-phase dehydration/hydrogenation (APD/H) will be introduced in this talk. It has been developed aiming at liquid alkanes (C7-9), which are the main components of fossil gasoline, from cellulose in one single batch reactor without the consumption of external hydrogen (H_2). During this new process, part of the cellulose is first converted to in situ H_2 by steam reforming in the steam gas phase mainly as well as in liquid water phase; and, in the liquid water phase, the remaining cellulose is converted to an alkane precursor, such as 5-(hydroxymethyl)furfural (HMF), by hydrothermal decomposition. 5-HMF itself is a valuable pharmaceutical product, and it can be extracted from the liquid products or converted into alkanes by reacting with in situ H_2 through APD/H. Experimental results showed that the volumetric ratio of the reactor headspace to the reactor (H/R) and an initial weakly alkaline condition are the two key parameters for SR(H_2)-APD/H. With proper H/R ratios (e.g., 0.84) and initial weakly alkaline conditions (e.g., pH = 7.5), liquid alkanes are directly formed from the SR(H_2)-APD/H of cellulose using in situ H_2 instead of external H_2. In this study, compared with pyrolysis and hydrothermal liquefaction of cellulose, SR(H_2)-APD/H greatly increased the liquid alkane yields, by approximately 700 times and 35 times, respectively.

BIOGRAPHY

As the youngest brother of six, Chao Tan was born in Jiangsu Province, China in 1972. He received his B.Sc. and M.Sc. degrees, both in Thermal Engineering, in 1996 and 1999, respectively, from Tsinghua Uni-

versity, Beijing, China and Ph.D. degree in Bioenvironmental Engineering in 2004 from the University of Illinois at Urbana-Champaign (UIUC), Illinois, USA.

Chao is now an Associate Professor appointed in multiple engineering departments and institutes at the University of Waterloo, Waterloo, Ontario, Canada. Prior to this position, he was an Assistant Professor and later on promoted to Associate Professor at the University of Calgary from July 2004 to August 2010. Dr. Tan's research focuses on air pollution control, indoor air quality and biofuels. He is supervising 4 PhD and 3 MSc students.

Dr. Tan is a member of ASME, ASABE, and ISIAQ. He received the ASABE Superior Paper Award in 2006. In 2004, his PhD research work was awarded First Place Graduate Student Research Award in PhD Category from ASAE. Dr. Tan was presented with Schulich School of Engineering Early Research Excellence Award on January 28, 2009, and SSE's Departmental Teaching Award (Jan 2010) and The University of Calgary Student Union's Teaching Excellence Award Honorable Mention (2007).

*Session : **D2-W1-T2:*** **New Green Energy/Environment/Sustainability, Intelligent/Electric Vehicle**

n-Butanol production through native and engineered microorganisms

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ABSTRACT

n-Butanol has been proposed as a gasoline alternative and thus has attracted many attentions in the past several years. In view of sustainability, fermentation is the process mainly considered to produce n-butanol, in which *Clostrdium*, the native n-butanol producing bacterial genus, is responsible for the work. *Clostridum* is an obligate anaerobe, spore-forming, and can digest wide range of carbon sources from hexoses to pentoses. One of the major hurdles of fermentative butanol production is the bio-toxicity of n-butanol to microorganisms. Two strategies are discussed to overcome the butanol bio-toxicity problem. The first one is using a membrane reactor as a bioreactor where the membrane can selectively remove butanol before the toxic level is reached during the fermentation process. A novel PDMS/PE/metal alloy pervaporation membrane is used in this study and the results are discussed. The second strategy is based on the principle of chemical reaction engineering where batch, fed-batch, and chemo-stat fermentation reactors were discussed in terms of butanol production. The optimal chemical reactor for the production of bio-toxic butanol is concluded.

Butanol degeneration is another major hurdler referring *Clostridium* butanol fermentation. The mechanism of butanol degeneration is still not completely understood but it has been shown that gene regulations of both the butanol production and the sporulation of *Clostrdium* are highly related. In other words, butanol production and degeneration are coupled during the production of butanol. To overcome the problem of butanol degeneration, the butanol production pathway of *Clostridium*, including six genes, has been heterougously moved to non-spore-forming gram-negative *E. coli* by the techniques called ordered gene assembly in *Bacillus subtilis* (OGAB). The fermentation conditions of butanol production using the genetically modified E. coli constructed in this study is discussed.

BIOGRAPHY

EDUCATION

2006-2010	**Ph.D.** in chemical engineering, University of Connecticut, USA
2003-2005	**M.S.** in chemical engineering, National Chung Hsing University, Taiwan
1999-2003	**B.S**. in chemical engineering, National Chung Hsing University, Taiwan

He is now the Assistant Professor of chemical engineering department at National Chung Hsing University in Taiwan. He has authored 6 SCI peer-reviewed journal articles and 6 conference proceeding. He also has 1 non-provisional patent application. His research interests are bio-fuel production, bio-degradable plastics production, and bio-separation.

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***Session : D2-W2-T2:* Medicine, Public Health, Biomedical Science and Engineering**

Session Organizer & Chair

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BIOGRAPHY

Peter P. Liu, MD, FRCPC

Scientific Director, University of Ottawa Heart Institute
Professor of Medicine, University of Ottawa
Professor of Medicine & Physiology, Peter Munk Cardiac Centre, University of Toronto
President of International Society of Heart Failure of World Heart Federation

Dr. Liu graduated from the University of Toronto Faculty of Medicine. During his cardiology training, he also pursued a post-doctoral fellowship in cardiovascular imaging and immunology at the Massachusetts General Hospital of Harvard Medical School, and clinical epidemiology at McMaster University. In 1985 he joined the Division of Cardiology at the Toronto General Hospital, University of Toronto. Since 1999, he has been the Heart & Stroke/Polo Chair Professor at the University Health Network, and serves as the inaugural Director of the Heart & Stroke/Richard Lewar Centre of Excellence in Cardiovascular Research at the University of Toronto. Since 2005, he was the Scientific Director at CIHR's Institute of Circulatory & Respiratory Health, the major federal funding agency that supports biomedical research in Canada. At CIHR, he designed a number of innovative research programs and leveraged funding for several major research networks and consortia across the country and internationally. He served on the executive committee and provided research leadership for the Canadian Heart Health Strategy, Canadian Lung Health Framework, and National Sodium Reduction Strategies with the federal and provincial governments. Since this past July, Dr. Liu has also assume the role of Scientific Director of the University of Ot-

tawa Heart Institute, a prestigious institution that is a leader in personalized medicine and imaging. He will be working with members and stakeholders to enhance further the excellence and global impact of research and innovation of the Ottawa Heart Institute.

Dr. Liu focuses his own research on the pathophysiology and clinical outcomes of heart failure from bench to bedside. His team has elucidated the role of inflammation in changing heart structure and function, and potential novel treatment targets in heart failure. His laboratory has also identified how viruses and bacteria can accelerate heart failure and coronary artery disease, and is developing novel vaccines to prevent these complications. With support from Genome Canada, CIHR group and team programs, and Ontario Research Global Leadership Fund – he is also pursuing novel biomarkers and therapeutic targets for early cardiovascular disease identification and intervention. He has published over 320 peer reviewed articles in high impact journals, and his work has been cited over 20,000 times in the literature. In addition, he co-chaired a series of Canadian Cardiovascular Society Consensus Guideline Recommendations for heart failure care.

He is the recipient of numerous awards in recognition of his scientific contributions and accomplishments including the Rick Gallop Research Award Recognizing Research Excellence from the Heart & Stroke Foundation of Ontario (2003), the Research Achievement Award from the Canadian Cardiovascular Society (CCS, 2003), Visiting Research Professor Award from the Royal College of Physicians and Surgeons (2005), Extramural Award of Merit from the American College of Cardiology (2005), the Jean Davignon Cardiometabolic Award (2008), and Lifetime Achievement Award from CCS (2011), and Distinguished Lecture Award of the ICRH at CIHR (2012). He has served as the scientific program chair for the Canadian Cardiovascular Society, Heart Failure Society of America, International Human Proteomic Organization, and World Heart Federation.

Currently he is the Director of the National C-CHANGE Initiative, harmonizing and integrating cardiovascular preventive guidelines for both the professional and patients, and develops strategies for implementation. This just has been adopted as the national standards across all provinces in Canada for implementation by the Ministries of Health. He is also President of the International Society of Heart Failure of the World Heart Federation (WHF), and also serves on the Research and Policy Committees of WHF, coordinating global fight against heart disease and promoting its prevention.

Session : D2-W2-T2: Medicine, Public Health, Biomedical Science and Engineering

Targeting ErbB receptors for cancer therapy with new ideas

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ABSTRACT

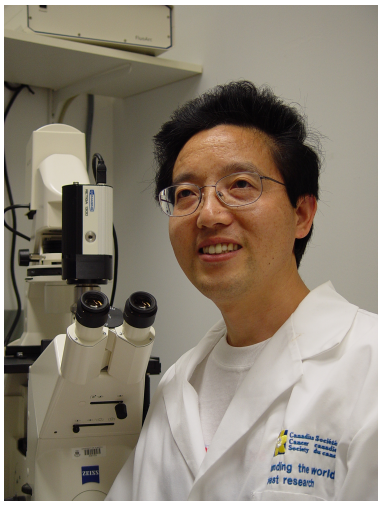
A major difference between cancer cells and normal cells is that the cancer cells are much more mitogenic and frequently enter mitosis for proliferation. Most cancer drugs therefore are designed to specifically target the mitotic cells. ErbB receptors have been implicated in many cancers, and thus have been frequently targeted for cancer therapy. Down-regulation of ErbB receptors through endocytosis has also been a major therapeutic treatment for cancer. Endocytosis has also been used as a means for drug delivery. Current approaches for targeting ErbB receptors include monoclonal antibodies (mAbs) directed against the receptor; synthetic tyrosine kinase inhibitors that inactivate the tyrosine kinase domain; conjugates of toxins to anti-ErbB antibodies and ErbB ligand; and antisense therapy to ErbB receptors. To date, mAbs and synthetic inhibitors of tyrosine kinase have taken central stage. Several findings from our research may contribute to design better cancer therapy if being translated to clinical application.

The current approach to generate ErbB antibodies for cancer therapy is through large screening without understanding the mode of the action. Thus, we do not know how to improve these antibodies once encounter problems. Indeed, Trastuzumab (Herceptin), the only approved monoclonal antibody targeting ErbB2, has facing increasing resistance and no solution is in sight. The antibodies targeting EGFR, being studied for a long time, have not received regulatory approve yet. Recent findings from our lab indicate that we are able to design the most effective EGFR antibody. We showed that EGFR endocytosis is regulated by its dimerization, rather than kinase activation. Our data also indicate that we can decouple the EGFR signalling and its downregulation through the proper regulation of EGFR dimerization. Our data suggest that the EGFR antibodies that meet the following criteria will be fundamentally promising: bivalent antibody that dimerizes EGFR to stimulate its endocytosis without activates EGFR kinase.

Another finding from our lab may help to design a better drug delivery system to specifically targeting cancer cells. We found that EGF-induced EGFR endocytosis is differentially regulated during cell cycle: dependent on EGFR kinase activation in M phase, but independent of EGFR kinase activation in interphase. We conclude that cells have adopted a system for selective endocytosis in M phase. Our findings could provide new means to specifically target cancer cells through specific drug delivery and EGFR downregulation.

Finally, our data may help design drugs to specifically targeting the signaling pathways activated by EGFR at Mitosis, thus specifically targeting cancer cells. We showed that EGFR signaling pathways are differentially regulated at M phase, thus by targeting the critical signaling pathways that activated at mitosis will help us to design drugs to specifically target cancer cells.

BIOGRAPHY



Education:

Sept. 1989-June 1993	Department of Biological Sciences Simon Fraser University, Vancouver, Canada Ph.D. Biochemistry
Sept. 1982June 1985	Institute of Zoology, Academia Sinica, Beijing, China M.Sc. Zoology
Sept. 1978July 1982	Department of Biology, Beijing University, Beijing, China B.Sc. Biology

After obtained his PhD, Dr. Wang did his postdoctoral training at University of Toronto supported by various scholarships including CIHR (MRC) Centennial Fellowship, Charles H. Best Postdoctoral Fellowship and NSERC Postdoctoral Fellowship. He started his first independent research position as a Career Scientist at Northeastern Ontario Cancer Centre in 1996 and as an Assistant Professor at University of Ottawa in 1997. He moved to the Department of Cell Biology, University of Alberta as an Assistant Professor. He is now a Full Professor at the Department of Medical Genetics, University of Alberta. His research has focused on ErbB receptor-mediated cell signaling, receptor endocytosis, and human cancer. ErbB receptors including EGFR/ErbB1, ErbB2, ErbB3 and ErbB4 lie at the head of a complex signal transduction cascade that modulates cell proliferation, survival, adhesion, migration and differentiation. While ErbB receptor signaling is essential for many normal cell functions, the aberrant activity of ErbB receptors has been shown to play a key role in the development of many cancers. ErbB receptors are overexpressed in many cancers especially in breast cancer, ovarian cancer, small cell lung cancer and skin cancer. ErbB receptor overexpression correlates to poor prognosis, drug resistance, cancer metastasis and lower survival rate. All these make ErbB receptor the top choice as a target for developing cancer therapies. To date, monoclonal antibodies (mAbs) and synthetic inhibitors of tyrosine kinase have taken central stage. The central theme of my research is to understand how the activation of EGFR regulate cell signaling, how the signaling is terminated through EGFR endocytosis, trafficking and degradation, how the breakdown of this regulation contributes to cancer development, and how an intervention can be provided.

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Session : D2-W2-T2: **Medicine, Public Health, Biomedical Science and Engineering**

Stem cell biology and regenerative medicine in skeletal development and disease

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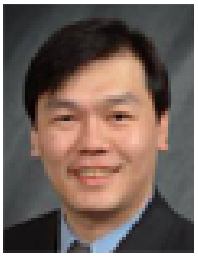
ABSTRACT

The global objective of my lab is to understand how embryos develop from a single cell to a complex organism, how genes control the development of organs and how abnormal regulation of these genes resulted in human diseases. One of our major projects is to investigate the molecular and cellular mechanisms underlying stem cell renewal, proliferation, fate determination and differentiation using craniofacial skeleton as a model system. This line of investigation has led to our understanding of these processes tightly regulated during development. Disruption in any of these processes, caused by aberrant regulation of the evolutionary conserved signal transduction pathways, leads to skeletal deformities. The stem cells reside in the craniofacial mesenchyme play an orchestrating role in bone morphogenesis. However, nothing is known about the nature of these cells. Using advanced genetic systems, we have identified a cell population functioning as mesenchymal stem cells responsible for craniofacial bone development, homeostatic maintenance and injure repair. Better understanding of these stem cells promises new insight into skeletal development, and is essential to achieve our goal to improve therapeutic strategies for future molecular and regenerative medicine.

BIOGRAPHY



Wei Hsu was born in 1966 in Taipei, Taiwan. After graduating in 1989 with a bachelor's degree in chemistry, he entered the graduate program at Mount Sinai Medical Center, NYC, USA. He earned his M.Ph. in Biomedical Sciences in 1992 and Ph.D. in Biomedical Sciences in 1994.

He then did a postdoctoral fellowship in genetics and developmental biology at Columbia University Medical Center, NYC, USA. In 1998, he became a faculty member at Columbia University Medical Center. He then moved to University of Rochester Medical Center, Rochester, NY, USA as an Assistant Professor in 2002, was promoted to Associate Professor with tenure in 2006 and Professor in 2012. He also has joint appointments with the James Wilmot Cancer Center, and is a member of the University of Rochester Stem Cell and Regenerative Medicine Institute. The primary focus of Hsu's lab is to study the Genetic Regulatory Network in Development and Disease. His research team members investigate the genetic control of cellular signaling and signal transduction mechanisms. Their current efforts concentrate on the

interplay of signaling pathways in the regulation of stem cells, cell fate determination and lineage-specific differentiation. By delineating these regulatory networks underlying normal developmental processes, he hopes to advance the knowledge base of human diseases, leading to novel strategies for molecular and regenerative medicine.

Dr. Hsu has received distinctions including National Kidney Foundation fellowship award, the Northeast Regional Developmental Biology award, the PHS grant awards from the National Institutes of Health, an Idea award from the Department of Defense, the Basil O'Connor award from March of Dimes Foundation, the New York State Stem Cell Science awards, and a Distinguished Alumni award from Taipei Fuhsing Private School. He has served on grant/external review panels for National Institutes of Health, Department of Defense, Alzheimer's Association, Florida Department of Health, Kansas City Area Life Sciences Institute, Telethon Foundation – Italy, Dutch Cancer Society – Netherlands, and the Research Council of University of Ghent – Belgium, Medical Research Council – UK. He has been invited to lecture in international conferences as well as leading research institutions, including Academia Sinica - Taiwan, National Health Research Institutes – Taiwan, RIKEN – Japan, Chinese Academy of Science – China, Harvard University – USA, Cornell University – USA, and Cold Spring Harbor Laboratory – USA. He is currently on the editorial board for International Journal of Women's Health, Cancer Management and Research, Breast Cancer – Targets and Therapy, Human Genetics & Embryology, and Hereditary Genetics.

Session : D2-W2-T2: **Medicine, Public Health, Biomedical Science and Engineering**

Postpartum depression and misregulation of stress signaling in Luman Recruitment Factor (LRF, or CREBRF)-deficient mice

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ABSTRACT

My research interests are centered on the biological function of three mammalian transcription factors, Luman/CREB3, Zhangfei/CREBZF and Luman-recruiting factor LRF that are identified in our lab. They are all involved in cellular stress responses, especially the endoplasmic reticulum stress or commonly called unfolded protein response. My talk today is primarily on the characterization of a recently established LRF gene-knockout mouse model. We found that LRF is essential for the development of maternal behavior, as 80% of entire litters born to LRF-/- females died within 24 hours due to neglect or infanticide, while most of the pups would survive if cross-fostered. Although LRF-/- females responded and retrieved pups to the nest normally, they lacked the instinct in tending to the pups, which is accompanied by hyperactivity and reduced social recognition. The level of prolactin, but not oxytocin or corticosterone, was 45% lower in LRF-/- females in late pregnancy and postpartum than the wild type, with prolactin downstream targets significantly decreased; in the meantime, the stress hormone glucocorticoid signaling was elevated. This observation is supported by our cell-based assays showing that LRF is a suppressor of glucocorticoid receptor. It is known that the glucocorticoid signaling is tightly regulated at the onset of parturition to promote lactation and maternal responsiveness, but the molecular mechanism is unclear. In addition to stimulating milk production, prolactin acts on the hypothalamus to induce maternal behaviors, which is inhibited by glucocorticoids in the anterior pituitary. We thus postulate that, through repression of glucocorticoid receptor activity, LRF plays a key role in hypothalamic-pituitary-adrenal (HPA) axis attenuation in late pregnancy and postpartum and impacts prolactin signaling as well as maternal behaviors.

BIOGRAPHYDr. Ray Lu received his first postgraduate degree at the Beijing Medical University (now the Peking University Health Science Center), studying the relationship between oncogenic activities and tumour metastasis. That was when he first became fascinated with genes. Following his Master's study,

he went to the University of Saskatchewan and obtained his Ph.D. degree in Genetics. His current research interests originate from his postdoctoral work at the Western College of Veterinary Medicine and National Institute of Allergy and Infectious Diseases of NIH. At that time people were very intrigued by a cellular protein, Host Cell Factor 1 (HCF1) which is required by the human herpes virus-1 protein VP16 to initiate the viral gene expression cascade during viral lytic infection. Among several groups competing to identify cellular ligands for HCF1, Dr. Lu was the first to discover two novel human proteins that interact with HCF1, Luman (or CREB3) and Zhangfei (or CREBZF), named after two legendary Chinese warriors. He and others have found that the viral protein VP16 mimics the mode of interaction of Luman/Zhangfei with HCF1. This discovery has led to the hypothesis that Luman and Zhangfei mediate important cellular stress signaling pathways which are targeted by the viral mimicry and are critical for the herpes virus latency/reactivation cycle. Since 2001, Dr. Lu has been a professor at the University of Guelph.

Since Dr. Lu established his own laboratory, his research has focused on the cellular functions of the Luman and Zhangfei proteins. His group has identified yet another novel protein, Luman-recruiting factor (LRF, or CREBRF), which is proved to be a regulator of Luman. They have also produced key evidence implicating all these proteins in animal stress responses, specifically the Unfolded Protein Response (UPR) that is caused by stress in the endoplasmic reticulum. The UPR has now been linked to animal development, cell differentiation, as well as a variety of human diseases such as Alzheimer's, diabetes, cancer and viral infection. While his laboratory continues to elucidate the precise biological roles of Luman, Zhangfei and LRF, their recently established gene knockout mouse models of Luman and LRF displayed interesting behavioral defects. Their current data strongly suggest that these proteins play critical roles in the neuroendocrine response to stress as well as many associated psychiatric/mental diseases such as depression, anxiety and attention deficit disorder. Dr. Lu's research has since been drawn into the exciting and challenging field of molecular neuroscience.

Another new field that Dr. Lu has undertaken recently is to study of the mechanisms of aging using planarians (flat worms). The planarians are potentially a better model system than traditional fruitflies and *C. elegans*. They are working to establish planarians as a new aging model to test the hypothesis that longevity requires multiplex resistance to stress, in hope to identify genes or alleles that confer such multiplex stress resistance and/or promote longevity.

Session : D2-W3-T2: **New Materials Science and Engineering, Nanotechnology**

Session Organizer & Chair

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BIOGRAPHY

Huey-Liang Hwang (黃惠良) was born in Mainland China in 1946. He received the B.S.E. and M.S.E. degree in Electrical Engineering from National Cheng Kung University, Tainan, Taiwan, ROC in 1969 and 1971, respectively. In 1976 he was awarded the Ph.D degree in Solar Cells from Brown University, Providence R.I., USA. Since then he joined the faculty of the Electrical Engineering Department of National Tsing Hua University, Hsin-chu,Taiwan. His research areas include Giant Area Microelectronics (solar cells, displays, medical imaging devices and etc.) and ULSI. He was a pioneer researcher in Ternary Chalcopyrite Semiconductors and he has published more than 440 papers in scientific journals and conference proceedings. He was the Conference Chairmen of the first International Symposium on Electronic Devices and Materials(1980), Non-stoichiometry in Semiconductors(1991), 7th International Conference on Solid Films and Surfaces (1994) and 12th International Conference on Ternary and Multinary Compounds(2000).

Dr. Hwang was elected Fellow of IEEE in 1994 for "contributions in fundamental understanding of photovoltaic and semiconductor materials and devices", he was elected Fellow of National Science Council of Republic of China for his distiguished research, in 1996 he was also elected Fellow of American Vacuum Society in 1998 for "contributions for pioneering and sysmatical work on thin film photovoltaic materials and the fundamental understanding of hydrogenated Si films". Dr. Hwang was elected Member of Asia Pacific Academy of Materials (APAM) in 1998, and in 2011 he was elected President of APAM.

Dr. Hwang was the founders of the Electrical Engineering Departments of National Tsing Hua University and National Chung Hsing University, Tze-chiang Foundation of Science and Technology (the most re-nowned high tech engineers training center in Taiwan), and Sinonar Corp. (the 1st Amorphous Si Solar Cell manufacturer in Taiwan) 、Cando Corp. (Cando is the world front ranking manufacturer in Color

Filter & touch panels)、IDTI (Integrated Digital Technology Inc, the 1st LCD Design House in Taiwan) , Lofsolar (the world uniue color solar cell corp.) all of the four companies are located in Hsin-Chu Science Industrial Park. He was the Visiting Professors of the University of Stuttgart, University of Tokyo, Danish Technical University, Stanford University and Hong Kong University of Science and Technology (HKUST). He was nominated as the 1st Y.Z. Hsu Scientific (the 1st Chair Professor of Nano Science in Taiwan) since 2002, and Tsing Hua Chair Professor of Electrical Engineering and Computer Science since 2003. Since Feburary 2012 he was appointed as the Star River Chair Professor and Director of Photovoltaic Research Center of Shanghai Jiaotong University.

Session : D2-W3-T2: **New Materials Science and Engineering, Nanotechnology**

A Framework of Nano Crystal Growth

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ABSTRACT

Crystal growth on solid has been a focus of research since 1950s. However, the growth of crystalline nanostructures on solid, being a part of the nano fashion, has defied the established theory of crystal growth and has gone on without a systematic theory. Recently, the speaker and his associates have developed a theoretical framework of nano crystal growth, using a combination of atomistic simulations, analytical formulations, and physical vapor deposition experiments. This framework builds on three advancements of crystal growth principles: (1) the surface diffusion over steps sensitively depends on step thickness; (2) multiple-layer steps can be kinetically stabilized, in contrast to the classical theory of Schwoebel and Shipsey (1966); and (3) a characteristic length scale develops from the coupling of diffusion kinetics and kinetic stability of multiple-layer steps.

BIOGRAPHY

Hanchen Huang was born in Longhua, Hebei Province of China in 1965. He was awarded a BS in physics by Hebei Normal University in 1984; an MS in theoretical nuclear physics by Institute of Atomic Energy, Chinese Academic of Sciences in 1987; and a PhD in nuclear engineering by University of California at Los Angeles in 1995. Hanchen's primary field of study is the growth of nano crystals, particularly the development of a theoretical framework of the growth process. In addition, he also works on mechanics, radiation damage, and oxidation of nanostructured materials.

He has been a Connecticut Clean Energy Fund Professor in Sustainable Energy (formerly School of Engineering Named Professor) at the University of Connecticut at Storrs since 2009. Before this appointment, he was Associate and then Full Professor at Rensselaer Polytechnic Institute, Assistant and then Associate Professor at Hong Kong Polytechnic University, Post-doc Fellow and then Term Technical Staff Member at Lawrence Livermore National Laboratory; and Junior Physicist at Institute of Atomic Energy, Chinese Academy of Sciences. He has held a range of visiting positions such as the Royal Society of London KTP Visiting Professor at Hong Kong Polytechnic University, Professor Invited at Metz University of France, Advisory Professor at Harbin Institute of Technology of China, Visiting Scientist at Lawrence Livermore

National Laboratory, and Advisory Committee Member at Institute of Physics of Chinese Academy of Sciences. He has published more than 100 refereed journal papers, which have been cited for more than 2000 times according SCI; and delivered more than 100 keynote/invited talks. Two publications relevant to this talk are: (1) Liu, Huang, and Woo, Applied Physics Letters 80, 3295 (2002) – which has been highlighted in Nature (2002); and (2) Zhou and Huang, Physical Review Letters 101, 266102 (2008) – which has been featured in the DoE Office of Science Weekly (2009) with a title "Surface Science Breakthrough: Reason for Nanorod Growth Discovered".

Dr. Huang is an elected member of Connecticut Academy of Science and Engineering (www.ctcase.org). He has chaired various committees in professional societies such as the Nanotechnology Committee of USACM and the Young Investigator Award Committee (experiment) of ICCES; and also serves as a member in many committees such as the NanoEngineering for Energy & Sustainability (NEES) Steering Committee of ASME. He has been an associate editor of Journal of Engineering Materials and Technology since 2009; and has served as a member of multiple editorial boards and a guest editor of multiple journals such as MRS Bulletin. He has received the Outstanding Faculty Advisor Award at the School of Engineering, University of Connecticut; the School of Engineering Research Excellence Award, Rensselaer Polytechnic Institute; and the President's Award for Outstanding Achievement in Research and Scholarship, Hong Kong Polytechnic University.

Session : D2-W3-T2: **New Materials Science and Engineering, Nanotechnology**

Magnified Hard X-ray Imaging at Nano Scales

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ABSTRACT

Hard x-rays of angstrom wavelengths have been used extensively in imaging techniques by shadow projection without magnification. In some cases, x-ray lens can be constructed by diffraction based zone plates. The "line width" of zone plates restricts the wavelengths to be in the soft x-ray range, which are more absorptive and much less penetrating. A possible solution to this problem is to use the Borrmann effect caused by dynamic x-ray diffraction of a nearly perfect crystal.

In the case of usual Bragg diffraction of a crystal, the diffracted beam follows Bragg angle 2è. When the crystal is nearly perfect, less absorbing, and much larger than the incoming beam size, however, inside the crystal the diffracted beam will propagate along the crystal planes, rather than along the Bragg angle. If the incident beam is tilted slightly within the Darwin width, which is the incident angle range (in the order of 10^{-5} arc) within which there is a total reflection when no absorption is involved, the diffracted beam will be split into two symmetrical lines, corresponding to á and â branches. Their propagating directions will be varied drastically within the crystal from the crystal planes to the Bragg angle 2è, covering half of the Borrman Fan on each side. This leads to an angular magnification of 100,000 times.

Spatial modulation of hard x-ray beam profiles can thus be achieved, using the "Borrmann pyramid" formed in dual Bragg diffraction of a single crystal, where a small angular change of the incident beam is magnified to span the entire pyramid base. I has been demonstrated using hard x rays by the linear shift of a micrometer sized mask; the partial blockade of a two micron beam; and the millimeter shadow of a nano-scale gold strip, which shows the potential application of Borrmann pyramids in the form of an enlarged x-ray image. The possibility of magnified x-ray imaging was also explored, by the near-field attenuation of a sample intercepting a spherical wave-front, and verified by experiments in one-dimension as well as numerical simulation.

BIOGRAPHY

Born in Shanghai, China in December 1957, received his M.S. and Ph.D of physics from University of Pittsburgh in 1984 and 1987, respectively. Also received Doc Eng Sci in materials science and engineering from Columbia University (New York) in 1989.

He became Assistant Professor in 1991, Associate Professor in 1996 and Professor in 2002 of Materials Science and Engineering Department, McMaster University, Canada

Dr. Xu has been a member of Sigma Xi since 1989, and has published over 90 journal papers and a few book chapters.

Session : D2-W3-T2: New Materials Science and Engineering, Nanotechnology

SELECTIVELY TRANSPARENT AND CONDUCTING PHOTONIC CRYSTAL FOR ENHANCED PHOTOVOLTAICS AND ALLIED DEVICES

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ABSTRACT

Photonic crystals offer the ability to control the spectral flow of light and accordingly present a multitude of unique characteristics for efficiency enhancement in photovoltaics ranging from its photonic band gap properties, to its slow photon effects, to exceeding the ray-optic light-trapping limit [1]. In its simplest configuration, one-dimensional photonic crystals, otherwise known as Bragg reflectors, have been investigated for their benefits as a back reflector in single junction photovoltaic devices. Recently, it has been proposed that photonic crystals can be designed to strategically split the solar spectrum and used as intermediate reflectors in tandem or multijunction solar cells provided that the photonic crystal is synthesized entirely out of materials that are both transparent and electrically conducting [2]. In this context, a well-conceived conducting Bragg reflector would reflect incident higher energy frequencies towards the upper cell while transmitting the lower energy part of the spectrum towards the lower cell.

We have recently proposed a novel one-dimensional photonic crystal, called selectively transparent and conducting photonic crystal (STCPC), which integrates tunable optical and electrical properties amenable to enhancing the performance of next-generation photovoltaic devices [3]. A significant advance over existing 1D PCs, STCPCs combine intense wavelength selective broadband reflectance with the transmissive and electrical conductive properties of sputtered transparent conducting oxides. Optical tunability is demonstrated to extend over the visible wavelengths and into the infrared while providing electrical conductivity necessary for its integration in optoelectronic devices. Exploring its potential as an intermediate reflector in tandem thin film amorphous-microcrystalline silicon solar cells, the STCPC is shown to substantially improve the cell performance. Incorporation of the STCPC in other photovoltaic cell concepts is also found to enhance the cell conversion efficiency. Its viability in other allied devices is also illustrated. The STCPC, given its simple bilayer structure, is scalable for large area applications.

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BIOGRAPHY

Nazir P. Kherani, Associate Professor
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Nazir Kherani is currently leading the Advanced Photovoltaics and Devices research group at the University of Toronto which focuses on semiconductor and nano-structured materials and devices R&D. Specific areas of recent research include: heterojunction and thin film silicon photovoltaics, photonic crystal photovoltaics, optical coatings, photonic materials, and micropower sources and sensors. He is a recipient of a number of awards which include: the New Opportunities Award (2004); Early Researcher Award - equivalent to the US Presidential Early Career Award (2006); the Ontario Research Foundation - Research Excellence Award for High-Efficiency Silicon Photovoltaics (2008); and the Engineering Medal in Research and Development (2009). He has over one hundred seventy publications including 5 US patents and 1 co-authored book.

Dr. Kherani is a graduate from the University of Toronto: PhD in Physics (1994), MASc in Nuclear Reactor Physics (1983), and BASc (Hon) in Engineering Science (1982). He completed two industrial research sabbaticals, one with Los Alamos National Laboratory (1986) and the other with the Institute for Plasma Physics, Kernforschungsanalage Jülich, Germany (1987), during his industrial tenure at the Research Division of Ontario Hydro. He joined University of Toronto in 2002 on a contractually limited term appointment, and in 2006 was jointly appointed as an Associate Professor in the Departments of Electrical & Computer Engineering and Materials Science & Engineering.

Session : ***D2-W4-T2:*** **Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)**

Session Organizer & Chair

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BIOGRAPHY

Li-Chun Wang (M'96 – SM'06 – F'11) received the B.S. degree from National Chiao Tung University, Taiwan, R. O. C. in 1986, the M.S. degree from National Taiwan University in 1988, and the Ms. Sci. and Ph. D. degrees from the Georgia Institute of Technology , Atlanta, in 1995, and 1996, respectively, all in electrical engineering.

From 1990 to 1992, he was with the Telecommunications Laboratories of the Ministry of Transportations and Communications in Taiwan (currently the Telecom Labs of Chunghwa Telecom Co.). In 1995, he was affiliated with Bell Northern Research of Northern Telecom, Inc., Richardson, TX. From 1996 to 2000, he was with AT&T Laboratories, where he was a Senior Technical Staff Member in the Wireless Communications Research Department. In August 2000, he has joined the Department of Electrical Engineering of National Chiao Tung University in Taiwan and has been promoted to the full professor since 2005.

His current research interests are in the areas of radio resource management and cross-layer optimization techniques for wireless systems, heterogeneous wireless network design, and cloud computing for mobile applications.

He was elected to the IEEE Fellow grade in 2011 for his contributions in cellular architectures and radio resource management in wireless net- works. Dr. Wang was a co-recipient (with Gordon L. St¨uber and Chin-Tau Lea) of the 1997 IEEE Jack Neubauer Best Paper Award for his paper "Architecture Design,Frequency Planning, and Performance Analysis for a Microcell/Macrocell Overlaying System," IEEE Transactions on Vehicular Technology, vol. 46, no. 4, pp. 836-848, 1997. He has published over 180 journal and international conference papers. He served as an Associate Editor for the IEEE Trans. on Wireless Communications from 2001 to 2005, the Guest Editor of Special Issue on "Mobile Computing and Networking" for IEEE Journal on Selected Areas in Communications in 2005 and on "Radio Resource Manage-

ment and Protocol Engineering in Future IEEE Broadband Networks" for IEEE Wireless Communications Magazine in 2006. He is holding nine US patents.

Session : D2-W4-T2: **Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)**

Malware Propagation in Online Social Networks and Detection Mechanisms

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ABSTRACT

Online social networks (OSNs) such as Facebook, Twitter and MySpace have provided hundreds of millions of people worldwide with a means to connect and communicate with their friends, family and colleagues geographically distributed all around the world. The popularity and wide spread usage of OSNs have also attracted attackers and hackers who would use OSNs as a platform to propagate malicious software (malware) from one user's computer to another's. The focus of this talk is on malware propagation in OSNs. I will first present the characteristics of OSNs and three malware propagation techniques in OSNs, namely cross-site scripting, Trojan and clickjacking types. I will then discuss the propagation characteristics of the above malware in OSNs and different mechanisms for detecting malware in OSNs.

BIOGRAPHY

Prof. Uyen Trang Nguyen received her Bachelor of Computer Science and Master of Computer Science degrees in 1993 and 1997, respectively, from Concordia University, Montreal, Canada. She completed her Ph.D. degree at the University of Toronto, Canada, in 2003. From 1995 to 1997 she was a software engineer at Nortel Networks, Montreal, Canada. She joined the Department of Computer Science and Engineering at York University, Toronto, Canada, in 2002 and is currently an Associate Professor. Her research interests are in the areas of mobile computing, wireless networking, multimedia applications and information security. She is on the editorial board of Communications Journal published by ACTA Press. She was a program co-chair of the 3rd International Conference on Mobile, Ubiquitous, and Intelligent Computing (MUSIC 2012). She was also a program vice-chair of the 13th IEEE International Conference on High Performance Computing and Communications (HPCC 2011) and the 7th International Conference on Future Information Technology (FutureTech 2012).

*Session : **D2-W4-T2:*** **Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)**

Gamma Codes: A Low-Overhead Low-Complexity Network Coding Solution

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ABSTRACT
Network coding is a technique suggested to improve the throughput of existing networks by enabling network nodes to perform coding and recoding on their received part of the message. The most common and practical network coding scheme is Random linear combination of the message packets is. However, existing linear network codes either suffer from high decoding complexity or from significant overhead. In this work, a low-complexity low-overhead linear network coding solutions is presented.

BIOGRAPHY

Masoud Ardakani received the B.Sc. degree from Isfahan University of Technology in 1994, the M.Sc. degree from Tehran University in 1997 and the Ph.D. degree from the University of Toronto in 2004, all in Electrical Engineering. He was a Postdoctoral fellow at the University of Toronto from 2004 to 2005. He is currently an Associate Professor of Electrical and Computer Engineering and Alberta Innovates New Faculty at the University of Alberta. His research interests are in the general area of digital communications, codes defined on graphs and iterative decoding techniques.
He serves as an Associate Editor for the IEEE TRANSACTIONS ON WIRELESS COMMUNICATIONS and the IEEE COMMUNICATION LETTERS.

Session : D2-W4-T2: **Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)**

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*Session : **D2-W1-T3:*** **New Green Energy/Environment/Sustainability, Intelligent/Electric Vehicle**

Session Organizer & Chair

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Session : D2-W1-T3: **New Green Energy/Environment/Sustainability, Intelligent/Electric Vehicle**

Exploring the Opportunity of Using Electric Vehicles as an Energy Distribution Network

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ABSTRACT

Vehicle-to-grid provides a viable approach that feeds the battery energy stored in electric vehicles (EVs) back to the power grid. Meanwhile, since EVs are mobile, the energy in EVs can be easily transported from one place to another. Based on these two observations, we introduce a novel concept called *EV energy network* for energy transmission and distribution using EVs. In this talk, I will introduce a concrete example to illustrate the usage of an EV energy network, and then study the potential opportunity of using electric vehicles as an energy distribution network.

BIOGRAPHY

Ting Zhu is an assistant professor in the Department of Computer Science at Binghamton University. He received M.S. and PhD degrees in computer science from the University of Minnesota - Twin Cities. He obtained B.E. and M.E. degrees in electronic science and technology from Zhejiang University, Hangzhou, China. His research interests are in systems, energy, communication and networking.

He worked with the distinguished Professor Don Towsley as a Computing Innovation Fellow from 2010 to 2011. He also worked as a research intern at Motorola Research lab in the summer of 2006 and 2007. He has published four book chapters and more than 30 peer-reviewed journal and conference papers, including IEEE/ACM Transactions on Networking, ACM Transactions on Sensor Networks, SenSys, NSDI, MobiSys, BuildSys, and INFOCOM.

Dr. Zhu is a founding member of IEEE Communications Society Technical Subcommittee on Green Communications and Computing. He serves on the editorial board for multiple journals, including the Journal of Ad Hoc & Sensor Wireless Networks and Journal of Mobile Computing.

*Session : **D2-W1-T3:*** **New Green Energy/Environment/Sustainability, Intelligent/Electric Vehicle**

Electrodeposition of Gold, Silver on Carbon Nanotube Thin Films

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ABSTRACT

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BIOGRAPHY

Jie Yu obtained the B.S. and M.S. degrees in Bioengineering and Biochemical Engineering from Zhejiang University in China in 2000 and 2003, respectively. He received the M.S. and Ph.D. degrees in Chemical Engineering from The University of Texas at Austin in 2005 and 2007, respectively. He is currently an Assistant Professor in Department of Chemical Engineering at McMaster University in Canada and a faculty member of McMaster Advanced Control Consortium (MACC) and McMaster Institute of Energy Studies (MIES). Prior to joining McMaster, he worked as a Senior Research Scientist and Subject Matter Expert at Shell Technology Center in U.S. for over four years.

His research interests include process modeling, control and optimization, multivariate statistics, data mining and machine learning, bioinformatics and systems biology, computer-aided drug design, energy informatics, energy systems engineering, biofuels, etc. He has published more than 20 articles in peer-reviewed journals including the top-rank journals in his fields such as *AIChE Journal, Chemical Engineering Science, Industrial & Engineering Chemistry Research, Journal of Process Control, IIE Transactions, Biochemical Engineering Journal, Applied Microbiology and Biotechnology, etc.* Also he has been elected as Associate Editor for *IEEE Transactions on Control Systems Technology*, Associate Editor for IFAC Journal*Control Engineering Practice,* Editorial Board Member for *International Journal of Automation and Control* and *International Journal of Condition Monitoring and Diagnostic Engineering Management*, invited reviewer for over 20 international journals, and grant panelist or reviewer for U.S. National Science Foundation (NSF), U.S. Depart-

ment of Energy (DOE) , U.S. National Institute of Health (NIH), Natural Science and Engineering Research Council (NSERC) of Canada and IEEE Control Systems Society (CSS). He is listed in Who's Who in America, a full member of Sigma Xi – The Scientific Research Society, Phi Lambda Upsilon –The National Honorary Chemical Society, AIChE, CSChE and IEEE, and a recipient of several prestigious awards including CPC/FOCAPO Young Professor Travel Award, Third Prize of Science & Technology Award by China Association of Medicine, Third Prize of Science & Technology Award by Zhejiang Province Government of China, Special Recognition Award (SRA) by Shell, University Preemptive Graduate Student Fellowship by University of Texas at Austin, etc. He has been invited to give industrial talks to over 10 global companies.

Session : D2-W1-T3: **New Green Energy/Environment/Sustainability, Intelligent/Electric Vehicle**

Ching-Fuh Lin, PhD (林清富 教授)
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ABSTRACT

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BIOGRAPHY

Prof. Ching-Fuh Lin obtained the B.S. degree from National Taiwan University in 1983, and the M.S. and Ph.D. degrees from Cornell University, Ithaca, NY, in 1989 and 1993, respectively, all in electrical engineering.

He is now the Director of Innovative Photonics Advanced Research Center (i-PARC), the Chairman of Graduate Institute of Photonics and Optoelectronics and a joint professor in the Graduate Institute of Photonics and Optoelectronics, Graduate Institute of Electronics Engineering, and Department of Electrical Engineering at National Taiwan University. His research interests include organic-inorganic composite thin-film solar cells and optoelectronic devices, single-crystal Si thin-film solar cells, Si-based photonics, and physics in broadband semiconductor lasers and optical amplifiers.

He is a Fellow of IEEE, a Fellow of SPIE, Member of Asia-Pacific Academy of Materials, and a member of OSA. He has published over 140 journal papers and more than 350 conference papers and hold over 30 patents. He is also the sole author of a book, Optical Components for Communications: Principles and Applications, published by Kluwer Academic Publishers (USA 2004), and co-author/edit a book, Or-

ganic, Inorganic and Hybrid Solar Cells – from Principles to Practices, to be published by John Wiley & Sons, Inc. and IEEE Press. He had obtained the Distinguished Research Award and several Class A Research Awards from National Science Council of Taiwan, ROC, and the Outstanding Electrical Engineering Professor Award from the Chinese Institute of Electrical Engineering. He and his students had also been granted the 18th Acer Research Golden Award, 18th Acer Research Excellent Award, 14th Acer Research Excellent Award, Collins Thesis Awards for years of 1998, 2001, 2002, 2004, 2007, 2009, and 2010.

Prof. Lin has served as the Chair of IEEE LEOS Chapter Taipei Section, the Board member of the 17th IEEE Taipei Section, the Evaluation Committee member of Higher Education Evaluating & Accreditation Council of Taiwan, the Council member of the 10th Optical Engineering Society of ROC, and the Convener in the area of Electronics and Information for the Conventional Industry Technology Development Project in the Bureau of Industry, Ministry of Economics, ROC. He has also served as Project Instructors of the National Programs in the nano-science and nano- technology and the renewable energy (solar energy).

*Session : **D2-W2-T3:*** **Medicine, Public Health, Biomedical Science and Engineering**

Session Organizer & Chair

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BIOGRAPHY

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Scientific Director, University of Ottawa Heart Institute
Professor of Medicine, University of Ottawa
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President of International Society of Heart Failure of World Heart Federation

Dr. Liu graduated from the University of Toronto Faculty of Medicine. During his cardiology training, he also pursued a post-doctoral fellowship in cardiovascular imaging and immunology at the Massachusetts General Hospital of Harvard Medical School, and clinical epidemiology at McMaster University. In 1985 he joined the Division of Cardiology at the Toronto General Hospital, University of Toronto. Since 1999, he has been the Heart & Stroke/Polo Chair Professor at the University Health Network, and serves as the inaugural Director of the Heart & Stroke/Richard Lewar Centre of Excellence in Cardiovascular Research at the University of Toronto. Since 2005, he was the Scientific Director at CIHR's Institute of Circulatory & Respiratory Health, the major federal funding agency that supports biomedical research in Canada. At CIHR, he designed a number of innovative research programs and leveraged funding for several major research networks and consortia across the country and internationally. He served on the executive committee and provided research leadership for the Canadian Heart Health Strategy, Canadian Lung Health Framework, and National Sodium Reduction Strategies with the federal and provincial governments. Since this past July, Dr. Liu has also assume the role of Scientific Director of the University of Ottawa Heart Institute, a prestigious institution that is a leader in personalized medicine and imaging. He

will be working with members and stakeholders to enhance further the excellence and global impact of research and innovation of the Ottawa Heart Institute.

Dr. Liu focuses his own research on the pathophysiology and clinical outcomes of heart failure from bench to bedside. His team has elucidated the role of inflammation in changing heart structure and function, and potential novel treatment targets in heart failure. His laboratory has also identified how viruses and bacteria can accelerate heart failure and coronary artery disease, and is developing novel vaccines to prevent these complications. With support from Genome Canada, CIHR group and team programs, and Ontario Research Global Leadership Fund – he is also pursuing novel biomarkers and therapeutic targets for early cardiovascular disease identification and intervention. He has published over 320 peer reviewed articles in high impact journals, and his work has been cited over 20,000 times in the literature. In addition, he co-chaired a series of Canadian Cardiovascular Society Consensus Guideline Recommendations for heart failure care.

He is the recipient of numerous awards in recognition of his scientific contributions and accomplishments including the Rick Gallop Research Award Recognizing Research Excellence from the Heart & Stroke Foundation of Ontario (2003), the Research Achievement Award from the Canadian Cardiovascular Society (CCS, 2003), Visiting Research Professor Award from the Royal College of Physicians and Surgeons (2005), Extramural Award of Merit from the American College of Cardiology (2005), the Jean Davignon Cardiometabolic Award (2008), and Lifetime Achievement Award from CCS (2011), and Distinguished Lecture Award of the ICRH at CIHR (2012). He has served as the scientific program chair for the Canadian Cardiovascular Society, Heart Failure Society of America, International Human Proteomic Organization, and World Heart Federation.

Currently he is the Director of the National C-CHANGE Initiative, harmonizing and integrating cardiovascular preventive guidelines for both the professional and patients, and develops strategies for implementation. This just has been adopted as the national standards across all provinces in Canada for implementation by the Ministries of Health. He is also President of the International Society of Heart Failure of the World Heart Federation (WHF), and also serves on the Research and Policy Committees of WHF, coordinating global fight against heart disease and promoting its prevention.

***Session : D2-W2-T3:* Medicine, Public Health, Biomedical Science and Engineering**

Emerging Role of microRNAs in Preeclampsia

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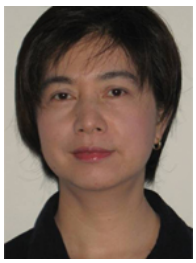
ABSTRACT

Preeclampsia is a disease of pregnancy characterized by hypertension and proteinuria. It affects about 7–10% of pregnancies worldwide and is a leading cause of maternal and perinatal morbidity and mortality. The pathogenesis of preeclampsia is not well understood, however, defects in placental development have been linked to preeclampsia. MicroRNAs (miRNAs) are small noncoding RNAs that control many developmental and physiological processes. A major mechanism by which miRNAs regulate gene expression is via partial base pairing to the 3'-untranslated region (3'UTR) of the target mRNAs to repress their translation and/or to induce their degradation.

We have been investigating the expression patten of miRNAs in human placenta throughout different stages of gestation and in normal and preeclamptic pregnancies. We have identified a number of miRNAs that are dysregulated in placenta and plasma of women with preeclampsia. Using cell lines derived from placental trophoblast cells and explants of placental tissues, we demonstrate that several dysregulated miRNAs target transforming growth factor-beta signalling pathways to regulate trophoblast cell proliferation, survival, migration, and invasion. These studies suggest that miRNAs are involved in the regulation of placental development and their aberrant expression contributes to the pathogenesis of preeclampsia. Since placental miRNAs are detectable in maternal plasma, it is possible that they can be used as biomarkers and/or therapeutic targets for preeclampsia.

BIOGRAPHY



Dr. Chun Peng was born in Chaozhou, Guangdong, China. She did her undergraduate and MSc studies at Sun Yat-Sen University in Guangzhou, China. She received her BSc in Zoology in 1983 and MSc in Comparative Endocrinology in 1986, both from Sun Yat-Sen University. Dr. Peng came to Canada in 1988 and completed her PhD study in Fish Endocrinology. In 1993, she received her PhD degree from the University of Alberta.

Following her postdoctoral training in the Department of Obstetrics and Gynecology, University of British Columbia, she joined the Department of Biology, York University in Toronto as an Assistant Professor.

She was promoted to Associate Professor in 2001 and Full Professor in 2007. Her research is focused on the role of hormones and growth factors, particularly members of the transforming growth factor-beta superfamily, in female reproductive systems. Currently, she is funded by Natural Science and Engineering Research Council (NSERC) to study the regulation of ovarian follicle development and oocyte maturation in zebrafish. She also holds grants from Canadian Institutes of Health Research (CIHR) to investigate the role of growth factors, cyclin G2 and microRNAs in ovarian cancer and the role of microRNAs in placental development and preeclampsia.

Dr. Peng has received many awards for her work, including NSERC and CIHR fellowships (1993-95), NSERC Women's Faculty Award (1995-2000), Premier's Research Excellent Award (2001-06), Ontario Women's Health Council/CIHR Mid-Career Award (2005-2010), and Chinese Canadian Legend Award (2011). She is a member of the Endocrine Society and Society for the Study of Reproduction. She serves as an associate editor or an editorial board member for several scientific journal. She has also served in grant review panels for CIHR and NSERC.

*Session : **D2-W2-T3:*** **Medicine, Public Health, Biomedical Science and Engineering**

Small Molecules as Inducers to Direct Stem Cell Differentiation

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ABSTRACT

Pluripotent stem cells have the ability to differentiate into many types of cell lineages including cardiac and skeletal myocytes. Nevertheless, the frequency of stem cells generates a specific lineage is relatively low, thus comes to the need of small molecule inducers to direct lineage specification. Mouse stem cells have been used for decades as a model system to study the molecular mechanisms of cell differentiation. They respond well to development cues *in vitro,* to differentiate into cell types of all three primary germ layers. The commitment of stem cells into cardiac and skeletal muscle lineage recapitulates closely the cellular and molecular processes occurring in early embryogenesis. Inducing stem cells with regulatory signals important for embryonic development, such as nuclear receptor agonists, enhances their myogenic commitment. However, many challenges remain, and perhaps foremost, is how to generate the desired progenitors in high yields and large quantities for cell-based therapies. Understanding on a molecular level, how different signaling pathways and chromatin dynamics converge during stem cell differentiation to direct lineage specification is imperative for identifying efficient small molecule inducers and for developing non-toxic protocols to obtain sufficient amount of progenitors for potential clinical applications. To this end, mouse stem cells will continue to serve as an invaluable system due to their close resemblance to myogenic differentiation *in vivo,* and their ease of manipulation in experimental procedures.

BIOGRAPHY

Qiao Li / 李樵 received her M.D. in 1982 and her M.Sc. in 1986 from the Norman Bethune University of Medical Sciences of China. She then received her Ph.D. in 1996 from the Karolinska Institute of Sweden, and continued her research in the field of chromatin and gene regulation with Dr. Alan Wolffe at the Na-

tional Institutes of Health of U.S.A. from 1996 to 1999. Thereafter, she relocated to Canada and established her independent research program at the University of Ottawa.

Dr. Li has devoted her research efforts to the regulatory mechanisms of gene expression. She has made important contributions to the understanding of how chromatin dynamics and various signaling pathways crosstalk in cells and how cells respond to regulatory signals in the context of chromatin. Recently, her research team has focused on how chromatin dynamics and different signaling pathways converge to direct stem cell differentiation. Her long term goal is to develop approaches and efficient non-toxic protocols to direct stem cell differentiation for therapeutic uses in devastating diseases, including musculoskeletal and cardiovascular diseases. She has received many awards and research grants from the Canadian Institute for Health Research, the National Science and Engineering Research Council, Canada Foundation for Innovation, Ontario Innovation Trust, and the Cancer research Society. She has authored hundred of research articles, book chapters and abstracts, and has delivered many invited presentations on various aspects of her research discoveries.

Session : D2-W2-T3: **Medicine, Public Health, Biomedical Science and Engineering**

Hsueh-Fen Juan

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ABSTRACT

Ectopic expression of F1Fo-ATP synthase on the plasma membrane has previously been described in several different cancer cell types and may serve as a tumor marker, but its role remains unclear. In this study, we demonstrate the presence of ectopic ATP synthase on the plasma membrane of lung adenocarcinoma cells. Applying ATP synthase inhibitor citreoviridin can induce cell cycle arrest and inhibit the proliferation and anchorage-independent growth of lung cancer cells. Based on the protein expression profiles following citreoviridin treatment, we propose a protein-protein interaction network implying citreoviridin induces an unfolded protein response (UPR) with phosphorylation of a protein synthesis regulator, eukaryotic translation initiation factor 2α (eIF2α) leading to inhibition on cell growth. Furthermore, citreoviridin-enhanced eIF2α phosphorylation could be reversed by knockdown of PKR-like ER kinase (PERK) and antioxidant N-acetylcysteine, indicating reactive oxygen species (ROS) boost UPR under citreoviridin treatment. Elevation of UPR and ROS generates a positive feedback loop and inhibits cell proliferation in a convergent way. These findings reveal the molecular role and the therapeutic potential of inhibiting ectopic ATP synthase in targeting lung cancer cells.

BIOGRAPHY

Hsueh-Fen Juan was born in 1969, Miao-Li, Taiwan. She received her BS and MS degree in Botany and PhD in Biochemical Sciences from National Taiwan University (NTU) in 1999. She worked as a research scientist in the Japan International Research Center for Agricultural Sciences (Tsukuba, Japan) during 2000-2001 and a postdoctoral research fellow in the Institute of Biological Chemistry, Academia Sinica (Taipei, Taiwan) during 2001-2002.

She started her academic career in the Department of Chemical Engineering, National Taipei University of Technology as an assistant professor and in the Department of Computer Science and Information Engineering at NTU as an adjunct assistant professor in 2002. She moved to NTU in 2004 as an assistant professor in the Department of Life Science and the Institute of Molecular and Cellular Biology. She was promoted to be an associate professor in 2006 and full professor in 2009. Dr. Juan is currently working on cancer systems biology, integrating transcriptomics, proteomics and bioinformatics for biomarker and drug discovery.

Prof. Juan has developed a number of novel methods to advance systems-biology research and applied such approach for drug discovery and elucidating molecular mechanism of drug responses in cancer cells. In the past five years, she has published more than 36 journal papers including prestigious journals such as *Proc. Natl. Acad. Sci. USA*, *Oncogene*, *J. Proteome Res.*, *Proteomics*, *Bioinformatics,* and edited a scientific book entitled as *Systems Biology: Applications in cancer-related research* (2012). She also serves as the reviewer of thirty various journals like *Molecular and Cellular Proteomics* (ASBMB), *Proteomics* (Wiley-VCH), *BMC Bioinformatics*, and has organized several international systems biology and bioinformatics symposiums. In 2008, she was awarded as Taiwan's Ten Outstanding Young Persons. In 2011, she received FY2011 JSPS Invitation Fellowship Program for Research in Japan. She currently serves as the Board Member in the Taiwan Society for Biochemistry and Molecular Biology, Taiwan Proteomics Society, Taiwan Bioinformatics and Systems Biology Society.

*Session : **D2-W3-T3:*** **New Materials Science and Engineering, Nanotechnology**

Session Organizer & Chair

Huey-Liang Hwang, PhD (黃惠良 教授**)**

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BIOGRAPHY

Huey-Liang Hwang (黃惠良) was born in Mainland China in 1946. He received the B.S.E. and M.S.E. degree in Electrical Engineering from National Cheng Kung University, Tainan, Taiwan, ROC in 1969 and 1971, respectively. In 1976 he was awarded the Ph.D degree in Solar Cells from Brown University, Providence R.I., USA. Since then he joined the faculty of the Electrical Engineering Department of National Tsing Hua University, Hsin-chu,Taiwan. His research areas include Giant Area Microelectronics (solar cells, displays, medical imaging devices and etc.) and ULSI. He was a pioneer researcher in Ternary Chalcopyrite Semiconductors and he has published more than 440 papers in scientific journals and conference proceedings. He was the Conference Chairmen of the first International Symposium on Electronic Devices and Materials(1980), Non-stoichiometry in Semiconductors(1991), 7th International Conference on Solid Films and Surfaces (1994) and 12th International Conference on Ternary and Multinary Compounds(2000).

Dr. Hwang was elected Fellow of IEEE in 1994 for "contributions in fundamental understanding of photovoltaic and semiconductor materials and devices", he was elected Fellow of National Science Council of Republic of China for his distiguished research, in 1996 he was also elected Fellow of American Vacuum Society in 1998 for "contributions for pioneering and sysmatical work on thin film photovoltaic materials and the fundamental understanding of hydrogenated Si films". Dr. Hwang was elected Member of Asia Pacific Academy of Materials (APAM) in 1998, and in 2011 he was elected President of APAM.

Dr. Hwang was the founders of the Electrical Engineering Departments of National Tsing Hua University and National Chung Hsing University, Tze-chiang Foundation of Science and Technology (the most re-nowned high tech engineers training center in Taiwan), and Sinonar Corp. (the 1st Amorphous Si Solar Cell manufacturer in Taiwan) 、Cando Corp. (Cando is the world front ranking manufacturer in Color

Filter & touch panels)、IDTI (Integrated Digital Technology Inc, the 1st LCD Design House in Taiwan) , Lofsolar (the world uniue color solar cell corp.) all of the four companies are located in Hsin-Chu Science Industrial Park. He was the Visiting Professors of the University of Stuttgart, University of Tokyo, Danish Technical University, Stanford University and Hong Kong University of Science and Technology (HKUST). He was nominated as the 1st Y.Z. Hsu Scientific (the 1st Chair Professor of Nano Science in Taiwan) since 2002, and Tsing Hua Chair Professor of Electrical Engineering and Computer Science since 2003. Since Feburary 2012 he was appointed as the Star River Chair Professor and Director of Photovoltaic Research Center of Shanghai Jiaotong University.

Session : D2-W3-T3: **New Materials Science and Engineering, Nanotechnology**

Polyoxometalate Modified Carbon Nanotubes for Electrochemical Capacitors

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ABSTRACT

In electrochemical capacitors (EC), the electrode materials are classified into two categories: electrochemical double layer capacitance (EDLC) and pseudocapacitance. In our approach, we aim to leverage both EDLC and pseudocapacitance through chemical modifications of multi-wall carbon nanotubes (MWCNTs) with polyoxometalates (POMs) to enhance the performance of these electrodes. The electrochemical behavior of POM molecules such as phospho-molybdate (PMo_{12}), silico-molybdate ($SiMo_{12}$) and vanadium substituted phospho-molybdate ($PMo_{10}V_2$) was investigated. A Layer-by-Layer (LbL) deposition technique was used to coat a thin layer of each POM species on MWCNTs. In addition to individual POM layers, several multi-layer combinations of these POM molecules have resulted in a further increase in pseudocapacitance on MWCNTs, while maintaining the conductivity of the electrodes. The LbL method has been demonstrated to be very effective in changing the surface chemistry of MWCNTs and other carbon nano materials, which enables us to design and engineer the surface of carbon nano materials for applications in ECs and beyond.

BIOGRAPHY

Keryn Lian was born in Shanghai, China. She received her B.Sc degree in Materials Science from Tongji University, Shanghai, China. She obtained her M.Sc degree in Chemistry from University of Calgary, and Ph.D in Materials Science and Engineering from the University of Toronto.

Currently, Keryn is an Associate Professor at the Department of Materials Science and Engineering, University of Toronto. Her research interests include high performance electrode materials and polymer electrolytes for electrochemical capacitors, hybrid energy systems and flexible printed electronics. Prior to her current position, she was a distinguished member of the technical staff and manager at Motorola Labs, where she conducted and led research in RF-MEMS and mi-

crofluidics with advanced printed wiring board (PWB) technology. She has over 60 journal and referred conference publications. She also holds 35 US patents.

*Session : **D2-W3-T3:*** **Medicine, Public Health, Biomedical Science and Engineering**

Small Molecules as Inducers to Direct Stem Cell Differentiation

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***Session : D2-W3-T3:* Medicine, Public Health, Biomedical Science and Engineering**

Plasmonic Nanoantenna and Nanolaser

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ABSTRACT

The diffraction law in optics limits the spatial resolution of light focusing and guiding by conventional lenses, fibers, and waveguides to about the light wavelength. To date, this fundamental limit (Abbe diffraction limit) remains an insurmountable barrier for the modern developments of super-resolution optical microscopy, photolithography, optical data storage, and integrated photonics. Recently, the concepts of plasmonics have been successfully applied to imaging, lithography, data storage, photovoltaics, and biochemical sensing. In the early research stage, the surface plasmon-polaritons (SPPs) excited by the incident optical wave at the planar noble-metal/dielectric interface is the main means to create surface plasmons. Later on, gold and silver nanomaterials (e.g., nanoparticles and nanorods) have been introduced to generate local surface plasmon resonance (LSPR) by visible lights. Very recently, we have demonstrated a new paradigm to realize 0-D (dimers), 1-D (linear nanoantenna arrays), and 2-D/3-D plasmonic metamaterials (artificially structured nanoparticle composites exhibiting unusual and tunable plasmonic properties) based on large-scale self-assembly and high-precision nanomanipulation of colloidal gold and silver nanoparticles. Using these techniques, we can control not only the plasmonic resonance over the complete visible and near-infrared spectrum range, but also the subradiant (dark) or superradiant (bright) mode. Usually, plasmonic dark modes are difficult to be studied and they hold great promise for nanoantenna and waveguide applications, such as low-loss subwavelength detection, concentration, manipulation, and transport of light. Furthermore, we have been able to demonstrate the 3-D subwavelength green plasmonic nanolaser based on hybrid III-nitride (InGaN)/noble metal (Au or Ag) metal-oxides-semiconductor (MOS) nanostructures. This work represents a significant step toward active plasmonic components, which are critically needed to overcome the intrinsically lossy feature of passive plasmonic components.

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BIOGRAPHY

Shangjr Gwo received his B.S. in Electronic Engineering from National Chiao-Tung University in 1985 and PhD in Physics from The University of Texas at Austin in 1993. He was a research scientist in National Institute for Advanced Interdisciplinary Research, AIST, Tsukuba, Japan for 3 years. In 1997, he joined National Tsing-Hua University in Hsinchu, Taiwan as an Associate Professor. In the past ten years, he was promoted to Professor of Physics in 2002, Distinguished Professor of Physics in 2006, and Chair Professor of Physics in 2010. From August, 2010, he is appointed as the Vice President for Research and Development in National Tsing-Hua University. His current research interests include studies on electronic and optical properties of nitride semiconductors, plasmonic nanomaterials, and their hybrid structures.

*Session : **D2-W4-T3:*** **Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)**

Session Organizer & Chair

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Session : D2-W4-T3: **Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)**

An Agent-based Infrastructure for Mobile Commerce

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ABSTRACT

Mobile commerce (M-commerce) is an attractive research area due to its relative novelty, rapid growth, and great potential in business applications. Over the last decade, various M-commerce applications have been geared to targeting mobile users and achieved great success. However, most M-commerce applications are developed by different retailers for special purposes and thus lack of fully automated business processes to integrate various existing services. In this talk I will present a novel infrastructure, Call U Back (CUB), for M-commerce applications. The proposed scheme integrates concepts of agent and context-aware workflow to implement automated trading task and compose services dynamically. The context awareness is based on ontology and logic models which derive from a set of descriptive contextual attributes for knowledge sharing and logical inference. Based upon the context-aware workflow analysis, the system will generate automated intelligent agents to conduct commerce transactions on behalf of mobile users.

The novelty of our proposal is that it uses ontology context model and logic model to provide personal and environmental contextual information and supports automatic context inference. Moreover, The CUB system not only utilizes existing Web services and service discovery protocol, but also employs mobile agents to achieve flexible network roaming for interactive services. In order to support scalability and flexibility, the concept of theme provides a simple framework for mobile users to interface with various M-commerce applications.We have implemented the middleware layer of the CUB server. An experimental prototype of the system is under developing and testing.

BIOGRAPHY

Xining Li is a professor of the School of Computer Science at the University of Guelph, Canada and the director of the IMAGO Lab. Li received a PhD in computer science from the University of Calgary, Canada. His research interests include mobile agent system, logic programming, context-aware computing, virtual machine implementation and mobile commerce systems.

*Session : **D2-W4-T3:*** **Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)**

Parallelization of Spectrum Sensing Algorithms Using Graphic Processing Units

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ABSTRACT

Cognitive radio (CR) is the next-generation communication system with high spectrum utilization and efficiency. It is very crucial for CR to sense the environment spectrum holes quickly and accurately. In this paper, we implement two kinds of spectrum sensing algorithms: waveform-based detection and cyclostationary feature extraction methods. Both of these algorithms are capable to separate the signal of interest from the noise or interference. In order to lower the computation time required by these complex algorithms, we parallelize these algorithms on a Graphic Processing Unit (GPU). Our methods show up to an average of 30x speedup in waveform preamble detection and an average of 39x speedup in cyclostationary feature extraction on a NVIDIA GTS 450 compared with the sequential implementation on a 2.94GHz Intel Core 2 CPU.

BIOGRAPHY

Sao-Jie Chen received the B.S. and M.S. degrees in electrical engineering from the National Taiwan University, Taipei, Taiwan, ROC, in 1977 and 1982 respectively, and the Ph.D. degree in electrical engineering from the Southern Methodist University, Dallas, USA, in 1988.

Since 1982, he has been a member of the faculty in the Department of Electrical Engineering, National Taiwan University, where he is currently a full professor. During the fall of 1999, he was a visiting professor in the Department of Computer Science and Engineering, University of California, San Diego, USA. During the fall of 2003, he held an academic visitor position in the Department of Electronic Design Automation, IBM Thomas J. Watson Research Center, Yorktown

Heights, New York, USA. He obtained the "Outstanding Electrical Engineering Professor Award" by the Chinese Institute of Electrical Engineering in December 2003 to recognize his excellent contributions to EE education. During the falls of 2004 to 20012, he was a visiting professor in the Department of Electrical and Computer Engineering, University of Wisconsin, Madison, USA. He served also as an International Adjunct Professor in the Department of Electrical and Computer Engineering, University of Illinois, Urbana-Champaign, for the Spring Semesters, 2010 and 2011. His current research interests include: VLSI physical design, SOC hardware/software co-design, Network-on-Chip, and Wireless LAN and Bluetooth IC design.

Dr. Chen is a member of the Chinese Institute of Engineers, the Chinese Institute of Electrical Engineering, the Institute of Taiwanese IC Design, the Association for Computing Machinery, a senior member of the IEEE Circuits and Systems and the IEEE Computer Societies.

*Session : **D2-W4-T3:*** **Broadband Technologies and Multimedia Services, Cyber Security, Cloud Computing, and SoC (System-on-a-chip)**

Recent Progress in Design Methodologies for Software Defined Radio

Li-Chun Wang, PhD (王蒞君 教授)

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BIOGRAPHY

Li-Chun Wang (M'96 – SM'06 – F'11) received the B.S. degree from National Chiao Tung University, Taiwan, R. O. C. in 1986, the M.S. degree from National Taiwan University in 1988, and the Ms. Sci. and Ph. D. degrees from the Georgia Institute of Technology , Atlanta, in 1995, and 1996, respectively, all in electrical engineering.

From 1990 to 1992, he was with the Telecommunications Laboratories of the Ministry of Transportations and Communications in Taiwan (currently the Telecom Labs of Chunghwa Telecom Co.). In 1995, he was affiliated with Bell Northern Research of Northern Telecom, Inc., Richardson, TX. From 1996 to 2000, he was with AT&T Laboratories, where he was a Senior Technical Staff Member in the Wireless Communications Research Department. In August 2000, he has joined the Department of Electrical Engineering of National Chiao Tung University in Taiwan and has been promoted to the full professor since 2005.

His current research interests are in the areas of radio resource management and cross-layer optimization techniques for wireless systems, heterogeneous wireless network design, and cloud computing for mobile applications.

He was elected to the IEEE Fellow grade in 2011 for his contributions in cellular architectures and radio resource management in wireless net- works. Dr. Wang was a co-recipient (with Gordon L. St¨uber and Chin-Tau Lea) of the 1997 IEEE Jack Neubauer Best Paper Award for his paper "Architecture Design,Frequency Planning, and Performance Analysis for a Microcell/Macrocell Overlaying System," IEEE Transactions on Vehicular Technology, vol. 46, no. 4, pp. 836-848, 1997. He has published over 180 journal and international conference papers. He served as an Associate Editor for the IEEE Trans. on Wireless Communications from 2001 to 2005, the Guest Editor of Special Issue on "Mobile Computing and Networking" for IEEE Journal on Selected Areas in Communications in 2005 and on "Radio Resource Manage-

ment and Protocol Engineering in Future IEEE Broadband Networks" for IEEE Wireless Communications Magazine in 2006. He is holding nine US patents.

Travel, Accommodation, and Registration

Where to meet

The EITA-EITC 2012 workshops will be held at the rooms: (**BA 1200, BA 2179, BA 3008, BA 3012, BA 3116**), **the Bahen Centre for Information Technology (BA), the University of Toronto's St. George campus** (Address: 40 Saint George Street, Toronto, Ontario, Canada M5S 2E4).

The St. George campus is located in downtown Toronto, and it's easily accessible by just every method of transportation. You can get detailed directions on how to get to the St. George campus (or anywhere in the city) by accessing the **Toronto Transit Commission (TTC)** website or calling 416-393-4636.

Visitor Parking

If you require parking during your visiting the Bahen Centre for Information Technology, the closest underground parking garage is in the Bahen Centre for Information Technology, located at 40 St. George Street. The entrance to the underground **Parking Garage** is accessible from Huron Street.

University of Toronto **Parking locations** are serviced by Pay and Display machines. The Pay and Display machines accepts both coins and credit card as a method of payment. Please ensure that you have exact change when processing payments.

Getting to the St. George Campus by Subway

There are four **subway stations** near the St. George campus (See the **TTC downtown routes** map).

- **St. George** (at Bloor Street and St. George Street)
- **Spadina** (at Bloor Street and Spadina Road)
- **Queen's Park** (at College Street and University Avenue)
- **Museum** (at Bloor Street and Queen's Park Crescent)

Useful Links:

- **Interactive St. George Campus Map**.
- **Toronto Map.**
- **Toronto Pearson International Airport.**
- **Toronto Transit Commission (TTC)**.
- **Toronto's Union Station**.
- **Toronto Coach Terminal.**
- **Toronto's Weather**.

How to register

The EITA-EITC 2012 at the University of Toronto is a free event, and open to the public.

Registration for the event is now open. Please download and complete the **registration form** and send in.

Please send your registration form to: **eitc_usa@yahoo.com** (Deadline: August 15, 2012)

Wireless Internet Access at the St. George Campus

Meeting ID for the EITA-EITC 2012 guests:

Please connect to the UToronto wireless (Wi-Fi) network with the following credentials:

Username (ID) = eitaguest

Password = eitc2012

There are two options to access to the UToronto Wi-Fi network:

- connect to the Wi-Fi network named **UofT**, and then simply input the **ID** and **password**.
- connect to the Wi-Fi work named **UTORwin**, it will ask for password which is '**UToronto1home**'. After that open a browser, it will be directed to a webpage, and then input the ID and password on the page.

Recommended Conference Hotels

Hotel Name	Address	Phone	Price (Group Rate)	Current Availability	Comment
Holiday Inn Toronto Bloor-Yorkvill	280 Bloor Street West, Toronto, Ontario M5S 1V8, Canada	(416) 968-0010	Single/double occupancy: **$129.99 + tax** Triple/quad occupancy: **$139.99 + tax** Group Block: **EEC**	August 15, 2012 - August 18, 2012	Note 1, Note2

Note 1: **Room Block Release Date: Monday, July 16, 2012**

Note 2: Please download **In-House Reservation Request Form** - Holiday Inn Toronto Bloor-Yorkvill to make hotel reservations.

Where to eat

- **Mega Bites** (also known as: **BCIT Caf**): located at the south-west end of the Bahen Centre for Information Technology (**BCIT**). This cafe serves Starbucks coffee, sandwiches, Grab and Go, salads, confectionary, cold beverages, baked goods, and soup.
- **More restaurants/cafeterias near the Bahen Centre for Information Technology**.
- Toronto offers restaurants and foods from all over the world. For a complete listing of restaurants visit: http://www.dine.to/toronto_restaurants.php.

Public Transit

Toronto and the Greater Toronto Area (the GTA) are closely connected through intertwining subways, bus routes, bike trails and walking paths. **The Toronto Transit Commission** (TTC) is a quick, convenient and safe way to get around Toronto (Maps).

Directions and Transportation To and From the Holiday Inn Toronto Bloor-Yorkvill Toronto

A. The Bahen Centre for Information Technology, the University of Toronto

Walking Directions

- Distance: less than 0.59 MI/1 KM or less than 10 min to walk (Directions)
- Start from **the Holiday Inn Toronto Bloor-Yorkvill hotel**.
- Head east on Bloor St W toward St George St.
- Turn right onto St George St.
- The Bahen Centre for Information Technology, the University of Toronto will be on the right.

B. Transportation

1. Toronto City Centre Airport - Billy Bishop

- Distance: 1.86 MI/3.0 KM SOUTH WEST to Hotel
- North on Bathurst to Bloor, right turn to hotel.

2. Toronto Pearson International Airport

- Distance: 21.75 MI/35.0 KM SOUTH EAST to Hotel

- Hwy-427 S to Gardiner East. Gardiner to Spadina, exit Spadina North to Bloor, right on Bloor, hotel on left after first set of lights.

3. Train

- Station Name: **Toronto's Union Station**
- Distance: 1.55 MI/2.5 KM NORTH to Hotel
- Taxi Charge (one way): $12.00 CAD
    - East on Front St. W toward Bay St. U-turn at Bay St. on Front St. W Turn right onto University Ave. Follow Provincial Route 11A N Turn right on Hoskin Ave.Turn right on Devonshire Pl.Turn left onto Bloor St W / Provincial Route 5. End at 280 Bloor St.
-

4. Subway /RT

- Subway Station Name: **St. George Station**
- Distance: 0.03 MI/0.05 KM EAST to Hotel

5. Driving Directions

Located at St. George and Bloor, the hotel is easily accessible from Toronto's major highways. From the Gardiner, exit Spadina North to Bloor, turn right and the hotel is on your left after the first set of lights. From the 401 take the 427 south to the Gardiner or take the Don Valley south to Bloor, go West or right and watch for the hotel after St. George.

6. Toronto Chinatown

Toronto Chinatown (多倫多華埠) is located in Downtown Toronto, with a high concentration of ethnic Chinese residents and businesses extending along Dundas Street West and Spadina Avenue. (Map)

- Distance: 1 MI/1.9 KM or less 20 min to walk (Directions)

6. Taxi Reservation

- **Beck Taxi:** Tel: 416-751-5555, http://www.becktaxi.com
- **Co-op Cabs**: Tel: 416-504-2667, http://www.co-opcabs.com
- **Diamond Taxicab**: Tel: 416-366-6868, http://www.diamondtaxi.ca

- **Toronto Airport Limousine Taxi**: Tel: 647-893-7786, http://www.1torontoairportlimo.com
- **Royal Taxi**: Tel: 416-777-9222, http://www.royaltaxi.ca
- **City Taxi**: Tel: 416-740-2222, http://www.citytaxitoronto.com
  Crown Taxi

More to Stay

The following are the recommended hotels:

Hotel Name	Address	Phone
Sheraton Centre Toronto Hotel	123 Queen Street West; Toronto, Ontario M5H 2M9, Canada	(416) 361-1000

Flying to Toronto

If you are arriving by plane, you can take a car, a taxi or **public transit** from **Pearson International Airport** or **the Toronto Island Airport**.

A. Pearson International Airport

1. Shuttle Buses

There are shuttle buses from Toronto Pearson International Airport to Downtown Toronto.

- Tel: 1-800-387-6787
- http://www.torontoairportexpress.com/

2. Take Public Transit

If you are taking public transit from **Pearson International Airport**, you have a choice of **four TTC bus routes**:

- **192 Airport Rocket** — this bus takes you to **Kipling subway station on the Bloor-Danforth Subway**. From **Kipling**, take the subway eastbound to **St. George subway station**. The 192 Airport Rocket route provides all-day accessible express bus service between Kipling Station on the Bloor-Danforth Subway and Pearson International Airport.

- **58A Malton** — this bus takes you to **Lawrence West subway station on the Spadina Subway**. From **Lawrence West**, travel southbound to **St. George subway station**. The 58A Malton route provides all-day bus service between Lawrence West Station on the Spadina Subway and Pearson International Airport.

If you are arriving in the middle of the night or very early in the morning, public transit access is limited because the subway doesn't run between 1:30 a.m. and 6:00 a.m. To get to downtown Toronto during these times, you can take **the 300A Bloor-Danforth bus** from the airport, which provides overnight service along Bloor Street and Danforth Avenue. We suggest taking the bus to Bloor and Yonge (which is minutes away from campus) and catching a taxi from there to your final destination. To reach mid-town Toronto, take **the 307 Eglinton West bus**, which provides overnight service to Yonge Street and Eglinton Avenue. From this intersection, you will be able to catch a taxi to your final destination.

3. Rent a Car

If you decide to rent a car at Pearson International Airport and drive to campus:

- Follow the airport signs that direct you to highway 401.
- Take highway 401 east to the Yonge Street south exit.
- Go south on Yonge Street for 10.4 km to College Street.
- Turn right onto College Street and then turn right onto St. George Street.

B. Toronto Island Airport

If you are flying Porter Airlines and decide to take public transit from **the Toronto Island Airport**.

- Catch the Porter shuttle, which will drop you off at to the north-east corner of Front Street and York Street.
- Cross to the south side of Front Street and enter **Union subway station**.
- Take the **University-Spadina line subway** northbound to **St. George subway station**.

Arriving by Bus

If you are arriving by bus, you can either take a taxi or the subway from the **Toronto Coach Terminal** or the **GO Transit** station at **Union Station**.

To get to the St. George campus by subway from the **Toronto Coach Terminal**, walk three blocks west along Dundas Street to **St. Patrick subway** station (at University Avenue and Dundas Street) and go north to **Queen's Park, Museum,** or **St. George** subway station (depending on your destination.) You can alter-

natively walk east along Dundas Street to **Dundas** subway station (at Yonge Street and Dundas Street). Take the subway northbound to **Bloor-Yonge** station. Then transfer westbound and go to **St. George** subway station.

To get to St. George campus by subway from the **GO Transit** station at **Union Station**, you can enter **Union subway station** and catch the **University-Spadina line** subway northbound to **Queen's Park, Museum** or **St. George** subway station (depending on your destination.)

Arriving by Train

All trains arrive at the **Toronto's Union Station** located at the foot of the city.

You can either take a taxi to the St. George campus or travel by subway:

- Enter **Union subway** station.
- Catch the **University-Spadina line** subway northbound to **Queen's Park**, **Museum**, or **St. George** subway station (depending on your destination.)

Money Matters

A. Sales Tax

Ontario Harmonized Sales Tax is 13%

B. Nearby Banks in Toronto

- **CIBC:** 595 Bay Street, Toronto, ON M5G 1M6
- **Bank of Montreal:** 763 Bay Street, Toronto, ON M5G 2R3
- **Scotiabank:** 79 Queen Street East, Toronto, ON M5C 1R8
- **TD Canada Trust:** 21 Carlton Street, Toronto, ON M5B 1L3
- **RBC:** MaRS Discovery Centre, 130-101 College Street Toronto, ON M5G 1L7

Emergencies

Hospitals & Nearby Medical Facilities

- **Mount Sinai Hospital**: 600 University Avenue, B 119, Toronto, ON M5G 1X5
- **St. Michael's Hospital**: 30 Bond Street, Toronto, ON M5B 1W8

- **Toronto General Hospital**: 200 Elizabeth Street, Toronto, ON M5G 2C4