The 11th Emerging Information and Technology Conference (EITC-2011)

Research, Innovation and Commercialization

Conference Proceedings

The Knapp Center for Biomedical Discovery,

The University of Chicago, Chicago, Illinois, U.S.A.

Thursday-Friday, July 28-29, 2011

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Welcome Message

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 EITC-2011 consists of following four workshops:

• **Workshop 1 (W1):** New Green Energy/Environment/Sustainability, Intelligent Green Building, Intelligent/Electric Vehicle

• **Workshop 2 (W2):** Medicine, Public Health, Biotechnology, Bioinformatics
• **Workshop 3 (W3):** New Materials Science and Engineering, Nanotechnology
• **Workshop 4 (W4):** C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip):

Conference General Chairs

Wei-Jen Tang	(湯惟仁)	The University of Chicago
Lih J. Chen	(陳力俊)	National Tsing-Hua University

Conference Chairs

Huei Peng	(彭暉)	University of Chicago
Ta-Hui Lin	(林大惠)	National Cheng-Kung University

Conference Organizers

Che-Wun Hong	(洪哲文)	National Tsing-Hua University
Howard Chen	(陳　浩)	IBM T.J. Watson Research Center
Shanchieh Yang	(楊善傑)	Rochester Institute of Technology (**Project Manager**)
Paul Wang	(王振福)	Commercial Division, TECO in Chicago
Rose Chen	(陳幗珍)	Cultural Division, TECO in Chicago
Jerry K. Chen	(陳寬享)	Investment & Trade Office, TECRO in the U.S.
Bonnie Sheu	(許芳瑜)	The University of Chicago

Program Steering Committee

George T. Tsao	(曹祖寧)	Purdue University

Program Committee

Technical Program Committee Chairs

Li-Chun Wang (王蒞君) National Chiao-Tung University
Chih-Hung Chang (張至弘) Oregon State University

Workshop Track/Session Chairs

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

Che-Wun Hong (洪哲文) National Tsing-Hua University
Huei Peng (彭暉) University of Michigan at Ann Arbor

Workshop 2: Bioinformatics, Biotechnology, Medicine, Public Health, Biotechnology, and Bioinformatics

Wei-Jen Tang (湯惟仁) The University of Chicago
Hong-Yo Kang (康宏佑) Chang Gung University

Workshop 3: New Materials Science and Engineering, and Nanotechnology

Chih-Hung Chang (張至弘) Oregon State University
Ching-Fuh Lin (林清富) National Taiwan University

Workshop 4: C4I (Content, Computer, Communications, Consumer Electronics, and Integration), SoC (System-on-a-Chip)

Yung-Hsiang Lu (陸永祥) Purdue University
Hsi-Pin Ma (馬席彬) National Tsing Hua University

Conference Manager

Bonnie Sheu (許芳瑜) The University of Chicago

Publication

Conference Program:

Shanchieh Yang (楊善傑) Rochester Institute of Technology

Conference Proceedings:

Yuan-Hao Huang (黃元豪) National Tsing-Hua University

Conference Treasurer

Chinese Institute of Engineers – USA, Greater New York Chapter (CIE-USA/GNYC)

(美洲中國工程師學會大紐約分會)

Local Management (Student Volunteer)

<TBD>

General Inquiries & Pre-registration

Investment & Trade Office, TECRO in the U.S.
(駐美投資貿易服務處)
Tel: 212-317-7395
E-mail: investny@msn.com

On-site Registration

Taiwanese Student Association of the University of Chicago

Web Operations

Wei-Cheng Wong	(翁唯城)	University of Texas at Dallas
Hwa-Han Wang	(王華漢)	EBMedia LLC

Conference Program

Building Abbreviations and Addresses (**University of Chicago**):

- **KCBD** (The Knapp Center for Biomedical Discovery, UChicago):
- 900 East 57th Street, Chicago, IL 60637
- **BSLC** (Biological Sciences Learning Center, UChicago):
- 924 East 57th Street, Chicago, IL 60637

Day 1 (Thursday, July 28, 2011)

7/28 (Thu) 8:00 am - 6:00 pm : Registration

Room: KCBD 1st Floor Lobby (8:00 am – 10:00 am)
BSLC 1st Floor Main Lobby (10:00 am – 6:00 pm)

7/28 (Thu) 8:30 am - 6:00 pm : EITC Office & Storage

Room: BSLC 009

7/28 (Thu) 8:30 am - 9:40 am : Opening Speech

Chair: **Prof. Wei-Jen Tang** (湯惟仁)**,** University of Chicago
Room: KCBD Lecture Hall 1103

Mr. Perry Pei-hwang Shen
Director General
Taipei Economic and Cultural Office in Chicago (TECO in Chicago)
(駐芝加哥台北經濟文化辦事處申佩璜處長)

Professor Kevin White
James and Karen Frank Family Professor of Human Genetics
Professor of Ecology & Evolution Director, Institute for Genomics and Systems Biology
University of Chicago

Parallel Sessions:

7/28 (Thu) 9:40 am-11:10 am: D1-W1-T1: Sustainability

Chair: **Professor Che-Wun Hong** (洪哲文), National Tsing-Hua University
Room: BSLC 202

"The Energy Transformation"
Dr. Gong-Ping Yeh
Computing Division
Fermi National Accelerator Laboratory (Fermilab)
（費米研究院資深科學家葉恭平博士）

"Engineering Solutions for Biomass Feedstock Production and Provision"
Professor K. C. Ting Department of Agricultural and Biological Engineering
University of Illinois at Urbana-Champaign
(伊利諾大學香檳校區農業生物工程系系主任丁冠中教授)

"Global Status and Prospects of Green Energy Technology and Policies"
Professor Jing-Tang Yang
Department of Mechanical Engineering, National Taiwan University
(台灣大學機械工程系楊鏡堂教授)

7/28 (Thu) 9:40 am-11:10 am: D1-W2-T1: Medicine/Health/Bio

Chair: **Professor Hong-Yo Kang** (康宏佑), Chang Gung University
Room: BSLC 205

"Overview of Simultaneous PET/MR Imaging for Clinical & Preclinical Research"
Dr. Gene-Jack Wang
Medical Department, Brookhaven National Laboratory
(布魯克海文國家實驗室醫學部主任王俊傑醫師)

"Development of Novel Tools for Gene Therapy via Protein Engineering"
Professor Huimin Zhao
Departments of Chemical and Biomolecular Engineering
University of Illinois at Urbana-Champaign
(利诺伊大学厄巴纳−香槟分校赵惠民教授)

"Following Protein Conformational Transitions, One Molecule at a Time"
Professor Haw Yang
Department of Chemistry
Princeton University

"Innovation through Fixed Dose Combination (FDC) Products: Opportunities and Challenges"
Dr. Tzuchi "Rob" Ju
Global Pharmaceutical Sciences, Abbott

7/28 (Thu) 9:40 am-11:10 am: D1-W3-T1: Materials/Nanotechnology

Chair: **Professor Ching-Fuh Lin** (林清富), National Taiwan University
Room: BSLC 240

"Novel Nano-Scale Electrodes For Solid Oxide Electrochemical Cells"
Professor Scott Barnett
Department of Materials Science and Engineering
Northwestern University

"Silicon Thin Film Solar Cells Fabricated by ECRCVD"
Professor Ting Tung Li
Department of Mechanical Engineering
National Central University
（中央大學機械工程系利定東教授）

"Lithium Battery Technology and Modeling"
Professor Shi-Chern Yen
Department of Chemical Engineering
National Taiwan University
(台灣大學化學工程學系顏溪成教授)

"Sustainability through Silicon Material Innovation"
Dr. Joe Xiaobing Zhou
Dow Corning Corporation
(道康宁公司周晓兵博士)

7/28 (Thu) 9:40 am - 11:10 am: D1-W4-T1: Cyber/Computing/SoC

Chair: **Professor Hsi-Pin Ma** (馬席彬)**,** National Tsing Hua University
Room: BSLC 218

"Energy-Efficient and Memory Access Techniques for Wireless Video Entertainments"
Professor Wei Hwang, IEEE Life Fellow Department of Electronics Engineering, National Chiao Tung University
(交通大學電子工程系黃威教授)

"Securing Data in the Cloud – Challenges and Research Directions"
Professor Elisa Bertino
Department of Computer Science
Research Director of CERIAS
Purdue University

"Detecting Anomaly Mobile Web Page through Template Classification"
Professor Chia-Mei Chen
Department of Information Management
National Sun Yat-Sun University
（中山大學資訊管理學系陳嘉玫教授）

"Energy-Aware Multi-path Routing for Wireless Sensor Network with Holes"
Professor Sheng-Tzong Cheng
Department of Computer Science and Information Engineering
National Cheng-Kung University
(成功大學資訊工訊系教授兼系主任鄭憲宗教授)

7/28 (Thu) 11:10 am - 11:30 am : Break

Room: BSLC 009

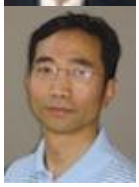
Parallel Sessions:

7/28 (Thu) 11:30 am–1:00 pm: D1-W1-T2: Sustainability

Chair: **Professor Ta-Hui Lin** (林大惠), National Cheng-Kung University
Room: BSLC 202

"Recent Advances in Green Energy and Green Chemicals Production from Cellulosic Biomass by Yeast-Based Technologies"
Professor Nancy W.Y. Ho
School of Chemical Engineering Purdue University, Potter Engineering Center

"Environment-Enhancing Energy – An Ultimate Substitute of Petroleum"
Professor Yuanhui Zhang
Department of Agricultural and Biological Engineering
University of Illinois at Urbana-Champaign
(利诺伊大学厄巴纳−香槟分校张源辉教授)



"Distributed Biofuel Production Technologies"
Professor R. Roger Ruan
Department of Bioproducts and Biosystems Engineering
The University of Minnesota at Twin Cities
(明尼苏达大学阮榕生教授)

"Studies of an Innovative Piezoelectric Micro-proton Exchange Membrane Fuel Cell and Development of 3.5KW PEMFC Hybrid"
Professor Hsiao-Kan Ma
Department of Mechanical Engineering
National Taiwan University
(台灣大學機械工程系馬小康教授)

7/28 (Thu) 11:30 am–1:00 pm: D1-W2-T2: Medicine/Health/Bio Chair:
Professor Christine D. Wu (吳大如), University of Illinois at Chicago
Room: BSLC 205

"Strategies to Enhance Bone Regeneration in Critical-sized Defects"
Professor Tien-Min Gabriel Chu
Department of Restorative Dentistry
Indiana University School of Dentistry
(印第安納大學牙醫學系朱天民教授)

"Stem Cells for Musculoskeletal Tissue Regeneration"
Professor Wan-Ju Li Department of Biomedical Engineering University of Wisconsin-Madison
(威斯康星大學麥迪遜分校生物醫學工程學系李萬柱教授)

"Rigorous Quantitative Sciences Integration: the Foundation of Drug Approval in the Personal Genome Era"
Professor Yu Shyr
Department of Biostatistics
Vanderbilt University School of Medicine
(范德堡大學癌症中心生物統計主任石瑜教授)

"The Role of Foods and Diet in Oral Health Promotion & Disease Prevention"
Professor Christine D. Wu
Department of Pediatric Dentistry
University of Illinois at Chicago, College of Dentistry
(伊利諾大學芝加哥校區兒童牙醫系教授及齲齒研究中心主任吳大如教授)

7/28 (Thu) 11:30 am–1:00 pm: D1-W3-T2: Materials/Nanotechnology Chair:
Professor Chih-Hung (Alex) Chang (張至弘), Oregon State University Room: BSLC 240

"A Top-Down Approach to Generating Functionalized Carbon-based Nanomaterials and Polymer Nanocomposites in Poly(phosphoric acid)"
Dr. Loon-Seng Tan
AFRL Fellow, Materials & Manufacturing Directorate
US Air Force Research Laboratory

"Nanotechnology Research Supported by the Asian Office of Aerospace Research and Development"
Dr. Joseph Tringe
Major and Reserve Program Manager
US AFOSR/Asian Office of Aerospace Research and Development

"Nanotechnology Applied to the Macro World: Nanoscale Science and Engineering of Steels for Infrastructure Applications"
Professor Yip-Wah Chung
Department of Materials Science and Engineering
Northwestern University
(西北大學材料科學與工程學系鐘業華教授)

"Molecular Combing of Quantum-Dot-Conjugated DNA and Its Use in Developing One-Dimensional FRET Sensor with Enhanced Target-Molecule Probing Sensitivity"
Professor Hsien-Hung Wei
Department of Chemical Engineering
National Cheng Kung University
(成功大學化學工程系魏憲鴻教授)

7/28 (Thu) 11:30 am–1:00 pm: D1-W4-T2: Cyber/Computing/SoC

Chair: **Professor Yu-Hen Hu** (胡玉衡), University of Wisconsin at Madison
Room: BSLC 218

"Compressive Data Management for SoC, CMP and VM"
Professor Janet Meiling Wang-Roveda
Department of Electrical and Computer Engineering
The University of Arizona

""More Moore" and "More than Moore" beyond 22nm: Challenges and Opportunities"
Professor David Z. Pan
Department of Electrical and Computer Engineering
The University of Texas at Austin
（奥斯丁德州大学电机与计算机工程系潘志刚教授）

"Development of Communications SoC Evaluation Platforms"
Professor Hsi-Pin Ma
Department of Electrical Engineering and
National Tsing Hua University
(清華大學電機工程學系馬席彬教授)

"From Multi-User MIMO to Multi-Cell MIMO: A Radio Resource Management Perspective"
Professor Li-Chun Wang
Department of Electrical Engineering
National Chiao-Tung University
（交通大學電機系王蒞君教授)

7/28 (Thu) 1:00 pm - 2:30 pm : Lunch

7/28 (Thu) 2:30 pm - 3:30 pm: The Conference Keynote Session

Chair: **Professor Li-Chun Wang** (王蒞君), National Chiao-Tung University
Room: BSLC 202

"Creating Advanced Communications for the 21st Century: Applications, Technology and Global Facilities"
Professor Joe Mambretti
Director, International Center for Advanced Internet Research
Northwestern University

Parallel Sessions:

7/28 (Thu) 3:30 pm–5:00 pm: D1-W1-T3: Sustainability Chair: **Professor Huei Peng** (彭暉)**,** University of Michigan
Room: BSLC 202

Professor Lea-Der Chen Deparment of Mechanical Engineering
Texas A&M University at Corpus Christi
(德州農工大學陳立德教授)

"Parallel High-Speed Plasmonic Nano-Lithography"
Professor Cheng Sun
Department of Mechanical Engineering
Northwestern University
(西北大学機械工程系孙诚教授)

"Offshore Wind Power Developments in Taiwan"
Professor Ta-Hui Lin
Department of Mechanical Engineering
National Cheng-Kung University
(成功大學機械工程系特聘教授兼系主任林大惠教授)

7/28 (Thu) 3:30 pm–5:00 pm: D1-W2-T3: Medicine/Health/Bio Chair: **Prof. Michael Chiao-An Wu** (吳肇安), University of North Carolina at Chapel Hill
Room: BSLC 205

"Family-based Pathway Analysis Method"
Professor Ren-Hua Chung
Hussman Institute for Human Genomics
University of Miami Miller School of Medicine
(邁阿密大學人類基因研究所鍾仁華教授)

"A Novel Method for Detecting Rare-Variant Associations with Deep Sequencing Data in Large Genomic Regions"
Dr. Patrick Yee Him Cheung
Department of Biostatistics
Columbia University
（哥倫比亞大學公共衛生學院張貽謙博士）

"A Weighted Fisher's Method to Detect Rare-Variant Associations with Deep Sequencing Data for Complex Disorders"
Professor Shuang Wang
Department of Biostatistics
Columbia University
（哥伦比亚大学公共卫生学院王爽教授）

"Analysis of High-throughput Sequencing Data via the Sequence Kernel Association Test"
Professor Michael Chiao-An Wu Department of Biostatistics The University of North Carolina at Chapel Hill
(北卡萊羅納大學教堂山分校生物統計系吳肇安教授)

7/28 (Thu) 3:30 pm–5:00 pm: D1-W3-T3: Materials/Nanotechnologies Chair: **Professor Shi-Chern Yen** (顏溪成), National Taiwan University

Room: BSLC 240

"Germanium Quantum Dots Optoelectronic Devices"
Professor Pei-Wen Li
Department of Electrical Engineering
National Central University
(中央大學電機工程學系李佩雯教授)

"Fast Flexible Electronics with Transferrable Semiconductor Nanomembranes"
Professor Zhenqiang (Jack) Ma
Department of Electrical and Computer Engineering
University of Wisconsin-Madison
(威斯康辛大學電機與計算機工程系马振强教授)

"Nanophotonic Emitters for Future Communication, Energy, & Health Care"
Dr. Luke Lee & Professor Pei-Cheng Ku
Department of Electrical Engineering & Computer Science The University of Michigan at Ann Arbor

"Graphene Nanomaterial for Sensors and Energy Applications"
Professor Mark Ming-Cheng Cheng
Department of Electrical and Computer Engineering
Wayne State University

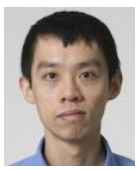
7/28 (Thu) 3:30 pm–5:00 pm: D1-W4-T3: Cyber/Computing/SoC

Chair: **Professor Shanchieh Jay Yang** (楊善傑)**,** Rochester Institute of Technology
Room: BSLC 218

"The Human-centric Cyber Situation Awareness MURI"
Professor John Yen
Department of Information Sciences and Technology
Pennsylvania State University

"On Developing a Guideline for Establishing RFID Privacy Policies"
Professor Shi-Cho Cha
Department of Information Management
National Taiwan University of Science and Technology
（臺灣科技大學資訊管理系**查**士朝教授）

"Secure Computation Outsourcing in Cloud Computing"
Professor Kui (Quinn) Ren
Department of Electrical and Computer Engineering
Illinois Institute of Technology
(伊利诺理工大学电机与计算机工程系任奎教授)



"Mobile Cloud Computing: Opportunities, Technologies, and Challenges"
Professor Yung-Hsiang Lu
School of Electrical and Computer Engineering
Purdue University
（普度大學電機與計算機工程學院陸永祥教授）

Day 2 (Friday, July 29, 2011)

7/29 (Fri) 9:00 am - 5:00 pm : Registration
Room: BSLC Main Lobby (1st Floor) (7:00 am – 6:20 pm)

7/29 (Fri) 9:00 am - 5:00 pm : EITC Office & Storage
Room: BSLC 009

Parallel Sessions:

7/29 (Fri) 9:40 am-11:10 am: D2-W1-T1: Sustainability

Chair: **Professor Huei Peng** (彭暉)**,** University of Michigan at Ann Arbor Room: BSLC 202

"Can We Produce Energy from the Carbohydrate in Lignocellulosic Biomass"
Professor JunYong (J.Y.) Zhu
USDA Forest Service, Forest Products Laboratory
Department Biological Systems Engineering, University of Wisconsin-Madison

"Utilization of Biofuel and Biomass Energy for Transportation and Heat Generation"
Professor Song-Charng Kong
Department of Mechanical Engineering
Iowa State University
(愛荷華州州立大學龔松長教授)

"Biofuel and Biomaterials from Renewable Biomass"
Professor Zaohui Tong
Department of Agricultural and Biological Engineering
University of Florida, Gainesville
(佛罗里达大学农业与生物工程学系童朝晖教授)

7/29 (Fri) 9:40 am-11:10 am: D2-W2-T1: Medicine/Health/Bio

Chair: **Professor Wei-Jen Tang** (湯惟仁), The University of Chicago
Room: BSLC 205

"How to Activate Cell-surface Receptors: RTKs and Neuronal Receptors"
Professor Xiaolin He
Molecular Pharmacology and Biological Chemistry
Northwestern University
（西北大学何小林教授）

"Mechanism for the Assembly of Co-transcriptional RNA Capping Complex"
Professor Jianhua Fu Department of Biochemistry Medical College of Wisconsin
(威斯康星医科大学大学生物化学系傅建华教授)

"Experimental Models for Androgen Receptor Functions: Tools for Studying Androgens-related Disorders in Human"
Professor Hong-Yo Kang
Graduate Institute of Clinical Medical Sciences
Chang Gung Memorial Hospital at Kaohsiung Medical Center
(長庚大學臨床醫學研究所康宏佑教授)

7/29 (Fri) 9:40 am-11:10: D2-W3-T1: Materials/Nanotechnologies

Chair: **Professor Ching-Fuh Lin** (林清富), National Taiwan University
Room: BSLC 240

"Vapor-Based Reactive Polymer Coatings: Surface Engineering Tools for Biotechnology"
Professor Hsien-Yeh Chen
Department of Chemical Engineering
National Taiwan University (台灣大學化學工程學系陳賢燁教授)

"Nanostructured Materials: From Lotus Leaf to Phase Change Process"
Professor Yen-Wen Lu
Department of Bio-Industrial Mechatronics Engineering
National Taiwan University
(台灣大學生物產業機電工程學系盧彥文教授)

"High Pressure, High Temperature Route to Diamond Aerogel"
Professor Peter J. Pauzauskie
Department of Materials Science and Engineering
University of Washington

7/29 (Fri) 9:40 am-11:10: D2-W4-T1: Cyber/Computing/SoC

Chair: **Professor Li-Chun Wang** (王蒞君), National Chiao-Tung University Room: BSLC 218

"Hybrid Cloud & Iterative MapReduce for Scalable Data Intensive Applications"
Professor Judy Qiu
School of Informatics and Computing
Indiana University Bloomington

"The Security Issues of a XBRL Demo Site"
Professor Deron Liang
Department of Computer Science & Information Engineering
National Central University
(中央大學資訊工程系教授兼軟體研究中心主任梁德容教授)

"Characterizing Hacker Behavior for Cyber Situation Awareness"
Professor Shanchieh Jay Yang
Department Head, Department of Computer Engineering
Rochester Institute of Technology
（羅徹斯特理工學院楊善傑教授）

7/29 (Fri) 11:10 am - 11:30 am : Break

Room: BSLC 009

Parallel Sessions:
7/29 (Fri) 11:30 am–1:00 pm: D2-W1-T2: Sustainability

Chair: **Professor Ta-Hui Lin** (林大惠), National Cheng-Kung University
Room: BSLC 202

"Microbial Syntrophy in Methanogenic Treatment Processes"
Professor Wen-Tso Liu
Department of Civil and Environmental Engineering
University of Illinois at Urbana-Champaign
(伊利諾大學香檳校區土木及環境工程學系劉文佐教授)

"Colossal Electrical Conductivity of Nano-scale YSZ Thin Films for SOFC"
Professor Chen-Chia Chou
Department of Mechanical Engineering
National Taiwan University of Science and Technology
(臺灣科技大學機械工程系周振嘉教授)

"Quantum Research on Biofuel Cells, Bio Solar Cells and OLEDs"
Professor Che-Wun Hong
Department of Power Mechanical Engineering
National Tsing-Hua University
(清華大學動力機械工程學系洪哲文教授)

7/29 (Fri) 11:30 am–1:00 pm: D2-W2-T2: Medicine/Health/Bio Chair: **Professor Hong-Yo Kang** (康宏佑), Chang Gung University Room: BSLC 205

"Intestine Lipid Metabolism and Energy Balance"
Professor C-L. Eric Yen
Department of Nutritional Sciences
University of Wisconsin at Madison
(威斯康辛大學營養科學系教授顏齊良教授)

"Systems Biology in Translational Medicine Research"
Professor Hsei-Wei Wang
Institute of Microbiology and Immunology
National Yang Ming University
(陽明大學微生物及免疫學研究所資訊生物研究室王學偉教授)

"Development of Novel Vaccines Against Tuberculosis"
Professor Chyung-Ru Wang
Department of Microbiology and Immunology,
Northwestern University
(西北大學醫學院王瓊如教授)

7/29 (Fri) 11:30 am–1:00 pm: D2-W3-T2: Materials/Nanotechnologies Chair: **Professor Shi-Chern Yen** (顏溪成), National Taiwan University
Room: BSLC 240

"Nanocrystal Solids: A Modular Approach to Materials Design"
Professor Dmitri Talapin
Department of Chemistry and James Frank Institute
The University of Chicago

"Inkjet-Printed Analytical Devices"
Professor Ying-Chih Liao
Department of Chemical Engineering
National Taiwan University
(台灣大學化學工程學系廖英志教授)

"TEM Applications in the Data Storage Industry"
Dr. Augusto A. Morrone
Materials Science
Seagate Technology LLC

"Develop Solution-based Processes for Printing Electronics"
Professor Chih-Hung (Alex) Chang
School of Chemical, Biological and Environmental Engineering
Oregon State University
(奥勒岡州立大學化學工程系張至弘教授)

7/29 (Fri) 11:30 am–1:00 pm: D2-W4-T2: Cyber/Computing/SoC

Chair: **Professor Sheng-Tzong Cheng** (鄭憲宗), National Cheng-Kung University
Room: BSLC 218

"GNSS 2020 Outlook, Applications and Challenges"
Dr. Fang-Cheng Chan
Department of Mechanical and Aerospace Engineering
Illinois Institute of Technolog
(伊利諾理工大學机械和航天工程系詹方正博士)

"Bandwidth Recycling in Broadband Wireless Networks"
Professor J. Morris Chang
Department of Electrical and Computer Engineering
Iowa State University
(愛荷華州立大學電機與計算機系張致恩教授)

"A Fair Non-Repudiation Framework for Cloud Storage"
Professor Yu Chen Department of Electrical and Computer Engineering State University of New York – Binghamton

"On Security Protocols and Attacks in WiMAX Networks"
Professor Chin-Tser Huang
Department of Computer Science and Engineering
University of South Carolina
(南卡羅萊納大學電機與計算機系黃金澤教授)

7/29 (Fri) 1:00 pm - 2:30 pm : Lunch

Parallel Sessions:

7/29 (Fri) 2:30 pm–4:00 pm: D2-W1-T3: Sustainability

Chair: **Professor Che-Wun Hong** (洪哲文), National Tsing-Hua University
Room: BSLC 202

"Estimation and Control of Electric Ground Vehicles with In-Wheel Motors"
Professor Junmin Wang
Department of Mechanical and Aerospace Engineering
The Ohio State University
(俄亥俄州立大學王俊敏教授)

"Mode Transition Control between SI and HCCI Combustions"
Professor Guoming (George) Zhu
Department of Mechanical Engineering
Michigan State University

"Power Electronics for Future Energy and Grid Systems "
Professor Jih-Sheng (Jason) Lai
Department of Electrical and Compuer Engineering
Virginia Institute of Technology
(維吉尼亞理工大學未來能源研究中心主任賴日生教授)

"Design and Control of Electrified Vehicles"
Professor Huei Peng
Department of Mechanical Engineering
The University of Michigan at Ann Arbor
（密歇根大學安娜堡分校機械工程系彭暉教授）

7/29 (Fri) 2:30 pm–4:00 pm: D2-W2-T3: Medicine/Health/Bio Chair: **Professor Chyung-Ru Wang** (王瓊如), Northwestern University
Room: BSLC 205

"Akt Signaling in Cancer Progression and Metastasis"
Professor Hui-Kuan Lin
Department of Molecular and Cellular Oncology
The University of Texas M. D. Anderson Cancer Center
（德州大學安得生癌症中心林慧觀教授）

"Understanding the Human Genome through Single Cell Analysis"
Professor Honghua Li
Department of Molecular Genetics, Microbiology and Immunology
University of Medicine and Dentistry of New Jersey Robert Wood Johnson Medical School (新泽西州罗伯屋强森医学院李洪華教授)

"Genome-wide Discovery & Clinical Validation of Pharmacogenomic Markers"
Professor Rong Stephanie Huang
Department of Medicine, The University of Chicago
（芝加哥大学医学系黄榕教授）

"Structural and Functional Analyses of Human Insulin Degrading Enzyme"
Professor Wei-Jen Tang
Ben May Department for Cancer Research
The University of Chicago
(芝加哥大學湯惟仁教授)

7/29 (Fri) 2:30 pm–4:00 pm: D2-W3-T3: Materials/Nanotechnologies Chair: **Professor Chih-Hung (Alex) Chang** (張至弘), Oregon State University Room: BSLC 240

"Semiconductor Nanoelectronic and Nanophotonic Devices: Towards Controllability and Manufacturability"
Professor Xiuling Li
Department of Electrical and Computer Engineering
University of Illinois, Urbana-Champaign

"Self-Assembly of Solution Processing Graphitic Nanomaterials"
Dr. Vincent C. Tung
Department of Materials Science and Engineering
Northwestern University
(西北大學材料科學與工程學系童俊智博士)

"Solution-processed Nanostructured Oxide Material Deposition for Antireflective Coating"
Dr. Seung-Yeol Han
School of Chemical, Biological and Environmental Engineering
Oregon State University

"Si-based Nano-Structures for Photovoltaic and Photonics"
Professor Ching-Fuh Lin
Department of Electrical Engineering
National Taiwan University
(台灣大學電機工程學系林清富教授)

7/29 (Fri) 2:30 pm-4:00 pm: D2-W4-T3: Cyber/Computing/SoC

Chair: **Professor Hsi-Pin Ma** (馬席彬), National Tsing Hua University
Room: BSLC 218

"Robust CMOS Millimeter-Wave Integrated Circuits"
Professor Yang Xu
Department of Electrical and Computer Engineering
Illinois Institute of Technology
(伊利诺理工大学电机与计算机工程系徐阳教授)

"AES Chip Implementation & Oscillator-based DPA Countermeasure Circuit"
Professor Hsie-Chia Chang
Department of Electronics Engineering
National Chiao Tung University
(交通大學電子工程系張錫嘉教授)

"Optimal Layered Video IPTV Multicast Streaming over Mobile WiMAX Systems"
Professor Yu-Hen Hu
Department of Electrical and Computer Engineering
University of Wisconsin at Madison
(威斯康辛大學電機與計算機工程系胡玉衡教授)

"A Fault-Tolerant NoC Scheme Using Bidirectional Channel"
Professor Sao-Jie Chen
Department of Electrical Engineering
National Taiwan University
(台灣大學電機工程學系陳少傑教授)

Opening Speech

General Conference Chairs
Professor Wei-Jen Tang (湯惟仁),
Ben May Department for Cancer Research,
the University of Chicago

Biography

NAME	POSITION TITLE
Wei-Jen Tang	Professor

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education,*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
National Taiwan University	B.S.	1978-198	Zoology
University of Texas, Austin	Ph.D.	1984-198	Biological Science

A. Personal Statement:

My research program involves in elucidating the molecular basis of cellular signal transduction. The research is based on the premise that the better understanding of protein-protein and protein-ligand interaction is key to elucidating the fundamental principles governing cellular signaling network. I apply X-ray crystallography and various biochemical, biophysical, cellular and pharmacological tools to address the protein functions and regulations. I am known for the studies on the catalysis and regulation of mammalian adenylyl cyclase, anthrax and pertussis adenylyl cyclase toxins, and insulin degrading enzyme. I am a very strong believer in collaboration.

B. Positions and Honors.

Positions:

1988 Postdoctoral fellow with Dr. William R. Folk, U Texas Austin
1988-1991 Postdoctoral fellow with Dr. Alfred G. Gilman, U Texas Southwestern Medical School
1991-1993 Instructor, Dept. of Pharmacology, University of Texas Southwestern Medical School
1993-1994 Assistant Professor, Dept. of Pharmacology, UT Southwestern Medical School
1994-1998 Assistant Professor, Dept. of Pharmacol. & Physiol. Sciences, U of Chicago
1998-2001 Assistant Professor, Dept. of Neurobiol. Pharmacol. &

Physiol., U of Chicago
2001-2007 Associate Professor, Ben-May Institute for Cancer Research, U of Chicago
2007- Professor, Ben-May Department for Cancer Research, U of Chicago

Honors and Federal Government Public Advisory Committee:

1987-1988 University Fellowship, University of Texas, Austin
1999-2002 American Heart Association Established Investigator
1998-present Ad Hoc NIH and NSF grant reviewing panels
2007-2011 Regular member of NIH MSF-C study section
2009-present The advisory Board, Structure Biology Center, APS, Argonne National Lab.

C. Selected peer-reviewed publications (Selected from 101 peer-reviewed publications).

1. Tang, W.-J., Krupinski, J., and Gilman, A.G. (1991) Expression and characterization of calmodulin activated (type I) adenylyl cyclase. J. Biol. Chem. 266:8595-8603.

2. Tang, W.-J. and Gilman, A. G. (1991) Type-specific regulation of adenylyl cyclase by G protein βγ subunits. Science 254:1500-1503.

3. Tang, W.-J. and Gilman, A.G. (1995) Forskolin and $G_{s\alpha}$ sensitive soluble adenylyl cyclase. Science 268:1769-1772.

4. Drum, C.L., Yan, S.-Z., Bard, J., Shen, Y.-Q., Lu, D., Soelaiman, S., Grabarek, Z., Bohm, A., and Tang, W.-J. (2002) Structural basis for the activation of anthrax adenylyl cyclase exotoxin by calmodulin, Nature 415:396-402.

5. Shen, Y.-Q., Lee, Y.-S., Soelaiman, S., Bergson, P., Lu, D., Chen, A., Beckingham, K., Grabarek, Z., Mrksich, M., Tang, W.-J. (2002) Physiological calcium concentrations regulate calmodulin binding and catalysis of adenylyl cyclase exotoxins. EMBO J. 21: 6721-6732.

6. Shen, Y.-Q., Zhukovskaya, N.L., Zimmer, M.I., Soelaiman, S., Wang, C.R., Gibbs, C.S., Tang, W.-J. (2004) Selective inhibition of anthrax edema factor by adefovir: a prototype for adjunctive therapy and probe of anthrax pathogenesis. Proc. Natl. Acad. Sci. USA 101:3242-3247.

7. Lee, Y.-S., Bergson, P., He, W.-S., Mrksich, M., Tang, W.-J. (2004) Discovery of a small molecule that inhibits the interaction of anthrax edema factor with its cellular activator, calmodulin. Chem. & Biol. 11:1139-46.

8. Shen, Y., Zhukovskaya, N.L., Guo, Q., Florián, J., and Tang, W.-J. (2005) Calcium-independent calmodulin binding and two-metal-ion catalytic mechanism of anthrax edema factor. EMBO J. 24:929-941.

9. Guo, Q., Shen, Y., Lee, Y.-S., Gibbs, C.S., Mrksich, M., and Tang, W.-J.

(2005) Structural basis for the interaction of adenylyl cyclase toxin of *Bordetella pertussis* with calmodulin. EMBO J. 24:3190-3201.

10. Shen, Y., Joachimiak, A., Rosner, M.R., and Tang, W.-J. (2006) Structures of human insulin degrading enzyme reveal a new substrate recognition mechanism. Nature 443:870-874.

11. Im, H., Manolopoulou, M., Malito, E., Shen, Y., Zhao, J., Neant-Fery, M., Sun, C.-Y., Meredith, S.C., Sisodia, S.S., Leissring, M., and Tang, W.-J. (2007) Structure of substrate-free human insulin degrading enzyme (IDE) and biophysical analysis of ATP-induced conformational switch of IDE. J. Biol. Chem. 282:25453-63.

12. Malito, E., Hulse, R.E., and Tang, W.-J. (2008) Amyloid-β degrading cryptidase: insulin degrading enzyme, presequence peptidase, and neprilysin. CMLS 65:2574-85. (PMC2756532)

13. Malito, E., Ralat, L.A. Manolopoulou, M., Tsay, J.L., Wadlington, N.L. and Tang, W.-J. (2008) Molecular Bases for the recognition of short peptide substrates and cysteine-directed modifications of human insulin-degrading enzyme. Biochemistry 47:12822-12834. (PMC2652632)

14. Manolopoulou, M., Guo, Q., Malito, E. Schilling, A, and Tang, W.J. (2009) Molecular basis of catalytic chamber-assisted unfolding and cleavage of human insulin by human insulin degrading enzyme. J. Biol. Chem. 284:14177-88. (PMC2682866).

15. Ren, M., Guo, Q., Guo, L., Lenz, M., Qian, F., Koenen, R.R., Xu, H., Schilling, A.B., Weber, C., Ye, R.D., Dinner, A.R., and Tang, W.-J. (2010) Polymerization of MIP-1 chemokine (CCL-3 and CCL-4) and clearance of MIP-1 by insulin degrading enzyme. EMBO J. 29:3952-3966.

Opening Speech

Director General
Mr. Perry Pei-hwang Shen
Taipei Economic and Cultural Office in Chicago (TECO in Chicago)
(駐芝加哥台北經濟文化辦事處申佩璜處長)

Opening Speech

Dr. Kevin P. White

James and Karen Frank Family Professor,
Department of Human Genetics and Ecology & Evolution
Director, Institute for Genomics & Systems Biology,
The University of Chicago and Argonne National Laboratory

Biography

Kevin White, PhD, combines experimental and computational techniques to understand the networks of factors that control gene expression during development and evolution. He is the James and Karen Frank Family Professor in Human Genetics, a Professor of Ecology & Evolution, and Director of the Institute for Genomic & Systems Biology at the University of Chicago and Argonne National Laboratory.

Dr. White graduated magna cum laude from Yale University with a joint B.S.-M.S. degree in biology in 1993. He completed his Ph.D. in developmental biology at Stanford University in 1998, followed by a postdoctoral fellowship in biochemistry and genomics at the Stanford Genome Technology Center. In 2001, he joined the faculty at Yale University as an Assistant Professor of Genetics, and was promoted to Associate Professor in 2003. In 2006 he was appointed as a full Professor and founded the Institute for Genomics and Systems Biology at The University of Chicago.

He has been the recipient of numerous awards and honors throughout his career, including an HHMI predoctoral fellowship (1993-1998), a Helen Hay Whitney postdoctoral fellowship (1998-2000), a NIH Genome Scholar award (2000-2005), a W.M. Keck Distinguished Young Investigator in Medical Sciences award (2003-2008), an Arnold and Mabel Beckman Young Investigator award (2004-2007), and was named as a Pritzker Fellow in 2007. Dr. White has authored more than 60 peer reviewed articles in the areas of genome biology and its application to development and disease. He also is active in organizing conferences on these topics. For example, in 2004, he was elected chairman of the Gordon Conference on Genomics and in 2009, chairman of the Gordon Conference on Hormone Action in Development and Cancer.

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

Chair
Professor Che-Wun Hong (洪哲文)
Department of Power Mechanical Engineering
National Tsing-Hua University

Biography

Prof. Che-Wun Hong was born in Kaohsiung city, Taiwan on March 15th, 1956. He received bachelor degree in Mechanical Engineering from National Cheng-Kung University in 1978. After graduation from the university, he served in the army as an armored vehicle officer (1978~1980), then worked as a mechanical engineer in the Ford Motor Company (1980~1981), and then transferred to the Industrial Technology Research Institute (ITRI) as an engine researcher (1981~1982). In the fall of 1982, after saving enough money, he went to United Kingdom to study higher degrees. He received his MSc degree from the UMIST (Manchester, UK) in 1983 and a PhD degree from the Imperial College (London, UK) in 1987, all majored in Mechanical Engineering. In 8/1987, he returned to Taiwan and joined the Department of Power Mechanical Engineering of National Tsing Hua University as an associate professor. He was promoted to full professor in 1997. Being a faculty member for 23 years, his research area ranges from internal combustion engines, turbochargers to the automotive engineering; and then he switched to the green power engineering at the millennium. His current research focuses on the fuel cells, solar cells, lithium-ion batteries, ultra-capacitors and thermoelectric chips by means of the academic fundamentals, such as: quantum mechanics, molecular dynamics, Boltzmann modeling, computational fluid dynamics and control system dynamics. He has published more than 200 technical papers, including archived journals, proceedings of national and international conferences and technical reports; also he has registered for two patents in Taiwan and USA.

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

"The Energy Transformation"

Dr. Gong-Ping Yeh
Division Scientist, Computing Division
Fermi National Accelerator Laboratory (Fermilab)
(費米研究院資深科學家葉恭平)

Abstract

The 21st Century is the Century of Energy. Sustainable energy is a vital key to national security, economy, environment, health, replacing oil, and reducing global warming. The energy solutions include wind, solar, biofuels, geothermal, ocean and other renewable energies, and improving energy efficiencies and energy conservation. Thorium energy and Accelerator Driven Systems may also provide sustainable energy for thousands of years. We discuss the energy transformation from using fossil fuels to sustainable energy in 2010-2050.

Biography

Dr. Gong Ping (G.P.) Yeh is a physicist at Fermi National Accelerator Laboratory. His education includes MIT BS, Caltech MS, MIT PhD. He is an American Physical Society Fellow and Okinawa Goodwill Ambassador. Dr. Yeh's work and contributions include the discovery of the Top Quark, large scale computing using Linux, and new Particle Therapy centers in Illinois and in Taiwan. He served as a member of the Republic of China Taiwan's Presidential Science and Technology Advisory Committee (2000-2001) and as Special Advisor to Japan's Minister of Science and Technology Policy to create Okinawa Institute of Science and Technology (2001-2002). His research and interests in sustainable energy include wind, solar, biofuels, geothermal and ocean energy. In recent years, he has focused on Accelerator Driven System and Thorium energy as a new source of energy. Dr. Yeh has served internationally as an advisor for sustainable energy.

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

"Engineering Solutions for Biomass Feedstock Production and Provision"

Professor K. C. Ting
Head, Department of Agricultural and Biological Engineering, University of Illinois
Urbana-Champaign, Illinois, U.S.A.
Tel: +1-217-333-3570, Fax: +1-217-244-0323
Email: kcting@illinois.edu
(伊利諾大學香檳校區農業生物工程系系主任丁冠中教授)

Abstract

In order to ensure a continuous supply of consistent quantity and quality cellulosic feedstock to biorefineries or power plants, biomass needs to be grown, harvested, transported, and stored in very large scales. A BP funded Energy Biosciences Institute (EBI, www.energybiosciencesinstitute.org), collocated at the University of California-Berkeley, Lawrence Berkeley National Laboratory, and the University of Illinois at Urbana-Champaign was established four years ago. EBI has research activities spanning the entire biofuels supply chain of feedstock production, feedstock logistics, biofuels production, biofuels distribution, and biofuels end use, as well as the related economic, environmental, ecological, social, political, and regulatory issues. A research program on "Engineering Solutions for Biomass Feedstock Production" was established within the EBI. The overall goals of the program are to develop engineering solutions and machinery for successful production and provision of biomass feedstock and establish research and development capacity capable of responding to a variety of potential candidate biomass feedstock. The deliverables of the program are operating machinery design and prototypes, scientific information and engineering data, computational platforms, and decision support tools. The program goals are being accomplished through five interrelated tasks of (1) Pre-Harvest Energy Crop Monitoring, (2) Harvesting of Energy Crops, (3) Transportation of Biomass, (4) Storage of Biomass, and (5) Systems Informatics and Analysis. Laboratories for all tasks have been built and made operational. Analyses based on experimental data and computer modeling/simulation/optimization have been conducted. Results will be presented at this conference.

Biography

K.C. Ting received his Ph.D. from the University of Illinois, M.S. from the University of Kentucky, and B.S. from National Taiwan University. All three degrees are in agricultural engineering. He is currently Professor and Head of the Agricultural and Biological Engineering Department at the University of Illinois. He teaches and conducts research on automation, systems informatics and analysis, alternative energy, and phytomation (i.e. plant based engineering systems). He served as the leader of the Systems Studies & Modeling Team within the New Jersey NASA Specialized Center Of Research and Training (NJ-NSCORT) during 1996-2000. He is a co-editor/co-author of an ASAE monograph entitled "Robotics for Bioproduction Systems." He holds a professional engineer license in New Jersey. Dr. Ting has been invited to deliver over 80 presentations at conferences and workshops in many countries. He has authored/co-authored over 230 articles, conference papers, and project reports. He is a creator of the concepts of "Phytomation" and "Automation-Culture-Environment oriented Systems analysis (ACESys)." He was a member of the African Scientific Committee for establishment of future African Institutes of Science and Technology. He was appointed a guest chair professor of Zhejiang University, Hangzhou, China in 2006. He currently leads a BP Energy Biosciences Institute program on "Engineering Solutions for Biomass Feedstock Production." He is an Editor-in-Chief for the journal of Computers and Electronics in Agriculture. He participated in an ESCOP/ACOP leadership program in 1993-1994 and was a fellow in the Food Systems Leadership Institute during 2006-2008. He was elected to Fellow of American Society of Agricultural and Biological Engineers (ASABE) in 2001 and to Fellow of American Society of Mechanical Engineers (ASME) in 2002. He is a recipient of the ASABE 2008 Kishida International Award and 2011 James R. and Karen A. Gilley Academic Leadership Award.

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

"Global Status and Prospects of Green Energy Technology and Policies"

Professor Jing-Tang Yang
Distinguished professor, Department of Mechanical Engineering, National Taiwan University
Director of the Office of Energy Strategy Development, National Science Council, ROC (Taiwan)
(台灣大學機械工程系楊鏡堂教授)
(國家科學委員會能源計畫辦公室主任)

Abstract

The average global surface temperatures have increased by about 0.74 ^{o}C over the past century, according to AR4 of IPCC. If current trend of the greenhouse gas emissions continues, the average global temperature may raise another 2 ^{o}C by 2035. By scientific evidence analysis, climate change and global warming is linked to the greenhouse gas (GHG) emissions which were mainly resulted from the use of fossil fuel. The biggest challenge for the governments is to adopt proper strategies to reach sustainable development when facing the escalating threat of global warming and prospective resource depletion. To shape the future of energy use in the longer term, it is an important issue to promote renewable energy as the new source of power and increase more efficient use of energy. By 2010, over 100 countries had policy targets or promotion policies related to renewable energy, compared to 55 in early 2005.

Information of economics activities, political processes, technology innovation and environment conservation is also crucial in energy-related issues in order to provide key facts and figures for decision makers. All above the information will help control these developments with the necessary conservation of energy resources and the environment. Based on the theme" Prospects of Green Energy Technology and Policies", the speech will cover three topics related to the phenomenon of climate change, mitigation and adaptation polices to tackle climate change, and current status and prospects of green energy technology.

Biography

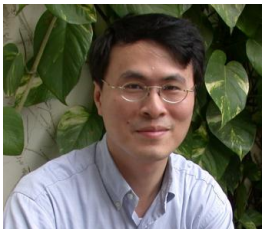
Professor Yang received his Ph.D. degree in 1983 from the Energy Division of the Mechanical Engineering Department of the University of Wisconsin at Madison and became a professor of the Department of Mechanical Engineering at National Taiwan University in August 2008. He has been appointed as a distinguished professor of NTU since 2009. His research group has 7 post doctors, 15 graduates (6 in PhD programs) and the current research topics contain energy and environmental engineering, microfluidics and biofluidics, lab-on-a-chip, biomimetic engineering and biophysics, jet propulsion, and laser diagnostics. During 1983-2008, he had been the faculty at the Department of Power Mechanical Engineering at National Tsing Hua University. He has received theNational Award of Invention and Creation of 2008, the National Innovation Award (on biotechnology) of 2007, the awards of the outstanding engineering professor of the Society of Chinese Engineers, the outstanding engineering professor of the Chinese Society of Mechanical Engineers, the outstanding research award of the National Science Council. His papers was selected into the *J. Micromechanics and Microengineering Highlights of 2006 and 2009*, respectively, and the Institute of Physics *IOP Select* 2009.

Dr. Yang has been the chairman of PME department (1997-2000) at NTHU, the director of Tzi-Chiang Science Research Center at NTHU, the member in the board of directors of Automobile Research and Testing Center (2000-2006), the general director of nanotechnology human resource development program office, the general coordinator of the reviewing committee of annual energy projects of the Energy Bureau of the Economy Ministry, the consultant in the Steering Committee for Energy Policy and Technological Development of Executive Yuan, the director of the Office for Energy Strategy Development of the Steering Committee for Energy Policy and Technological Development of Executive Yuan. Currently, he serves as the director of the Energy Strategy Development Office of National Science Council, and the Senior Consultant of National Applied Research Labatories.

Technical Session D1-W2-T1: Medicine/ Public Health/ Biotechnology/ Bioinformatics

Chair
Professor Hong-Yo Kang (康宏佑)
Graduate Institute of Clinical Medical Sciences,
Chang Gung Memorial Hospital at Kaohsiung Medical Center,
Chang Gung University, Taiwan
Tel: +886-7-735-6258
Fax:+886-7-733-6970
Email: hkang3@mail.cgu.edu.tw

Biography



Hong-Yo Kang received his B.S. (1991) in Pharmacy and M.S. (1993) in Microbiology from the National Taiwan University. He received his Ph.D. (1999) from the University of Wisconsin, Madison in Endocrinology and Reproductive Physiology, and was a postdoctoral fellow at the University of Rochester till 2000. He is currently a Professor of the Graduate Institute of Clinical Medical Sciences, Chang Gung University and the Director of the Center for Menopausal and Reproductive Research, Chang Gung Memorial Hospital at Kaohsiung Medical Center. He also serves as an Adjunct Professor in the Department of Biological Sciences, National Sun Yat-Sen University in Taiwan. He has conducted many medical research projects in several major human diseases such as infertility, menopause, osteoporosis, rheumatoid arthritis, prostate cancer and androgenic alopecia by analyzing human sample biopsies. His primary research interests are focusing on studying the roles of sex steroid hormones such as androgens and gonadal peptide hormones such as activins in both normal and abnormal development of reproductive organs, bone and cancer by combining molecular biology and genomics tools with animal models and advanced *in vivo* imaging technologies. He has published more than forty (40) papers with seventy five (75) papers presented at conferences and symposia. He has also served as the primary investigator (PI) of seven (7) research grants and Co-PI of more than thirty (30) funded research projects over 2.0 million US dollars in Taiwan for the past three years.

Dr. Kang's exceptional achievements have been recognized by many prestigious awards in the world, including the 84th Endocrine Society Young Investigator Award (2002), the Young Investigator Award for 11th International Congress on Hormone steroids and 7th International Congress on Hormones and Cancer (2002), the Young Investigator Award

for 1st joint meeting of the International Bone and Mineral Society and Japanese Society for Bone and Mineral Research (2003), the Young Scientist Award for 2nd Scientific Meeting of the Asia Pacific Menopause Federation (2004) and the Young Investigator Award for International Osteoporosis Foundation of World Congress on Osteoporosis (2006).

Technical Session D1-W2-T1: Medicine/ Public Health/ Biotechnology/ Bioinformatics

"Overview of Simultaneous PET/MR Imaging for Clinical and Preclinical Research"

Dr. Gene-Jack Wang
Senior Medical Scientist & Chair
Medical Department Brookhaven National Laboratory
(布魯克海文國家實驗室醫學部主任王俊傑醫師)

Abstract

The combination of x-ray CT with PET provides sufficient anatomical information for PET, which has very quantitative data for clinical and preclinical imaging but lack of spatial resolution. Although PET/CT is well established for clinical applications, there are some limitations. CT provides limited soft tissue contrast and exposes large radiation dose to the studied subjects. The conventional PET/CT scanner is a combination of PET and CT scanners back to back and does not allow simultaneous image acquisition. These temporal mismatch causes image artifacts by patient movement between the scanners. To solve the problem, recent research and development focus on combining PET and MRI into one single device. The goal is to integrate the PET detectors into the MR scanner. The combined PET/MR scanner provides high-resolution anatomical data with high soft tissue contrast and no radiation dose from MRI and allows simultaneous functional data acquisition from PET. The device allows very accurate temporal and spatial image fusion. In addition, MRI can also provide functional information such as blood oxygen level dependent (BOLD) imaging, diffusion tensor imaging and spectroscopy. The ability to obtain simultaneous PET and MR data with a combined PET/MR scanner could provide multi-functional information of physiological processes in vivo and would have tremendous impact on clinical and preclinical imaging research. Recent development and pitfalls of the technology will be discussed.

Biography

Dr. Gene-Jack Wang is a senior scientist at the Brookhaven National Laboratory (BNL) and a board certified Nuclear Medicine physician. In addition to performing his own research, he is the Chairman of the BNL Medical Department and holds a joint appointment as a Professor of Psychiatry at Mount Sinai School of Medicine and an adjunct professor of Psychiatry and Radiology at Stony Brook University. His research focuses on the application of PET and functional MRI to the study of various brain disorders. He is interested in using PET to study the neuro-psychiatric mechanisms and manifestations of alcoholism, drug addiction, obesity and eating disorder in humans and in animal models. Using PET, he reported similarity of brain circuits' disruption in drug addiction and in obesity. Currently, he uses PET to study the relationship between peripheral metabolic signals and brain neurotransmitters. His other interests include using functional MRI to study effect of diet control drug on brain satiety circuit and to assess cognitive function in obese subjects and using simultaneous PET/MR imaging to detect breast lesions. He has published over 230 peer-reviewed papers on his imaging research. The National Institute of Health and pharmaceutical companies fund his ongoing research.

Technical Session D1-W2-T1: Medicine/ Public Health/ Biotechnology/ Bioinformatics

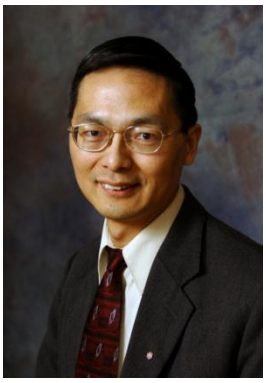
"Development of Novel Tools for Gene Therapy via Protein Engineering"

Professor Huimin Zhao,
Centennial Chair Professor
Departments of Chemical and Biomolecular Engineering, Chemistry, Biochemistry, and Bioengineering,
Institute for Genomic Biology, Center for Biophysics and Computational Biology
215 Roger Adams Laboratory, Box C3, University of Illinois at Urbana-Champaign
Tel: (217)333-2631, Fax: (217)333-5052
Email: zhao5@illinois.edu
(利诺伊大学厄巴纳-香槟分校赵惠民教授)

Abstract

Gene therapy has the potential to significantly influence human health in this millennium and promises new treatment for a large number of inherited and acquired diseases. However, despite decades of research, to date, gene therapy has been of limited medical benefit. This is mainly due to the difficulties in achieving sustained gene expression and in safe and efficient gene delivery. To address these limitations, my group has been applying protein engineering to create new tools for gene therapy. One of them is ligand-regulated gene expression systems that can significantly broaden the clinical efficacy and safety as well as the application range of gene therapy. We used a combined directed evolution and rational design approach to engineer variants of human estrogen receptor alpha ligand binding domain that bind and respond to two synthetic ligands – 4,4′-dihydroxybenzil and 2,4-di(4-hydroxyphenyl)-5-ethylthiazole – with high specificity and potency. These two receptor-ligand pairs were assembled with a variety of activation/repression domains and DNA-binding domains to generate multiple gene switches for selective regulation of gene expression in mammalian cells. The other tool is engineered artificial nucleases with novel defined sequence specificity. Recently, we developed a new class of artificial DNA nucleases, so called TAL effector nucleases (TENs), in which the central repeat DNA binding domain of the TAL effectors is fused with the non-specific DNA cleavage domain of the FokI restriction endonuclease through a flexible linker. As proof of concept, a custom-designed TEN targeting the human β-globin gene locus associated with sickle cell anemia was successfully engineered. Because of the simplicity and ease in engineering novel sequence specificity, custom-designed TENs may serve as a powerful tool for site-specific modification of a mammalian genome for basic and applied biological research.

Biography



Dr. Huimin Zhao is the Centennial Endowed Chair Professor of chemical and biomolecular engineering, and professor of chemistry, biochemistry, biophysics, and bioengineering at the University of Illinois at Urbana-Champaign (UIUC). He received his B.S. degree in Biology from the University of Science and Technology of China in 1992 and his Ph.D. degree in Chemistry from the California Institute of Technology in 1998 under the guidance of Dr. Frances Arnold. Prior to joining UIUC in 2000, he was a project leader at the Industrial Biotechnology Laboratory of the Dow Chemical Company. Dr. Zhao has authored and co-authored over 100 research articles and 12 patents with several being licensed by industry. His honors include Fellow of the American Association for the Advancement of Science (AAAS), Fellow of the American Institute of Medical and Biological Engineering, the American Chemical Society (ACS) Division of Biochemical Technology Young Investigator Award, American Institute of Chemical Engineers (AIChE) Food, Pharmaceutical, and Bioengineering Division Plenary Award Lecturer, National Science Foundation CAREER Award, DuPont Young Professor Award, Dow Chemical Special Recognition Award, Outstanding Overseas Young Chinese Scholars Award, Xerox Award for Faculty Research from UIUC College of Engineering, Petit Scholar from UIUC College of Liberal Arts and Sciences, and University Scholar from UIUC. Dr. Zhao served as a consultant for over 10 companies including Pfizer, Maxygen, British Petroleum, Gevo, Inc., and zuChem, and as a member of the Scientific Advisory Board of Gevo and Myriant Technologies. Dr. Zhao is an Associate Editor of *ACS Catalysis* and an editor of *Journal of Industrial Microbiology and Biotechnology*. His primary research interests are in the development and applications of synthetic biology tools to address society's most daunting challenges in human health and energy, and in the fundamental aspects of enzyme catalysis and gene regulation.

Technical Session D1-W2-T1: Medicine/ Public Health/ Biotechnology/ Bioinformatics

"Following Protein Conformational Transitions, One Molecule at a Time"

Professor Haw Yang
Department of Chemistry
Princeton University

Abstract

Proteins have evolved to harness thermal fluctuations, rather than frustrated by them, to carry out chemical transformations and mechanical work. What are, then, the operation and design principles of protein machines? Motivated by this overarching question, we have studied the domain movements in three different enzymes: protein tyrosine phosphatase B, PtpB, from M. tuberculosis (a virulence factor of tuberculosis and a potential drug target), adenylate kinase, AK, from E. coli (a ubiquitous energy-balancing enzyme in cells), and the human insulin degrading enzyme (a key enzyme relevant to diabetes and the Alzheimer's disease). These domain movements have been followed in real time on their respective catalytic timescales using model-free, high-resolution single-molecule Förster-type resonance energy transfer (FRET) spectroscopy. Integrating these microscopic dynamics into macroscopic kinetics allows us to place the conformation transitions in the context of enzymatic turnovers, revealing such operational principles as dynamically induced fit, conformational gating, and local folding. These observations and those by others suggest a mechanical view of large-amplitude protein conformational transitions. A new way of measuring the mechanical properties of individual protein molecules will also be presented.

Biography

Haw Yang attended National Taiwan University, where he was a Yuan Lee Scholar, and received a Bachelor's degree in Chemistry in 1991. After two years of mandatory military service, he attended graduate school at the University of California, Berkeley, where he worked under the supervision of Charles Harris. His Ph.D. thesis concerned the mechanisms and dynamics of photo-induced chemical bond activation by organometallic compounds. In 1999, he went to Harvard University where he worked with Sunney Xie as a postdoctoral research assistant. In 2002, he joined the faculty of the University of California, Berkeley, as an Assistant Professor of Chemistry. In 2009, he moved to Princeton University as an Associate Professor of Chemistry. He is an Alfred P. Sloan Fellow, has received the CAREER award from the National Science Foundation, the Hellman Family Faculty Award, and the Camille Dreyfus Teacher-Scholar Award. His research concerns molecular reactivity in complex systems, currently focusing on (1) investigating, understanding, and exploiting thermal fluctuations, and (2) deciphering molecular processes in living systems. He is an Associate Editor of Chemical Science and serves on the Advisory Board of Chemical Society Reviews.

Technical Session D1-W2-T1: Medicine/ Public Health/ Biotechnology/ Bioinformatics

"Innovation through Fixed Dose Combination (FDC) Products: Opportunities and Challenges"

Dr. Tzuchi "Rob" Ju
Distinguished Associate Volwiler Fellow
Global Pharmaceutical Sciences
Abbott

Abstract

Over the past few years, an increasing number of fixed dose combination (FDC) products has been approved by global regulatory agencies and used by medical professionals as an important treatment option for various diseases. Trending of FDC products in the market place and under development is discussed in terms of market share, recent approvals, delivery route, indication, and stage of development. Proven benefits offered FDC products in terms of treatment outcome, patient compliance, and cost are addressed, while potential limitations of FDC products are discussed. FDA's perspectives on FDC products will be highlighted. Finally, technical challenges and potential opportunities of developing FDC products will be presented. The presentation will end with case studies of selected FDC products.

Biography

Rob is a distinguished associate Volwiler Fellow at Abbott where he also manages a formulation development group responsible for product development from early clinical studies to product launch. In his 15 years experiences working for three companies, Rob has been responsible for the formulation development of four NDA submissions and successful approval of three marketed products. He sits in the Scientific Advisory Board of NIPTE that is actively involved with FDA-sponsored projects related to QbD policy setting and training of FDA reviewers. He is also a committee member of the PQRI Biopharmaceutics group. Rob has been productive in sciences with over 13 patent (applications) and 65 publications/presentations. His extensive development experiences and scientific productivity have allowed him to develop an industrial applied research program that blends innovation and business impact.

He is a well-known expert in oral controlled release and is well connected in the pharmaceutical industry. His other responsibilities include capital planning and budgeting, talent management & recruiting, outsourcing, facility planning, construction, and management, information management, project management, and new technology/compound scouting.

Rob received his B.S. in Chemical Engineering from National Taiwan University and Ph.D. in Chemical Engineering from Stanford University.

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

Chair
Professor Ching-Fuh Lin (林清富),
Graduate Institute of Photonics and Optoelectronics and Department of Electrical Engineering,
National Taiwan University

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 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 single-crystal Si thin-film solar cells, organic-inorganic composite thin-film solar cells and optoelectronic devices, Si-based photonics, and physics in broadband semiconductor lasers and optical amplifiers.

He is currently 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 300 conference papers and hold over 30 patents. He had obtained the Distinguished Research Award and 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 and many other awards, including 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.

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

"Novel Nano-Scale Electrodes For Solid Oxide Electrochemical Cells"

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Abstract

This talk will review recent work on novel nano-scale electrode materials for solid oxide fuel cells (SOFCs) that are also of interest for energy storage via high-temperature electrolysis. In the first part, a study of the stability of infiltrated nano-cathode materials is presented. In the second, part, a novel type of anode is described where nano-scale metal catalyst particles nucleate on oxide surfaces.

Although infiltrated nano-scale cathodes have shown excellent performance for reduced-temperature (<600C) SOFCs, long-term stability is a critical potential problem. One degradation mechanism is microstructural coarsening that will decrease infiltrate surface area and thereby increase polarization resistance R_P. Cathodes consisting of $La_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_{3-\delta}$ (LSCF) infiltrated into Gd doped ceria (GDC) scaffolds were maintained at temperatures from 650 - 850◦C, higher than the target cell operating temperature of 600◦C, in order to accelerate degradation processes. The symmetrical cathode cells were tested periodically at 600°C by impedance spectroscopy. A model for the cathode resistance variation, where the LSCF evolves assuming surface diffusion and capillary driven coarsening, is presented, used to fit the data, and used to predict long-term performance.

Composite anodes consisting of Pd-substituted $(La,Sr)CrO_{3-\delta}$ mixed with 50 wt% $Ce_{0.9}Gd_{0.1}O_{2-\delta}$ were tested in $La_{0.9}Sr_{0.1}Ga_{0.8}Mg_{0.2}O_{3-\delta}$ electrolyte supported fuel cells at 800°C with humidified H_2 fuel. A relatively low anode polarization resistance (~ 0.37 Ωcm^2 at 600°C) was observed, explained by the nucleation of Pd nano-particles on perovskite particle surfaces. Anode performance then degraded gradually before stabilizing. Redox cycling repeatedly restored the anodes to their initial peak performance, followed again by degradation. This regenerative behavior was explained by the observation that the Pd nano-particles were removed by oxidation, and then re-nucleated upon reduction. The anode characteristics changed considerably with the cell break-in temperature.

For example, the electrode produced a much lower polarization resistance at 600°C, when broken in at 600°C, compared to an electrode broken in at 800°C. That is, the electrode adapted in order to produce good performance at a given break-in temperature.

Biography

Scott A. Barnett is Professor of the Materials Science and Engineering department at Northwestern University. He is also founder and President of Functional Coating Technology LLC. After receiving his Ph.D. in Metallurgy from the University of Illinois at Urbana-Champaign in 1982, he held postdoctoral appointments at the University of Illinois and Linkoping University (Sweden). He took his present position at Northwestern in 1986. His research focuses on thin films and coatings produced by physical vapor and colloidal deposition methods. His general areas of interest in SOFCs include thin electrolyte deposition, low-temperature operation, electrode reaction mechanisms, and hydrocarbon reactions. He helped pioneer thin-electrolyte SOFCs, demonstrating that they can operate at temperatures as low as 600C. His work demonstrating the feasibility of direct-hydrocarbon SOFCs has helped sparked recent excitement in this area. Dr. Barnett has published about 200 papers in peer-reviewed journals, has 11 issued patents, and has been an invited speaker at many national and international conferences. In 1986 he was awarded the ONR Young Investigator Award, in 1998 was honored as a Fellow of the American Vacuum Society, and in 2008 received the Cheng Tsang Man Endowed Professorship at Nanyang Technological University.

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

"Silicon Thin Film Solar Cells Fabricated by ECRCVD"

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(中央大學機械工程系利定東教授)

Abstract

Electron cyclotron resonance (ECR) plasma possesses high density plasma under low pressure operation. It has several advantages such as high deposition rate and low contamination. An electron cyclotron resonance chemical vapor deposition (ECR-CVD) system was built to deposit hydrogenated amorphous silicon thin films on substrates including glass and silicon wafers. The objective of this study is to understand ECR plasma deposition mechanism, thin film characteristics and uniformity. From deposition rate control and optimization of the process conditions, a reasonable silicon thin film solar cell can be obtained. Langmuir probe was used to measure the plasma density, electron temperature and plasma potential. In addition to monitoring the species in plasma during thin film deposition and doping process, optical emission spectroscopy (OES) was also used to study deposition mechanism and its reaction ion temperatures. Fourier transform infrared spectroscopy (FTIR) and scanning electron microscope (SEM) were used to measure the film properties. It showed that higher deposition rate (>2.5 nm/sec) and lower microstructure parameter (10% < R* < 30%) could be achieved by varying microwave power, magnetic field, and hydrogen dilution ratio. Besides the main magnetic coil which creates resonance plasma zone, sub-magnetic (auxiliary) fields for inner and outer coils under ECR-CVD process chamber was installed to improve the deposit uniformity of a-Si solar thin films. We succeeded in obtaining a good deposit uniformity (< 10%) of a-Si solar thin films over 150mm diameter. Finally, we fabricated silicon solar cells successfully with a reasonable efficiency (~5%) .

Biography

Dr. Tomi T. Li was born in Taiwan. He received his PhD from Michigan State University in East Lansing of USA in 1982 in the field of Inorganic Chemistry and Materials.

Starting from 2007, he is a professor at Mechanical Engineering of National Central University in Taiwan. Prior to that, he was an Executive Senior Director of Applied Materials of USA. He worked and held various senior/executive technical, business management and product positions in the past 16 years in Applied Materials USA including Technology and Product General Manager in Applied Materials China, Directors of Product groups of PVD, CVD, Director and manager of Technology, Business Development and Marketing for Asia and Globe since 1991. Prior to these positions, he has worked for Digital Equipment Company of USA as a Principal IC Process Engineer and later as a Manager for 6 years since 1985. He also worked for IBM Research Lab. in San Jose of USA as a Research Scientist in thin film area for 1.5 year during 1984-1985. He had more than 20 years experience in Semiconductor areas. He had 50 published papers. He is interested in Si thin film solar cell, IC equipment and process integration, optoelectronics and nano technology.

In the past, Dr. Li was invited and gave many talks in various international conferences overseas and universities /institutes in the world. Dr. Li was selected as an international conference chairman i.e. ECS 2007 and proceeding editor few times in the past. Dr. Li was a visiting professor as lectureship in Materials Science and Engineering Department at San Jose State University during 1999-2000. He also served as a Graduate Student Board Committee at San Jose State University during 1998- 1999 and 2005- 2006

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

"Lithium Battery Technology and Modeling"

Professor Shi-Chern Yen
Department of Chemical Engineering
National Taiwan University
(台灣大學化學工程學系顏溪成教授)

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

"Sustainability through Silicon Material Innovation"

Dr. Joe Xiaobing Zhou
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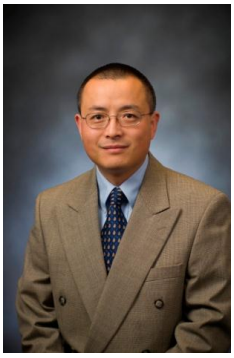
(道康宁公司周晓兵博士)

Abstract

Sustainability is being incorporated into silicon material innovation to support the strategic business move in Dow Corning. This presentation introduces how Dow Corning is driving towards sustainability through silicon material innovation, and uses three commercially successful examples to showcase "sustainability-oriented" material innovation, including development of specialty silane coupling agents for green tires, high purity silicon metals, high transparency silicone encapsulants for photovaltaic panels, and high performance silicone encapsulants for light-emitting diode devices.

Biography



The author was born in 1966 at Xi'an, China. He acquired a B.Sc. degree in chemistry in 1989 from Beijing University, China, and a Ph.D. degree in organometallics in 1998 from University of Victoria, Canada. Then he pursued a one-year post-doc research in the area of wood adhesive chemistry at Virginia Tech, U.S.A.

He started to work for Dow Corning Corporation in 1999, and has experience in various types of silicon materials used in construction, electronics or solar applications. He is currently a senior research specialist developing new silicon materials. He is the author/co-author of 15 journal papers, book chapters and conference proceedings, and the inventor of 9 patents.

Dr. Zhou is a member of American Chemical Society, Material Research Society and Sigma Xi.

Technical Session D1-W4-T1: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

Chair
Professor Hsi-Pin Ma (馬席彬),
Department of Electrical Engineering and Institute of Communications Engineering
National Tsing Hua University
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Tel: +886-3-516-2206, Fax: +886-3-571-5971
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Biography

Hsi-Pin Ma was born in Nantou, Taiwan, on January 17, 1973. He received the B.S. and Ph.D. degrees in electrical engineering from the National Taiwan University, Taiwan, in 1995 and 2002.

At the summer of 2000, he interned at Siemens Telecommunication Systems Limited, for feasibility study and establishment of a dual-mode base station for WCDMA and cdma2000. Since 2003, he has been with the Department of Electrical Engineering/Institute of Communications Engineering, National Tsing Hua University, Hsinchu, Taiwan, where he is currently as an Associate Professor.

Dr. Ma's research interests include communications system design, power efficient baseband DSP techniques, and communications SoC implementation. His group is working on the system design, signal processing algorithm development, and SoC implementation for advanced communications systems such as multi-user mobile MIMO communications, cognitive radio and for applications such as smart grid and biomedical electronics.

Technical Session D1-W4-T1: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

"Energy-Efficient and Memory Access Techniques for Wireless Video Entertainments"

Professor Wei Hwang, IEEE Life Fellow
University Chair Professor of Electronics Engineering, National Chiao Tung University
Director, Center for Advanced Information Systems and Electronics Research (CAISER), University System of Taiwan
Tel.: +886-572-9541, Fax.: +886-3-573-8390
E-Mail: hwang@mail.nctu.edu.tw
(交通大學電子工程系黃威教授)

Abstract

With increasing demands on ubiquitous wireless high-data-rate multimedia services, it is critical to have efficient processing capability and a merging multi-task system to sustain the growth. Different from the traditional approach, energy-efficient and adaptive design concepts become essential to handle concurrent multimedia services at minimum processing power. In this talk, we present a new low-power on- demand memory subsystems to overcome the challenges in the multi-core system design that needs to support wireless video entertainments. This heterogeneous system will provide energy-efficient data transfer, data storage and transmission control protocols. With circuit and architecture co-designs, the on-demand memory sub-systems provide dynamic scheduling mechanisms to optimize the memory allocation, low latency and high bandwidth of on-chip SRAM and off-chip LPDDR SDRAM. Advantages and highlight of a case study, the integrated digital home server with heterogeneous network entertainment systems, will be presented. Future directions and challenges related to multiview video to 3-D video are also briefly discussed.

Biography

Wei Hwang (F'01, LF'09) received the B. Sc. degree from National Cheng Kung University, Tainan, Taiwan, the M. Sc. degree from National Chiao Tung University, Hsinchu, Taiwan and the M. Sc and Ph.D. degrees in electrical engineering from the University of Manitoba, Winnipeg, MB, Canada in 1970 and 1974, respectively.

From 1975 to 1978, he was an Assistant Professor with the Department of Electrical Engineering, Concordia University, Montreal, QC, Canada. From 1979 to 1984, he was an Associate Professor with the Department of Electrical Engineering, Columbia University, New York, NY, USA. From 1984 to 2002, he was a Research Staff Member with the IBM Thomas J. Watson Research Center, Yorktown Heights, NY, USA, where he worked on High Performance DRAM and Microprocessor Design. In 2002, he joined National Chiao Tung University (NCTU) in Hsinchu, Taiwan, as the Director of Microelectronics and Information Systems Research Center until 2008. Currently, he is an University Chair Professor with the Department of Electronics Engineering. His research interests include low-power Digital Integrated Circuits design, Memory Systems and e-home applications, and 3-D Integration Technology and Systems. During 2003-2007, he served as Co-Principal Investigator of National System-on-Chip (NSoC) Program in Taiwan. From 2005 to 2007, he also served as a Senior Vice President and Acting President of NCTU, respectively. He is the coauthor of the book "Electrical Transports in Solids-with particular reference to Organic Semiconductors", Pergamon Press. 1981, which has been translated into Russian and Chinese. He has authored or coauthored over 200 technical papers in renowned international journals and conferences, and holds over 180 international patents (including 68 U.S. patents).

Prof. Hwang was a recipient of several IBM Awards, including 16 IBM Invention Plateau Invention Achievement Awards, 4 IBM Research Division Technical Awards. He was named an IBM Master Inventor. He has received the CIEE Outstanding Electrical Engineering Professor Award in 2004 and Outstanding Scholar Award from the Foundation for the advancement of Outstanding Scholarship **(**for 2005 to 2010. Recently, he has received two Outstanding Technical Awards from the National Science and Technology Program for System-on-Chip, National Science Council in 2010. He was President, Board Director and Chairman of the Boards of Directors of the Chinese American Academic and Professional Society (CAAPS) from 1986 to 1999. He is a member of the New York Academy of Science, Sigma Xi and Phi Tau Phi Society. He has served several times in the Technical Program Committee of the ISLPED, SOCC, A-SSCC. He served as the General Chair of 2007 IEEE SoC Conference (SOCC 2007) and the General Chair of 2007 IEEE International Workshop on Memory

Technology, Design and Testing (MTDT 2007). He also severed as a Supervisor of IEEE Taipei Section from 2007 to 2010. Currently, he is serving as Founding Director of Center for Advanced Information Systems and Electronics Research (CAISER) of University System of Taiwan, UST and Director of ITRI and NCTU Joint Research Center. He is a Life Fellow of IEEE.

Technical Session D1-W4-T1: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

"Securing Data in the Cloud – Challenges and Research Directions"

Professor Elisa Bertino
Research Director, the Center for Education and Research in Information Assurance and Security (CERIAS)
Interim Director, Cyber Center (Discovery Park), Department of Computer Science
Purdue University
Tel: +1-765-496-2399, Fax: +1-765-494-0739
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Abstract

Managing data is arguably one of the reasons for adopting cloud technologies. These technologies are very promising with respect to enhancing scalability, reducing costs, and rapidly adapting to changes in application demands. However the adoption of these technologies is not without risks. Data stored in a cloud would be accessible to a large variety of individuals, like the IT staff of the cloud providers. The cloud providers may in turn outsource data management functions to other providers. Data integrity and availability are critical issues. Physical protection, crucial for data security, may be difficult to assess for the organization owning the data as data may be stored in different countries, which makes difficult making inspections to the data storage location. In some cases, even being able to control the location of the data may be difficult. However, making sure that data is stored or not stored in certain locations is crucial for compliance. Data segregation is essential in the context of multi-tenant contexts in which data owned by different organizations may reside on the same systems. Support for disaster recovery, and accountability are also critical requirements. In the talk we will first elaborate on these issues. We will then present an overview of the MASK system, able to support fine-grained encryption of data while at the same time supporting identity-based privacy-preserving access control on encrypted data. We will conclude the presentation with a discussion about the notion of accountability policies and tools for managing security policies.

Biography

Elisa Bertino is professor of Computer Science at Purdue University and serves as Research Director of the Purdue Center for Education and Research in Information Assurance and Security (CERIAS) and interim director of Cyber Center. Previously she was a faculty member at Department of Computer Science and Communication of the University of Milan where she directed the DB&SEC laboratory. She has been a visiting researcher at the IBM Research Laboratory (now Almaden) in San Jose, at the Microelectronics and Computer Technology Corporation, at Telcordia Technologies. Her main research interests include security, privacy, digital identity management systems, database systems, and distributed systems. She serves (has served) on the editorial boards of several scientific journals, including IEEE Internet Computing, IEEE Security&Privacy, ACM Transactions on Information and System Security, ACM Transactions on Web. Elisa Bertino is a Fellow member of ACM and of ACM. She received the 2002 IEEE Computer Society Technical Achievement Award for "For outstanding contributions to database systems and database security and advanced data management systems" and the 2005 IEEE Computer Society Tsutomu Kanai Award “For pioneering and innovative research contributions to secure distributed systems”.

Technical Session D1-W4-T1: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

"Detecting Anomaly Mobile Web Page through Template Classification"

Professor Chia-Mei Chen
Department of Information Management, College of Management
National Sun Yat-Sun University, Kaohsiung, Taiwan
(中山大學資訊管理學系陳嘉玫教授)

Abstract

As the emerging technology of mobile communication and internetworking, web browsing has become a common activity in everyone's daily life. The intensive use of wireless networks is a trend in the future. A user can connect to the Internet anywhere any time through wireless networks. In the wireless environment, mobile web services provide access to web contents and create new applications for mobile telecommunications market. However, the convenience of mobile services also brings new attack types. The use of AJAX technology creates vulnerabilities that could lead to execute arbitrarily code and increases the risk of the user who browses the web.

The paper develops a secure web browsing mechanism which includes the following functions: (1) a template-based malicious mobile webpage classification; (2) a reasoning malicious webpage detection algorithm; and (3) a secure mechanism for web browsing on mobile devices. Experimental Results demonstrates that our detection algorithm is tolerant to obfuscation and perform superior to commercial anti-virus software.

Biography

Chia-Mei Chen joined in the National Sun Yat-Sen University as an associate professor in 1996 and became a full professor in 2004. In addition, she is Section Chef of Network Division, Office of Library and Information Services. She received BS and MS from the Department of Computer Science and Information Engineering, National Chiao-Tung University, and Ph.D. in Computer Science from the University of Maryland, College Park. She serves as a coordinator of TWCERT/CC (Taiwan Computer Emergency Response Team/Coordination Center) since 1998 and continues working for the network security society. Her current research interests include mobile networks, multimedia systems, and network security.

Technical Session D1-W4-T1: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

"Energy-Aware Multi-path Routing for Wireless Sensor Network with Holes"

Professor Sheng-Tzong Cheng
Chief, Department of Computer Science and Information Engineering
National Cheng-Kung University
(成功大學資訊工訊系教授兼系主任鄭憲宗教授)

Abstract

Transmission using excess power not only shortens the lifetime of sensor nodes, but also introduces interference. Packets should ideally be transmitted with moderate power. This talk addresses a multilevel power adjustment (MLPA) mechanism for a wireless sensor network to prolong the lifetime of individual nodes and the overall network. An analytical model of the MLPA mechanism with m distinct power levels (m-LPA) is constructed. For 3-LPA, the closed-form expression of the optimal power setting is determined and the mean transmission power is minimized to one third of original fixed power. Besides, we found that average power consumption of our proposed mechanism is 47% higher than original.
In addition, we extend the power-aware issue further to the wireless sensor network with holes. Holes in wireless sensor networks are the geographical region without enough available sensor nodes. When a hole exists in the wireless sensor network, it often causes traditional routing algorithms to fail. In most of the previous works, the hole-bypassing problem was tackled by using the static detour path to route data packets along the boundaries of holes. As a result, the energy of sensor nodes on the static path depletes quickly, and the size of hole enlarges. In this talk, we propose a scheme for bypassing holes in wireless sensor networks by exploiting energy-aware multiple paths. Our approach not only takes into account the shorter path to bypass the hole, but also eases the loading of the sensor nodes on the boundaries of holes. Simulation results show that the proposed scheme can achieve short detour paths, low energy consumption and network load balancing.

Biography

Sheng-Tzong Cheng received the BS (1985) and MS (1987) in Electrical Engineering from the National Taiwan University, Taipei, Taiwan. He received the MS (1993) and PhD (1995) in Computer Science from the University of Maryland, College Park, MD, USA. He was an Assistant Professor of Computer Science and Information Engineering at the National Dong Hwa University, Hualien, Taiwan, in 1995. He joined the Department of Computer Science and Information Engineering (CSIE), National Cheng-Kung University (NCKU), Tainan, Taiwan in 1997 and became an Associate Professor and a Professor in 1999 and 2004 respectively.

Dr. Cheng was the recipient of the Lee, Kuo-Din Research Award (李國鼎研究獎) in 2002 to highlight his research on multimedia and wireless communications. He advised many students to receive several top-prize awards from the contests held by the Ministry of Education and the Institute of Information Industry in Taiwan, etc.

Currently, Prof. Cheng is directing the wireless communication and mobile network laboratory in CSIE, NCKU. He also serves as the director of the Medical Computing and Communication (MCC) Software Center in NCKU. He is serving as the department chair of CSIE, NCKU from 2009. He has published more than 100 papers in the international journals and conferences. He holds one ROC patent and several pending patents. He is enlisted in Marquis *Who's Who in Asia*, and *Who's Who in Engineering and Sciences* in 2006 to 2008, and *International Educators of the Year* in 2009. His research interests include design and performance analysis of mobile computing, wireless communications, multimedia, quantum computing, and real-time systems.

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

Chair
Professor Ta-Hui Lin (林大惠),
Department of Mechanical Engineering,
National Cheng-Kung University

Biography

Present Position: Distinguished Professor and Head, Department of Mechanical Engineering,
Vice Director (Education/Research), Research Center for Energy Technology & Strategy
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Education:
9/84 – 6/87 Northwestern University, Evanston, Illinois, USA; Ph.D. in Mechanical Engineering.
9/82 – 8/84 Northwestern University, Evanston, Illinois, USA; M.S. in Mechanical Engineering.
9/75 – 7/79 National Cheng Kung University, Taiwan, ROC; B.S. in Mechanical Engineering.

Research Areas:
1. Basic combustion researches: gaseous, droplets and spray combustion, flame synthesis.
2. Applied combustion researches: gas stoves, IC engines, industrial furnaces and boilers.
3. Combustion related researches: energy utilization, air pollution control and fire research.

Current Research Activities:
1. Basic researches on compound drops combustion, spray combustion, oxy-fuel combustion, flame synthesis of carbon nano-structures, flame interaction and flame stabilization.
2. Improved designs on combustion efficiency and CO emission of domestic gas stoves.
3. Researches on dual-injection (ethanol-gasoline or water-gasoline) SI engines, basic designs of GDI engines and HCCI engines.
4. Experimental evaluations on combustion efficiency, pollutant emissions, and combustion deposits of burning fuel oil, coal or biofuel used in industrial furnaces and boilers.

5. Technology developments on burning by-product combustible gases from manufacturing processes.
6. Technology developments on oxy-fuel combustion for CO_2 capture in industrial furnaces.
7. Developing experimental facilities for architecture fire-prevention and safety researches, including the 10MW fire calorimeter and test furnaces for door, column, beam and floor.
8. Full-scale analyses on burning motor scooters, fireproof performance of a glass plane (or a steel rolling shutter) with down-flowing water film, smoke leakage through wall openings in a fire, and performance-based code evaluations of room fires.
9. Developments on offshore wind power in Taiwan, master project of National Science and Technology Program - Energy.

Publications:

Over 300 research articles including 75 international journal publications in *Proceedings of the Combustion Institute, Combustion and Flame, Combustion Science and Technology, Fuel, Physics of Fluids, Experiments in Fluids, International Journal of Heat and Mass Transfer, Energy Conversion and Management, Applied Thermal Engineering, Nanotechnology, Carbon, Atmospheric Environment, Building and Environment*, *Journal of Fire Sciences,* etc.

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

"Recent Advances in Green Energy and Green Chemicals Production from Cellulosic Biomass by Yeast-Based Technologies"

Professor Nancy W.Y. Ho
Research Professor
School of Chemical Engineering
Group Leader, Molecular Genetics Group
Laboratory of Renewable Resources Engineering (LORRE)
Purdue University, Potter Engineering Center

Abstract

After the first worldwide energy crisis in the 1970s, the US government agencies strongly focused their support on the development of technologies to produce ethanol from renewable cellulosic feedstocks. The efficient production of cellulosic ethanol (ethanol produced from cellulosic biomass) requires having effective microorganisms that can convert all sugars, particularly the major sugars (glucose and xylose), present in all types cellulosic materials to ethanol; effective pretreatment processes to release the polymers; as well as commercially available affordable cellulases to breakdown the polymers of cellulose present in cellulosic biomass to glucose. Now these required technologies have been developed. Since 1980, my laboratory at Purdue University has been devoted to the development of effective recombinant *Saccharomyces* yeast making it able to coferment xylose as well as other minor sugars together with glucose for efficient production of ethanol as well as high value co-products. Our current yeast has been used by industry to produce cellulosic ethanol in small scale since 2004. A company, Green Tech America, Inc. (GTA), has been established to closely collaborate with Purdue University to market and continue improving the yeast, particularly to enable the yeast to produce high-value coproducts during ethanol production in order to make the process more cost effective. In this presentation, I will report the capabilities of our current yeast as well as further improved yeast in producing ethanol from real cellulosic biomass hydrolysates containing high concentrations of the major sugars, glucose and xylose. We believe the technologies are ready and continually being improved for large-scale industrial cellulosic ethanol production.

Biography

University's Department of Biological Sciences. After completing her studies, she remained at Purdue to further research on the methods for the study of DNA. Since 1980, she has focused her efforts on using recombinant DNA techniques to improve industrial microorganisms. Her most noted work has been the development of recombinant *Saccharomyces* yeast, widely known as the Ho-Purdue yeast, which can effectively produce cellulosic ethanol from all types of cellulosic plant materials – such as corn stalks, wheat straws, wood, and grasses. Her lab at Purdue University continuously improves the yeast to make it to produce cellulosic ethanol even more efficiently.

Ho foresaw the need to have a global company to produce and market the yeast as well as to provide other services for cellulosic ethanol production. Dr. Ho founded Green Tech America, Inc. in West Lafayette, Indiana in 2006. Its immediate mission is to commercialize the best Ho-Purdue Yeast developed at Purdue University for the production of low-cost renewable fuel ethanol from cellulosic biomass. It will also continue to develop and market new co-products producing derivatives of the Ho-Purdue yeast, making industrial cellulosic ethanol production a prosperous business and making renewable transportation liquid fuel a sustainable reality. On March 23, 2011, Purdue University launched its the Difference Makers website: www.purdue.edu/differencemakers. Dr. Ho was honored to be one of the five difference makers in energy: http://www.purdue.edu/differencemakers/energy.html>.

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

"Environment-Enhancing Energy – An Ultimate Substitute of Petroleum"

Professor Yuanhui Zhang
The Innoventor Professor in Engineering and the Associate Department Head
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University of Illinois at Urbana-Champaign
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(利诺伊大学厄巴纳-香槟分校张源辉教授)

Abstract

Energy, environment and economic development are among the greatest challenges in 21st century, especially for densely populated countries. How to continue improving our living conditions with limited energy sources? How to protect our environment by reducing carbon emissions, and preserving our water resources? How can we handle the magnitude and the multitude of these challenges? Are you optimistic, or pessimistic, about our future? In this presentation, the author offers his perspectives, based on his own research, on the issues of energy and environment, and their implications to our economic development and sustainability. His propose and conducts research in Environment-Enhancing Energy.

Biowaste and algae are the only abundant resources have the potential to ultimately replace petroleum. E^2-Energy first converts organic solids in animal, human and food wastes into biocrude oil via a hydrothermal Liquefaction (HTL); Then grows fast-growing algae in the HTL wastewaters and sequester carbon dioxide from the atmosphere; Finally, the algae biomass is fed back to the HTL, as a sole feedstock or as an additive, to be converted into additional biocrude oil. In this way, crude oil is re-generated, and at the same time, carbon is captured and wastewater is cleaned and reused.

Biography

Yuanhui Zhang, borne in Qingdao, China. He graduated in Agricultural Engineering from Shandong University of Technology in 1978. He taught power and machinery in SUT for six years. He earned his MS in 1985 and PhD in 1989, both in Agricultural Engineering, University of Saskatchewan, Canada.

He is the endowed 'The Innoventor Professor in Engineering', Section Leader of Bioenvironmental Engineering, and Associate Head of Department of Agricultural and Biological Engineering. He is also a professor affiliate of Departments of Mechanical Science Engineering, Civil and Environmental Engineering, and Bioengineering, at the University of Illinois at Urbana-Champaign, Illinois, USA. His research areas include thermochemical conversion of biowaste and algae into crude oil, indoor air quality engineering and volumetric particle tracking velocimetry. He published over 240 scientific papers and is the Author of "Indoor Air Quality Engineering". Aside from his scientific publications, Professor Zhang's work has been reported by U.S. media including Fox, CNN, NBC, New York Times, Chicago Tribune and National Geographic.

Professor Zhang is a registered professional engineer; a Fellow of American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE); A fellow of American Society of Agricultural and Biological Engineers (ASABE); the winner of 2008 Henry-Geise Award from American Society of Agricultural and Biological Engineers, and an Everitt Teaching Excellence Award of College of Engineering, UIUC.

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

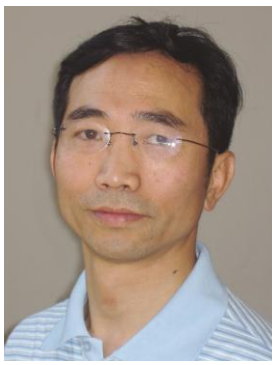
"Distributed Biofuel Production Technologies"

Professor R. Roger Ruan
Director, Center for Biorefining
Co-leader and Coordinator, IREE Biofuels and Bioproducts Cluster
Department of Bioproducts and Biosystems Engineering
The University of Minnesota at Twin Cities
(明尼苏达大学阮榕生教授)

Abstract

Increasing attention is focused on the utilization of agricultural and forest residues and byproducts as well as algal biomass for fuels and materials because they are abundant and outside the human food chain. We are taking a distributed production and conversion approach based on scalable production and conversion technologies. This unique approach can be implemented on average size farms to minimize the need to transport bulky biomass to a large conversion facility, and also provides a mechanism for farmers to receive their share of profits from the renewable energy economy. We have developed a novel technology called "Microwave Assisted Pyrolysis or MAP". We are also working on mass cultivation of microalgae from wastewater for biofuel production. Microalgae are a promising biomass feedstock as an alternative to cellulosics. Distributed production of algae does not have to take crop land away and algae are able to treat wastewater and capture a tremendous amount of CO_2. The oil yield from algae is many orders of magnitude higher than those from traditional oilseeds per acre per year base along with a large amount of non-oil algal biomass. Production of high oil content algae for biofuel production, coupled with wastewater treatment and flue gas emission control, provides significant environmental benefits and improves the economic feasibility of the whole approach. Harvested algae may be extracted for lipids or pyrolyzed to produce high quality biofuels. In this presentation, the basics of MAP process and recent progress in catalytic pyrolysis and bio-oil upgrading, mobile MAP system development, algae strain selection, photobioreactor development, and wastewater treatment will be presented. The prospects of high density algae production based on hydrolysates from liqnocellulosic biomass will also be discussed.

Biography



Professor Roger Ruan is the Director of Center for Biorefining and Professor of Bioproducts and Biosystems Engineering Department and Food Science and Nutrition Department at the University of Minnesota. Professor Ruan's research focuses on renewable energy and the environment as well as bioproducts and food safety and quality. His current interests are in biorefining and thermochemical conversion of renewable biomass into fuels, chemicals, materials, and food and feed, wastewater algae production as an energy crop and for wastewater treatment, biopolymer and food process improvement, quality enhancement and safety assurance. Professor Ruan has published over 200 papers in refereed journals, books, and book chapters, and over 300 meeting papers and other reports, and holds 12 US patents. He has supervised more than 40 graduate students, 70 post-doctors, research fellows, and other engineers and scientists, and 7 of his students hold university faculty positions. He has received over 130 projects totaling over $19 millions in various funding for research. He is an editor-in-chief of *International Journal of Agricultural and Biological Engineering* and editorial board member of *Journal of Food Process Engineering*, and Associate Editor of *Transactions of ASABE*, *Engineering Applications in Agriculture, and Transactions of CSAE*. Professor Ruan has given over 150 invited symposium presentations, company seminars, and short courses, and has been a consultant for many local, national, and international companies and agencies in renewable energy and products as well as food and value-added processing areas. Professor Ruan has also given frequent interviews on related topics to various news media.

Professor Ruan received his Ph.D. degree from University of Illinois at Urbana-Champaign in 1991, worked as a Research Associate in Pillsbury Company and Department of Food Science and Nutrition for three years, before joining Bioproducts and Biosystems Engineering Department at University of Minnesota as Assistant Professor in 1994, promoted to Associate Professor with Tenure and appointed to Director of Undergraduate Studies in 1998, and promoted to Full Professor in 2001 and appointed to Director of Center for Biorefining in 2003.

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

"Studies of an innovative piezoelectric micro-proton exchange membrane fuel cell and development of 3.5KW PEMFC hybrid forklift vehicle"

Professor Hsiao-Kan Ma
Department of Mechanical Engineering
National Taiwan University
(台灣大學機械工程系馬小康教授)

Abstract

In the present study, the novel design, using a reduced nozzle and diffuser, contains two cells with two outside anodes and two inside cathodes that share a common piezoelectric (PZT) vibrating device for pumping air flow has been developed in a bi-cell micro-PEMFC. The results show that the bi-cell should be operated with a larger stoichiometric ratio of 1.5 and a cell temperature of 50 ◦C to prevent concentration loss. Furthermore, the performance of the bi-cell using one degraded membrane electrode assembly (MEA) and one normal MEA is investigated to understand the current flow characteristic of the bi-cell. Although an internal current is observed, the bi-cell can still deliver a non-negative power. This finding will help reinforce the viability of using a PZT-PEMFC-ND bi-cell for future stack designs. Moreover, the power consumption of the PZT device is temperature-dependant and this should be taken into consideration when determining the net power of the PZT-PEMFC-ND bi-cell. The maximum net power of the bi-cell is found to be 0.7W.

Also, the 2kW hydrogen fuel cell with new BOP components has been developed and coupled with a 1.5kW 2nd Li-battery system in the design, assemble and test analysis of the 3.5kW forklift vehicle. The detailed studies include the comparison the different kinds of 2nd battery, the development of the circuit of electricity charging, discharging, control logic and process.

Biography

Professor Ma is Professor of Mechanical Engineering at National Taiwan University since 1987. Now he is the Board Member of the Steering Committee International Electronics Recycling Congress in Switzerland (http://www.icm.ch/), the Board Member and Asia Liaison of Semiconductor Thermal Measurement, Modeling and Management Symposium (http://WWW.SEMI-THERM.ORG/), the Board Member of Experts Meeting on Solid Waste Management in Asia and Pacific Islands (SWAPI_SolidWasteManagementExpertsInAsia@yahoogroups.com), and the Board Member of Taiwan Power Company in Taiwan. His research is directed to energy systems and the associated environmental impacts with activity ranging from combustion to advanced energy systems. His current research encompasses the development and application to model combustors and lower NOx burners, combustion synthesis of SiO_2/SiC/TiO_2 nano-particles, micro-diaphragm pump with piezoelectric device, micro-valve, micro-diaphragm flow channel with piezoelectric effect in PEMFCs/SOFCs, e-waste recycling/recovery, and energy/environment policy. Research by Professor Ma has been documented in over 200 publications. He is also a specialist on the combustion/heat transfer/incinerator/environment areas in Taiwan. Now he serves as board member of board member of Recycling Fund Management Board, Taiwan EPA. He was Chairman of Chinese Boiler Association in Taiwan during 2008-2010, President of Chinese Taipei Section of the Combustion Institute in 2008-2010, CEO of Institute of Environment and Resources (Taiwan) in 1998-2000, board member of TMMC, CTCI in 1990s and was chairman of Foundation for Obsolete appliance Recycling and Management (Taiwan) in 1997-98. And, he was Research Engineer of Energy and Environmental Research Co. (Irvine, USA) in 1985-87. He received the Ph.D. degree in Mechanical Engineering from the University of Illinois at Chicago, USA.

Technical Session D1-W2-T2: Medicine/ Public Health/ Biotechnology/ Bioinformatics

Chair
Professor Christine D. Wu,
Department of Pediatric Dentistry, University of Illinois at Chicago

Biography

Dr. Christine D. Wu received her B.S. degree in Botany from the National Taiwan University, Taipei, Taiwan. She obtained her M.S. and Ph.D. degree in Microbiology from the Loyola University of Chicago, Stritch School of Medicine, Maywood, IL. After completing her post-doctoral research training in Microbiology and Immunology at Northwestern University Medical School, she served on the faculty at the Chicago State University, University of Colorado Dental School, and University of Iowa College of Dentistry. Dr. Wu was recruited to the faculty of University of Illinois at Chicago (UIC) College of Dentistry in 1997. She was appointed the Associate Dean for Research at the College of Dentistry from 2002 to 2007. She currently is Professor and Director of Cariology Research at the UIC Department of Pediatric Dentistry.

Her honors and professional experiences include: Grant Proposal Reviewer, NIH/Minority Biomedical Support Grants (S06) (1980-1982); "Outstanding New Citizen of the Year Award", Citizenship Council of the Metropolitan Chicago, for Contribution to Research of Cariogenic Bacteria (1982-1983); "Faculty Excellence Award", Chicago State University (1986); Membership Committee, AADR, (1990-1994); Adhoc Study Section Member, Oral Biology and Medicine Study Section (OBM1), NIH (1993); Special Study Section Member, Natural Products Subdivision, Office of Alternative Medicine, NIH (1993); Secretary/Treasurer, AADR, Iowa Chapter (1993-1995); Member, Plaque Subcommittee of the Nonprescription Drugs Advisory Committee (NDAC), Center for Drug Evaluation and Research (CDER), FDA, Dept. of Health and Human Services (1993-1998); Member, Dental Products Panel, Medical Devices Advisory Committee, Center for Devices and Radiological Health, Food and Drug Administration (FDA), Dept. of Health and Human Services (1995-to 1999) Editorial Board, Taiwania (1994-present); Grant reviewer, for NIH/NIDR Small Business innovation Research/Small Business Technology Transfer (SBIR/STTR) grant proposals (1997 to 2003); Awarded First Place winner, Faculty Research Competition, 11th Annual Clinic and Research Day, College of Dentistry, UIC (1998); Consultant, NDAC, CDER, FDA (1998-2003); President, IADR/AADR Nutrition Group,

(2001-2002); Consultant, American Dental Association Council on Scientific Affairs (2001 to date); Recipient, National Research Service Award, National Institute of Health (NIH) (2002); Fellow, American Dental Education Association (ADEA) Leadership Program (2005-2006); National Advisory Committee, Hinman Student Research Symposium (2005-present); President, AADR-Chicago Chapter (2007-2008); "Outstanding Asian American Women in Science and Technology in the state of Illinois, 2008", honored by the Chicago Foundation of Women and the Chicago Chinatown Chamber of Commerce (2008); Outstanding Research Mentor of the Year, UIC College of Dentistry (2009); Scientific Advisory Board, Breath Research Unit, Austrian Academy of Science (2008-present); Editorial Board, Journal of Breath Research (2008-present); President, Mid-America Chinese Professional Association (2011-2012); NIH Grant reviewer, Oral, Dental and Craniofacial Sciences Small Business Small Emphasis Panel (2011- Present).

Dr. Wu's main research program involves the exploration and identification of plant-derived oral antimicrobial agents for the control of oral pathogens and their biofilms. Many of such compounds have been identified and their mechanistic studies against oral pathogens have been evaluated. These compounds may find application directly as dental prophylactic/therapeutic agents or serve as lead compounds for the subsequent design and synthesis of new agents that are safer and more effective than the existing ones. With current interests in natural/herbal remedies for health, Dr. Wu's research is most timely and unique using a multidisciplinary approach combining expertise in dentistry, oral microbiology and natural products chemistry. Besides laboratory research, Dr. Wu has also conducted many clinical studies to investigate the effect of natural products, beverages, snack foods, or chewing gums on human oral microflora associated with caries and halitosis, plaque pH and accumulation. Dr. Wu has organized many national and international symposia on topics related to natural antimicrobials and functional foods that possess preventive effects on oral diseases. Her studies on tea, honey, raisins, dried plums, cranberries, etc. have greatly contributed to the field of nutrition and functional foods that benefit oral health. Dr. Wu's work has also generated worldwide coverage and has received numerous mentions in professional publications and internet/TV/news media.

Technical Session D1-W2-T2: Medicine/ Public Health/ Biotechnology/ Bioinformatics

"Strategies to Enhance Bone Regeneration in Critical-sized Defects"

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(印第安納大學牙醫學系朱天民教授**)**

Abstract

Critical-sized defects are large defects in bone that will not heal spontaneously without the use of bone grafts or other interventions. These defects present special challenges in orthopedic and craniofacial surgeries. In this presentation, two strategies to enhance bone regeneration in critical-sized defects will be discussed. The first strategy involves the use a solid freeform fabrication process to fabricate 3D tissue engineering scaffolds from poly(propylene fumarate)/tricalcium phosphate (PPF/TCP) composites. Dicalcium phosphate dihydrate (DCPD) is used as the bone morphogenetic protein carrier inside the scaffolds. The in vitro characterization of the scaffolds and the in vivo validation of the efficacy of the scaffolds using rat femoral defect models and canine tibial defect models will be presented. The second strategy involves the use of 3D PPF/TCP reinforced calcium phosphate cements scaffolds loaded with bone marrow derived stem cells encapsulated in collagen gels. Stem cell characterization and in vivo evaluation of this strategy using rabbit cranium model will be presented. The challenges we see in our preliminary studies and potential future directions of these project will be discussed.

Biography

Dr. Tien-Min Chu was born in Taiwan in 1965. He received his Doctor of Dental Surgery degree from Kaohsiung Medical College in Kaohsiung Taiwan in 1989. He later received his PhD in materials science and engineering from the University of Michigan, Ann Arbor, Michigan in 1999.

He obtained his post doctoral training from the Department of Biomedical Engineering at the University of Michigan from 1999-2001. In 2001, He became Assistant Research Scientist in Biomedical Engineering and Assistant Clinical Professor in Prosthodontic Dentistry at the University of Michigan. In 2003, he started his career in Indiana as an Assistant Professor in Biomedical Engineering at Indiana University Purdue University Indianapolis. He joined Indiana University School of Dentistry in 2007 and became Associate Professor in Restorative Dentistry where he also holds adjunct appointments at Biomedical Engineering and Orthopedic Surgery. He has co-authored three US patents with two more pending. He has published more than 40 papers in peer-reviewed journals and three book chapters. He is now on the editorial board of two professional journals and serves as reviewer for 15 professional journals. He has mentored one PhD student and more than 20 masters students in biomedical engineering, prosthodontic dentistry, operative dentistry, and periodontic dentistry. His current research interests are in bone tissue engineering and in vivo dental implant evaluations. The funding sources of his projects include National Institute of Health, Office of Naval Research, Indianan Clinical and Translational Sciences Institute, Oral and Maxillofacial Surgery Foundation, Matsumoto Dental University, Baylor College of Dentistry, and Indiana University.

Dr. Tien-Min Chu is currently a member of the American Association of Dental Research, Society for Biomaterials and Academy of Dental Materials. He is named the 2011 Distinguished Faculty of Research by Indiana University School of Dentistry Alumni Association.

Technical Session D1-W2-T2: Medicine/ Public Health/ Biotechnology/ Bioinformatics

"Stem Cells for Musculoskeletal Tissue Regeneration"

Professor Wan-Ju Li
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(威斯康星大學麥迪遜分校生物醫學工程學系李萬柱教授)

Abstract

Mesenchymal stem cells (MSCs) can be isolated from several adult tissues, such as bone marrow, fat, and blood, and cultured in vitro for extensive propagation. These cells are multi-potent, and with proper biochemical or physical cues, they can differentiate into various connective tissue linage cells, such as osteoblast, chondrocyte, adipocyte, and tenocyte. Notably, transplanted allogeneic MSCs can regulate the activity of recipient's immune cells to reduce the immune response. These unique properties make MSCs an attractive cell source for cell therapy and regenerative medicine applications.

Musculoskeletal tissues frame and mobilize the body, and function to protect internal organs. They also play an important role in the regulation of calcium and other ions. Healthy functional musculoskeletal tissues are critical to maintaining the quality of one's life. However, musculoskeletal tissues are prone to degeneration due to trauma, aging, or developmental disorders. Loss of tissue functions associated with degeneration is one of the major orthopedic problems. For example, osteoarthritis commonly occurs to people who are over 50, and has afflicted more than 20 million people in the U.S. alone. It is expected to become an even more urgent health issue in the next decade or two among the aged baby boomer generation.

Using MSCs to regenerate cartilage for tissue repair is a promising treatment to osteoarthritis (OA) or other cartilage defects. However, one of the challenges using MSCs for regenerative medicine is that the cells isolated from adult tissues are often composed of heterogeneous cell populations, and the heterogeneity increases the difficulty of using the cells for cartilage regeneration. Another challenge is that MSCs become aged and senescent after several cell passages in vitro culture, limiting the use for clinical applications. To overcome the challenges, we derive MSCs

from human embryonic stem cells (hESCs) and study the potential of hESC-MSCs for cartilage regeneration. We compare the phenotype of hESC-MSCs with that of bone marrow-derived MSCs. Flow cytometry analysis shows that MSCs and hESC-MSCs express similar cell surface markers. In terms of the potential for chondrogenesis, the mRNA transcript levels of chondrocyte-related matrix proteins and transcription factors, such as collagens type II, IX, and X, aggrecan, and Sox9, are upregulated in MSCs compared to those in hESC-MSCs during chondrogenesis, suggesting that the current differentiation protocol more effectively induces MSCs into chondrocytes than hESC-MSCs, and an improved differentiation protocols should be developed to induce chondrogenesis of hESC-MSCs.

For cartilage tissue engineering applications, we have used a nanotechnology to fabricate a scaffold as a three-dimensional culture template for MSCs to regenerate cartilage. The unique scaffolding structure with ultra-fine fibers structurally similar to collagen fibrils has been shown to support MSC chondrogenesis and maintain chondrocyte phenotype. An in vivo animal model for testing cartilage repair shows that MSC-laden nanofiber-based engineered cartilage successfully repairs joint defects after 6 months. The regenerated tissue on the joint surface is able to carry out biomechanical function. Taken together, we have shown the potential of using stem cell and nanofabrication technologies to regenerate functional cartilage for cartilage treatment.

Biography

Professor Wan-Ju Li was born in 1970 in Toufen Town, Miaoli County, Taiwan. He received his Bachelor of Science degree in biomedical engineering from Chung-Yuan University in 1993, and a Master of Science degree in biomedical engineering from Drexel University in Philadelphia, Pennsylvania in 1999. He was awarded with a Doctor of Philosophy degree in cell and tissue engineering from Thomas Jefferson University in 2004. Between the year of 2004 and 2008 before taking his current position, he was trained at National Institutes of Health as a postdoctoral fellow in the Cartilage Biology and Orthopedics Branch. He was also trained in National Institute of Standard and Technology during the year of 2003 and 2005.

He is currently an Assistant Professor in the Department of Orthopedics and Rehabilitation at University of Wisconsin-Madison in Madison, the United States of America. He also holds a secondary appointment in the Department of Biomedical Engineering, and is an affiliated faculty member in Cellular and Molecular Biology Program, and Stem Cell and Regenerative Medicine Center. He has been interested nanobiomaterial fabrication, cell-matrix interaction, and cartilage tissue engineering. His current research interests include stem cell, tissue engineering, and skeletal biology.

Professor Li is the member of International Society for Stem Cell Research, Orthopaedic Research Society, Tissue Engineering International and Regenerative Medicine Society, American Society for Cell Biology, and American Society for Bone and Mineral Research. He has published 30 papers, 9 book chapters, and more than 60 abstracts. He holds 3 patients in cartilage, intervertebral disc, and tendon/ligament applications. Professor Li has received Fellow Award for Research Excellence from National Institutes of Health, and Young Investigator Research Award from North American Spine Society. He also serves in the editorial board of American Journal of Stem Cells, Formosan Journal of Musculoskeletal Disorders, and Journal of Biosensors and Bioelectronics.

Technical Session D1-W2-T2: Medicine/Public Health/Biotechnology/Bioinformatics

"Rigorous Quantitative Sciences Integration: the Foundation of Drug Approval in the Personal Genome Era"

Professor Yu Shyr
Ingram Professor of Cancer Research
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(范德堡大學癌症中心生物統計主任石瑜教授)

Abstract

In the last decade, there has been a veritable explosion in the amount of data generated by biomedical researchers worldwide. Today, modern technology allows for collection of patients' genomic information at an unprecedented level of detail and in increasingly vast quantities. To generate real knowledge from the mountains of data produced before any drug approval in the personal genome era, however, requires rigorous integration of quantitative sciences — a repeatable and reproducible experiment not only biologically but also with regard to the biostatistics and bioinformatics tools and techniques of data analysis. The motivation of this talk is to help the audience meet the challenges of genomic research in drug development; these challenges, as well as opportunities, relate to experimental design, data pre-processing, quality control, data mining, pattern recognition, class comparison, model prediction, internal and external validation, visualization, and interpretation. This talk focuses on the lessons learned from cancer clinical trials utilizing gene-signature-based patient selection, conducted at Duke University Medical Center, USA. Lessons such as these underscore the need for rigorous integration of quantitative sciences to overcome remaining obstacles, thereby opening the door to future routine practice of personalized medicine.

Biography

Yu Shyr, Ph.D., was born in Pingtung, Taiwan. In 1985, he graduated from Tamkang University, Taiwan, with a Bachelor of Business degree in statistics, and in 1989, he received his master's degree in statistics from Michigan State University. In 1994, he earned his Ph.D. in biostatistics from the University of Michigan, Ann Arbor.

While he was a doctoral student, he worked as a research assistant and lecturer in the Department of Biostatistics; after his Ph.D. was awarded, he joined Vanderbilt as assistant professor of biostatistics in the Department of Preventive Medicine and as chief biostatistician in the Vanderbilt-Ingram Cancer Center (VICC). In 1998, Dr. Shyr was named as founding director of the VICC Biostatistics Shared Resource; in 2006, he was appointed chief of the Division of Cancer Biostatistics, Department of Biostatistics, Vanderbilt University School of Medicine; in 2007, he became director of the VICC Cancer Biostatistics Center (CBC); and in 2009, he was named VICC associate director for quantitative sciences integration. In 2011, the CBC was dissolved when Dr. Shyr stepped down from his position of director to take on the founding directorship of the newly-created Vanderbilt Center for Quantitative Sciences, Vanderbilt University School of Medicine. As an Ingram Distinguished Professor of Cancer Research, Dr. Shyr is the first and only Vanderbilt biostatistician to hold an endowed professorship. In addition to his primary appointment as Vanderbilt Professor of Biostatistics, he holds secondary appointments in the Departments of Cancer Biology and Biomedical Informatics, and is an adjunct professor at Tokai University, Japan; Shanghai Jiao Tong University, China; and National Cheng Kung University, Taiwan.

Dr. Shyr is involved in a wide range of collaborative research including basic science research, translational research, and omics research; he has led the biostatistics and bioinformatics effort on multiple major projects, including serving as the director of the biostatistics and bioinformatics cores for U.S. National Cancer Institute (NCI)-funded Vanderbilt lung cancer, GI cancer, and breast cancer Specialized Programs of Research Excellence (SPOREs). In terms of statistical and bioinformatics methodology research, his current focus is the analysis of high-dimensional data, while he also continues to contribute to the evolution of novel clinical trial design. Recent publications include "Identification of human triple-negative breast cancer subtypes and preclinical models for selection of targeted therapies" (*Journal of Clinical Investigation* 2011), "Analyzing survival curves at a fixed point in time for paired and clustered right-censored data" (*Computational Statistics & Data Analysis* 2011), and "Wave-spec: a preprocessing package for mass spectrometry data" (*Bioinformatics* 2011).

Dr. Shyr is a member of the American Association for Cancer Research (AACR), American Society for Clinical Oncology (ASCO), and the Society for Epidemiologic Research, among others, and he is a member and elected fellow of the American Statistical Association (ASA). He has received numerous awards, including the American Statistical Association Chapter Service Recognition Award and the Vanderbilt University School of Medicine Master of Science in Clinical Investigation Program Excellence in Teaching Award (three times). He has delivered more than 170 abstracts to professional meetings and published more than 250 peer-reviewed papers in a variety of journals including *Lancet*, *The New England Journal of Medicine*, *Journal of Clinical Investigation, Nature Medicine*, *Proceedings of the National Academy of Sciences (USA)*, *PLoS Medicine*, *Bioinformatics*, and *Biometrics*. Dr. Shyr serves on many committees and advisory boards including the FDA Anti-Infective Drugs Advisory Committee (voting member); several NCI review panels, study sections, and special emphasis sections; and advisory boards for the Tennessee Department of Health, Middle Tennessee State University, Arizona University, the University of Colorado, the University of Alabama, Northwestern University, the University of Kentucky, and the NCI designated Moffitt Comprehensive Cancer Center.

Technical Session D1-W2-T2: Medicine/ Public Health/ Biotechnology/ Bioinformatics

"The Role of Foods and Diet in Oral Health Promotion and Disease Prevention"

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Abstract

Oral diseases and conditions including dental caries, periodontal disease, oral facial disorders, and tooth loss affect more persons than any other single disease in the United States. Millions of Americans suffer from these diseases and conditions of the oral cavity that result in pain and suffering, impairment of function and reduced quality of life. Next to the common cold, dental diseases are the major cause of lost work or school days and have had a negative impact on economic productivity and the learning ability of American children. Oral diseases can also significantly impact a person's overall health. Mounting evidence demonstrates that diabetes is a risk factor for periodontitis (gum disease), and that the systemic inflammatory response generated by inflamed periodontal tissue may in turn exacerbate diabetes, worsen cardio-vascular outcomes, and increase mortality. Therefore, the control of oral diseases can have a major impact on the lives of individuals with diabetes. Dental plaque, a complex oral microbial biofilm, has been implicated as the prime etiologic factor in both dental caries and periodontal disease. Biofilm-related infections are frequently chronic in nature due to their resistance to host defense mechanisms and conventional therapeutics. Recent research has also shown that oral bacteria may contribute to increased risk of heart attacks, strokes, lung disease, and may be associated with premature childbirth in some women.

In recent years, much attention has been focused on research and education related to the identification of food components and the development of food products with disease preventing and health promoting benefits - the "functional foods". Numerous naturally occurring components in foods and vegetables have been shown to promote health

and reduce risks for many common diseases. Despite these advances, the general public seems less aware of foods that promote oral health. We hypothesize that higher plants and selected foods possess antimicrobial phytochemicals capable of suppressing growth and virulence factors of oral pathogens, thereby benefiting oral health. Using a multidisciplinary research approach involving dentistry, oral microbiology, and natural products chemistry, we have identified important antimicrobial phytochemicals from higher plants and foods against oral pathogens. This presentation provides an overview of the impact of food components and dietary factors on oral health. The protective properties of various foods, plant extracts and plant-based polyphenolic compounds on dental caries and periodontal disease are discussed. Laboratory, human, and epidemiological studies demonstrating the multiple mechanistic actions in supporting their contribution to oral health and disease prevention are summarized. The need and development of multidisciplinary research approach toward experimental designs and strategies in clinical and epidemiological studies are also emphasized.

Biography

Dr. Christine D. Wu received her B.S. degree in Botany from the National Taiwan University, Taipei, Taiwan. She obtained her M.S. and Ph.D. degree in Microbiology from the Loyola University of Chicago, Stritch School of Medicine, Maywood, IL. After completing her post-doctoral research training in Microbiology and Immunology at Northwestern University Medical School, she served on the faculty at the Chicago State University, University of Colorado Dental School, and University of Iowa College of Dentistry. Dr. Wu was recruited to the faculty of University of Illinois at Chicago (UIC) College of Dentistry in 1997. She was appointed the Associate Dean for Research at the College of Dentistry from 2002 to 2007. She currently is Professor and Director of Cariology Research at the UIC Department of Pediatric Dentistry.

Her honors and professional experiences include: Grant Proposal Reviewer, NIH/Minority Biomedical Support Grants (S06) (1980-1982); "Outstanding New Citizen of the Year Award", Citizenship Council of the Metropolitan Chicago, for Contribution to Research of Cariogenic Bacteria (1982-1983); "Faculty Excellence Award", Chicago State University (1986); Membership Committee, AADR, (1990-1994); Adhoc Study Section Member, Oral Biology and Medicine Study Section (OBM1), NIH (1993); Special Study Section Member, Natural Products Subdivision, Office of Alternative Medicine, NIH (1993); Secretary/Treasurer, AADR, Iowa Chapter (1993-1995); Member, Plaque Subcommittee of the Nonprescription Drugs Advisory Committee (NDAC), Center for Drug Evaluation and Research (CDER), FDA, Dept. of Health and Human Services (1993-1998); Member, Dental Products Panel, Medical Devices Advisory Committee, Center for Devices and Radiological Health, Food and Drug Administration (FDA), Dept. of Health and Human Services (1995-to 1999) Editorial Board, Taiwania (1994-present); Grant reviewer, for NIH/NIDR Small Business innovation Research/Small Business Technology Transfer (SBIR/STTR) grant proposals (1997 to 2003); Awarded First Place winner, Faculty Research Competition, 11th Annual Clinic and Research Day, College of Dentistry, UIC (1998); Consultant, NDAC, CDER, FDA (1998-2003); President, IADR/AADR Nutrition Group, (2001-2002); Consultant, American Dental Association Council on Scientific Affairs (2001 to date); Recipient, National Research Service Award, National Institute of Health (NIH) (2002); Fellow, American Dental Education Association (ADEA) Leadership Program (2005-2006); National Advisory Committee, Hinman Student Research Symposium (2005-present); President, AADR-Chicago Chapter (2007-2008); “Outstanding Asian American Women in Science and Technology in the state of Illinois, 2008”, honored by the Chicago Foundation of Women and the Chicago Chinatown Chamber of Commerce (2008); Outstanding

Research Mentor of the Year, UIC College of Dentistry (2009); Scientific Advisory Board, Breath Research Unit, Austrian Academy of Science (2008-present); Editorial Board, Journal of Breath Research (2008-present); President, Mid-America Chinese Professional Association (2011-2012); NIH Grant reviewer, Oral, Dental and Craniofacial Sciences Small Business Small Emphasis Panel (2011- Present).

Dr. Wu's main research program involves the exploration and identification of plant-derived oral antimicrobial agents for the control of oral pathogens and their biofilms. Many of such compounds have been identified and their mechanistic studies against oral pathogens have been evaluated. These compounds may find application directly as dental prophylactic/therapeutic agents or serve as lead compounds for the subsequent design and synthesis of new agents that are safer and more effective than the existing ones. With current interests in natural/herbal remedies for health, Dr. Wu's research is most timely and unique using a multidisciplinary approach combining expertise in dentistry, oral microbiology and natural products chemistry. Besides laboratory research, Dr. Wu has also conducted many clinical studies to investigate the effect of natural products, beverages, snack foods, or chewing gums on human oral microflora associated with caries and halitosis, plaque pH and accumulation. Dr. Wu has organized many national and international symposia on topics related to natural antimicrobials and functional foods that possess preventive effects on oral diseases. Her studies on tea, honey, raisins, dried plums, cranberries, etc. have greatly contributed to the field of nutrition and functional foods that benefit oral health. Dr. Wu's work has also generated worldwide coverage and has received numerous mentions in professional publications and internet/TV/news media.

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

Chair
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Biography

Chih-hung (Alex) Chang was born in Taipei, Taiwan 1969. He received a B.S. degree from the Department of Chemical Engineering, National Taiwan University in June 1991. He received his PhD degree in chemical engineering from University of Florida, Gainesville Florida in December 1999. His dissertation research concerned the development of a manufacturing process for the growth of thin-film photovoltaic (PV) cells using rapid thermal processing (RTP) under Prof. Timothy J. Anderson's guidance. He joined Oregon State University in January, 2000. He is a Professor in the School of Chemical, Biological, and Environmental Engineering. He was a visiting professor in the Materials Science and Engineering Department at National Taiwan University from April 2008 till September 2008 sponsored by the National Science Council of Taiwan. He is a SHARP Labs of America scholar and a recipient of AVS Graduate Research award, National Science Foundation's CAREER award, and awardees of W.M. Keck Foundation. His group has studied solution based thin film deposition processes, ink jet printing, microreaction technology, and X-ray absorption fine structure. He has more than 60 refereed publications, 3 issued patents, and 9 pending patents in these areas.

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

"A Top-Down Approach to Generating Functionalized Carbon-based Nanomaterials and Polymer Nanocomposites in Poly(phosphoric acid)"

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Abstract

Inorganic acids such as HNO_3, HCl, H_2SO_4 and their mixtures are commonly used to remove residual catalyst particles and carbonaceous impurities from carbon nanotubes CNT, nanofibers (CNF), etc. Under more forcing conditions, nitric acid, serving as an oxidizing agent, is also known to "cut" the CNT into shorter tubes and impart oxygen-containing organic functions (COOH, >C=O, C-OH etc.) at the defect sites. Aletrnatively, we have found that a much milder and basically non-oxidizing inorganic acid, namely, **p**oly(**p**hosphoric **a**cid) or simply PPA, can be used not only for purifying CNT, but also for promoting electrophilic functionalization process. Two important attributes, namely, mild acidity and bulk viscosity, have make PPA an ideal reaction medium for functionalization and *in-situ* polymerization via certain electrophilic reactions. Thus, PPA is quite effective in dispersing carbon nanomaterials such as vapor-grown CNF, MWNT, SWNT, detonation nanodiamonds (DND), graphite nanoplatelets (GNP), etc., because of its acidic and viscous character. We believe that the former property promotes de-aggregation of these carbon nanoparticles, and the latter impedes their rebundling. In addition, PPA is also known for its catalytic ability to promote efficient Friedel-Crafts acylation, which has been successfully exploited based on the hypothesis that the pre-existing defect sites in the carbon frameworks of these nanomaterials (especially in as-synthesized or raw samples) are mostly comprised of C-H bonds, especially the aromatic sp^2C-H bonds that are susceptible to such acylation reaction. This presentation will provide an overview of our top-down approach in utilizing this versatile synthetic tool based on PPA to impart useful functional groups and generate polymer nanocomposites towards the goal of improving dispersion, interfacial adhesion and solution processability of these carbon-based nanomaterials with various types of polymers.

Biography

Loon-Seng Tan received his B.S. in chemistry from Harvey Mudd College, Claremont, California in 1976, and Ph.D. in inorganic/organometallic chemistry Indiana University-Bloomington in 1981. In 1981-83, he was an NIH and a visiting assistant professor of chemistry at Wright State University, Dayton OH. He is currently a Principal Research Chemist and Research Group Leader at US Air Force Research Laboratory's Nanostructured & Biological Materials Branch, Materials and Manufacturing Directorate (AFRL/RX), which he has been associated with since 1983. He has served as research group leader, roadmap manager/research direction lead, and AFOSR intramural research task manager/PI, AFRL/RX technical POC for Minority Leadership in Nanomaterials R&D Program, and National Research Council fellowship research advisor. He was elected in 2009 as an AFRL Fellow, the highest honor bestowed upon the scientists and engineers in recognition of their technical excellence and outstanding contributions to research and development programs within Air Force Research Laboratory.

His research activities deal primarily with synthetic chemistry of heat-resistant polymers with linear, network, or dendritic architecture, molecular composites, and functionalized nanocarbon materials & polymer nanocomposites for structural aerospace and space applications as well as organic materials for nonlinear optical applications. The results of his research and collaborative efforts have been documented in over 110 peer-reviewed publications, 60+ US patents, and numerous technical presentations.

Dr. Tan's research has led to 4 technology transitions/transfers as well as prestigious awards including Air Force Scientific Award, Air Force Chief-of-Staff Award, AFRL/RX Charles J. Cleary Award for Scientific Achievement, and AFOSR Star Team status for 4 consecutive times. Dr. Tan is a member of American Chemical Society and Materials Research Society, and received a Dayton Council of Affiliated Societies Research Award.

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

"Nanotechnology Research Supported by the Asian Office of Aerospace Research and Development"

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Abstract

The USAF Asian Office of Aerospace Research and Development (AOARD) identifies and funds a wide variety of basic research efforts in Australasia which have relevance for aerospace-related technologies. Nanotechnology in particular is supported because of its potential for wide-ranging benefits to components and systems.
I present an overview of AOARD's programs and recent results from nanotechnology-related projects it has supported, including advances in materials and device concepts for vastly improved sensing, energy generation, communications, and electronics for information processing.

Biography

Joe Tringe received a bachelor's degree in physics from Harvard University (Cambridge, Massachusetts) in 1994, and the Ph.D. degree in materials engineering from Stanford University (Stanford, California) in 2000.

He is a Reserve Officer and Program Manager attached to the U.S. Air Force Asian Office of Aerospace Research and Development in Tokyo, Japan. He has previously served in the active duty U.S. Air Force at Kirtland Air Force Base, New Mexico, as Group Leader for the Air Force Research Laboratory's radiation-hard electronics development program. He is a member of the American Physical Society, IEEE, and the Materials Research Society.

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

"Nanotechnology Applied to the Macro World: Nanoscale Science and Engineering of Steels for Infrastructure Applications"

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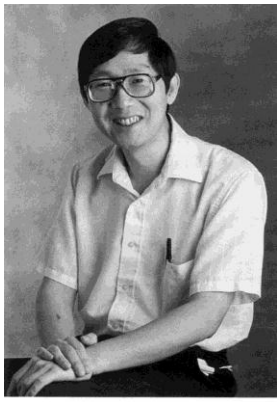
(西北大學材料科學與工程學系鐘業華教授)

Abstract

Several strategies are available to increase the strength of steels, such as grain refinement, work-hardening, incorporation of solutes and fine precipitates. However, these strategies are likely to decrease toughness and increase cost. In this talk, we discuss the idea of using nanoscale semi-coherent precipitates to increase both the strength and toughness of steels, without the use of carbon. The basic principle will be illustrated with the application of Cu-precipitation-strengthened steels in bridges. Further developments to develop high-strength high-toughness steels with properties comparable to maraging steels at much lower cost will be presented. Extension of these concepts to making steels with enhanced corrosion resistance will be discussed.

Biography



Yip-Wah Chung grew up in Hong Kong. He obtained his BS (physics and mathematics) and MPhil (physics) degrees from the University of Hong Kong. He then went to California and obtained his PhD (physics) from the University of California at Berkeley in 1977.

Immediately after completing his PhD study, he joined the Department of Materials Science and Engineering at Northwestern University as Assistant Professor. He served as Director of the Center for Engineering Tribology at Northwestern from 1987 to 1992, as Department Chair from 1992 to 1998, and as program officer in surface engineering and materials design in the Civil and Mechanical Systems Division at the National Science Foundation, acting as the Division representative for the nanoscale science and engineering initiative. He is currently Professor of Materials Science and Engineering and Mechanical Engineering at Northwestern, and Director of the NSF Summer Institute on Nanomechanics, Nanomaterials, and Micro/Nanomanufacturing. He has served many years on the Hong Kong Research Grants Council and is currently a member of the Hong Kong University Grants Committee. He has published 200 papers in surface science, thin films, and tribology, and two textbooks – one on surface science and spectroscopy, and one on introduction to materials science and engineering.

Prof. Chung was named Fellow, ASM International; Fellow, AVS; and Fellow, Society of Tribologists and Lubrication Engineers. His other awards include Teacher of the Year in Materials Science, Innovative Research Award and Best Paper Awards from the ASME Tribology Division, Technical Achievement Award from the National Storage Industry Consortium, Bronze Bauhinia Star Medal from the Hong Kong Special Administrative Region Government, and Advisory Professor from Fudan University.

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

"Molecular Combing of Quantum-Dot-Conjugated DNA and Its Use in Developing One-Dimensional FRET Sensor with Enhanced Target-Molecule Probing Sensitivity"

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Abstract

Detection of biomolecules is essential to medical diagnosis, immunoassays, and disease monitoring, etc. However, such detection is often limited by miniscule amounts of samples and by inherent transport deficiency due to molecular diffusion. In this talk we develop a new strategy for enhancing detection efficiency by overcoming these shortcomings. It combines molecular combing and fluorescence resonance energy transfer (FRET) in such a way the former acts like a wire-like concentrator capable of focusing target molecules and the latter works as a molecular beacon to signal specific target-ligand interactions involved. By lining illuminated quantum-dot nanoprobes along stretched DNA molecules, for the first time we demonstrate an addressable one-dimensional FRET sensor enabling to capture and detect target molecules efficiently. Not only FRET signals can be greatly amplified by this setup, but also the FRET efficiency can be boosted up due to the unique double excitation mechanism.

Biography

Dr. Hsien-Hung Wei received his BS in Chemical Engineering from National Taiwan University in 1991. After earning his Ph.D. in Chemical Engineering at the City University of New York in 2000, he went to University of Michigan and conducted his postdoctoral research in the fields of biofluid mechanics and microfluidics. In 2003, he joined the faculty in the Department of Chemical Engineering at National Cheng Kung University (NCKU) in Taiwan. Currently, he is an Associate Professor.

Dr. Wei's research interests are centered on the development of novel micro/nanodevices for high-throughput screening, targeted molecular diagnostics, and functional synthesis. His research group has been exploring a diversity of topics, including detection of picomolar biomolecules with enhanced sensitivity, molecular comb bionanosensor, manipulation of single DNA molecule, fluorescent probing for target-ligand interactions, and electrokinetic microdevices for rapid molecular assays. In parallel to these efforts, fundamental studies combining theoretical modeling and experimental assessment are also undertaken to elucidate the underlying fluid motion, colloidal dynamics, and molecular conformations/interactions in small or confined environments.

Technical Session D1-W4-T2: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

Chair
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Biography

Yu Hen Hu received BSEE from National Taiwan University, Taiwan ROC in 1976, and MSEE and PhD degrees from University of Southern California, Los Angeles, CA, USA in 1982. He was in the faculty of the Electrical Engineering Department of Southern Methodist University, Dallas, Texas. Since 1987, he has been with the Department of Electrical and Computer Engineering, University of Wisconsin, Madison where he is currently a professor.

Dr. Hu's broad research interests range from design and implementation of signal processing algorithms, computer aided design and physical design of VLSI, pattern classification and machine learning algorithms, and image and signal processing in general. He has published more than 300 technical papers, edited or co-authored three books and many book chapters in these areas.

Dr. Hu has served as an associate editor for the IEEE Transaction of Acoustic, Speech, and Signal Processing, IEEE signal processing letters, European Journal of Applied signal Processing, Journal of VLSI Signal Processing, and IEEE Multimedia magazine. He has served as the secretary and an executive committee member of the IEEE signal processing society, a board of governor of IEEE neural network council representing the signal processing society, the chair of signal processing society neural network for signal processing technical committee, and the chair of IEEE signal processing society multimedia signal processing technical committee. He was also a steering committee member of the international conference of Multimedia and Expo on behalf of IEEE Signal processing society.

Dr. Hu is a fellow of IEEE.

Technical Session D1-W4-T2: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

"Compressive Data Management for SoC, CMP and VM"

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Abstract

The emerging computing paradigms, for example, data centers and clouds, call for new mechanisms to manage data and to support fast and adaptable applications. One idea is Virtualization using Virtual Machines. Because of its ability to strengthen processing power in computer, Chip Multiprocessing and Simultaneous Multithreading (CMP/SMT) is a commonly used architecture in virtual machines. However, one problem with CMP/SMT is the diverse resource distribution at both core-level and thread-level. Any careless management will cause serious resource contention and eventually will degrade VM throughput and application performance. Yet, existing solutions to VM resource management fail to address and identify such contention issues. This presentation, instead of creating cross-layers for resource manager, demonstrates a new data compressive mechanism. We first show a case for breast cancer detecting system using this new scheme, and reveal how we can achieve low energy and reliable data management on SoC. Then, we extend this mechanism to CMP/SMT and VM where a new cross-layer is proposed to form collaborations between software layer and hardware layer of data manager. The new layer allocates both on-chip and off-chip resources according to data reduction, security and recovery need in a holistic fashion. Preliminary results show that it achieved successful management to accomplish ideal performance of VM-hosted applications and best overall throughput of the entire system.

Biography

Technical Session D1-W4-T2: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

“"More Moore" and "More than Moore" beyond 22nm: Challenges and Opportunities”

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Abstract

It is intriguing that new process technologies and design paradigms have been keeping pushing the envelope of Moore's Law. In this talk, key challenges and opportunities of "More Moore" such as using computational/next-generation lithography for nano-patterning beyond 22nm and "More than Moore" such as using 3-dimensional (3D) through-silicon visa for heterogeneous 3D-IC integration will be discussed. Some recent results will be presented along with future research directions, e.g., on double patterning lithography layout decomposition and physical design, e-beam lithography throughput optimization, and 3D TSV thermal-mechanical stress, electromigration and reliability issues.

Biography

David Z. Pan received his B.S. degree in Physics from Peking University (China) in 1992, and MS in Atmospheric Sciences in 1994, MS/PhD in computer science in 1998/2000, respectively, all from University of California in Los Angeles (UCLA). His research is mainly focused on VLSI design/technology co-optimization for manufacturing/reliability, interactions of physical and system-level co-design, and CAD for emerging technologies. He holds 8 U.S. patents and has published over 140 technical papers in premier journals and international conferences.

He was a Research Staff Member at IBM T. J. Watson Research Center from 2000 to 2003. He is currently an Associate Professor (with tenure) and Director of the UT Design Automation (UTDA) Lab at the Department of Electrical and Computer Engineering, University of Texas at Austin. He has served as an Associate Editor for IEEE Transactions on CAD, IEEE Transactions on VLSI, IEEE Transactions on CAS-I, IEEE Transactions on CAS-II, IEEE CAS Society Newsletter, and Journal of Computer Science and Technology. He has served as the IEEE CANDE Committee Chair, ACM/SIGDA Physical Design Technical Committee Chair, program committee member of major VLSI/CAD conferences, including DAC (Track Chair), ICCAD (Track Chair), DATE, ASPDAC (Track Chair), ISPD (Program/General Chair), ISCAS (CAD Chair), VLSI-DAT (EDA Chair), ISQED (Track Chair), ACISC (Program/General Chair), GLSVLSI (Publicity Chair), ISLPED (Exhibits Chair), SLIP (Publication Chair), and so on. He is a member of the International Technology Roadmap for Semiconductor (ITRS).

Prof. Pan is a Senior Member of IEEE and Life Member of ACM. He has received a number of awards for his research contributions and professional services, including ACM/SIGDA Outstanding New Faculty Award, NSF CAREER Award, UCLA Engineering Distinguished Young Alumnus Award, IBM Faculty Award four times, SRC Inventor Recognition Award three times, Best Paper Award at ISPD 2011, Best Paper Award at ASPDAC 2010, Best IP Award at DATE 2010, ACM Recognition of Service Award twice, Best Student Paper Award at ICICDT 2009, Best Paper In Session Award at SRC Techcon (1998 and 2007), ISPD 2007 Global Routing Contest Awards, eASIC Placement Contest Grand Prize (2009), and a number of Best Paper Award Nominations at premier conferences such as ASPDAC, DAC, ICCAD, and ISPD. He is an IEEE CAS Society Distinguished Lecturer for 2008–2009.

Technical Session D1-W4-T2: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

"Development of Communications SoC Evaluation Platforms"

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Abstract

In this talk, the development of communications SoC evaluation platforms will be introduced. In the progress, system design, performance verification, complexity reduction, hardware implementation and measurements are briefly explained. Several examples will be covered, including an uplink multi-user mobile MIMO-OFDMA transceiver, a dual-link MIMO-OFDMA transceiver, and a closed-loop MIMO transceiver with low complexity handset. Designers could use platform-based design approach as an effective strategy to cope with product complexity and time-to-market at all levels. For the verification stage, designers can use the hardware/software (HW/SW) co-verification strategy to debug hardware component, which will help designers identify faster. In this proposed platform, which introduces the figure file to be the transmission media. Designers validate their design in bit error rate/signal-to-noise ratio (BER/SNR) waveforms traditionally. In this proposed platform, designer could verify the decoded results in various environments by LCD panel. In the last case, a biomedical application with Android mobile phones will be introduced to show our next development for the patient-centric medical platform.

Biography

Hsi-Pin Ma was born in Nantou, Taiwan, on January 17, 1973. He received the B.S. and Ph.D. degrees in electrical engineering from the National Taiwan University, Taiwan, in 1995 and 2002.

At the summer of 2000, he interned at Siemens Telecommunication Systems Limited, for feasibility study and establishment of a dual-mode base station for WCDMA and cdma2000. Since 2003, he has been with the Department of Electrical Engineering/Institute of Communications Engineering, National Tsing Hua University, Hsinchu, Taiwan, where he is currently as an Associate Professor.

Dr. Ma's research interests include communications system design, power efficient baseband DSP techniques, and communications SoC implementation. His group is working on the system design, signal processing algorithm development, and SoC implementation for advanced communications systems such as multi-user mobile MIMO communications, cognitive radio and for applications such as smart grid and biomedical electronics.

Technical Session D1-W4-T2: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

"From Multi-User MIMO to Multi-Cell MIMO: A Radio Resource Management Perspective"

Professor Li-Chun Wang
Distinguished Professor, Department of Electrical Engineering
National Chiao-Tung University
(交通大學電機系王蒞君教授)

Abstract

In this talk, we first discuss how multi-user multiple input and multiple output (MU-MIMO) antenna systems can exploit the degree of freedom in the user domain by scheduling techniques to overcome sensitivity and high bandwidth requirement issues in the feedback channels of traditional transmit beamforming MU-MIMO systems. The proposed nonconformist receive beamforming MU-MIMO system utilizes feedback channel information for selecting users instead of calculating the beamforming weights, thereby delivering the advantages of robustness to the channel variation and low bandwidth requirement. In the second part of this talk, we extend the scope of MU-MIMO to multi-cell MIMO and discuss how a radio resource technique, sector rotation, can make a 3-cell collaborative network MIMO outperform all the other network MIMO systems with more collaborative cells. The ultimate goal of this talk is to show the importance of designing MIMO systems from the overall multi-faceted perspectives of cell architectures and radio resource management on top of physical layer techniques.

References related to this talk:

1. Li-Chun Wang and Chu-Jung Yeh, "3-Cell Network MIMO Architectures with Sectorization and Fractional Frequency Reuse," IEEE Journal in Selected Area in Communications, Vol. 29, No. 6, pp. 1185~1199, June, 2011
2. Li-Chun Wnag and Chu-Jung Yeh, "Scheduling for Multiuser MIMO Broadcast Systems: Transmit or Receive Beamforming?" IEEE Trans. on Wireless Communications, Vol. 9, No. 9. pp. 2779~2791, Sep. 2010.
3. Chiung-Jang Chen and Li-Chun Wang, "Performance Analysis of Scheduling in Multiuser MIMO Systems with Zero-Forcing Receivers," IEEE Journal of Selected Area in Communications, Vol. 25, No. 7, pp. 1435 ~ 1445, Sep. 2007.

4. Chiung-Jang Chen and Li-Chun Wang, "Enhancing Coverage and Capacity for Multiuser MIMO Systems by Utilizing Scheduling, " IEEE Trans. on Wireless Communications, Vol. 5, No. 5, pp. 1148-1157, May, 2006.
5. Chiung-Jang Chen and Li-Chun Wang, “A Unified Capacity Analysis for Wireless Systems with Joint Multiuser Scheduling and Antenna Diversity in Nakagami Fading Channels,” IEEE Trans. on Communications, vol. 54, No. 3, pp. 469~478, Mar. 2006.

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

The Conference Keynote Session

Chair
Professor Li-Chun Wang (王蒞君),
Department of Electrical Engineering,
National Chiao-Tung University

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.

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The Conference Keynote Session

"Creating Advanced Communications for the 21st Century: Applications, Technology and Global Facilities"

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Northwestern University
Director, Metropolitan Research and Education Network
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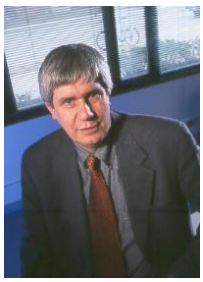
Abstract

Increasing demand for new applications, major technology innovation, and rapidly changing economics are motivating the creation of a fundamentally new types of digital communication services. These capabilities are being developed for the requirements of 21st century. The new capabilities do not constitute a mere incremental advance but a major transformation of all aspects of digital communications. Meeting the challenges of emerging requirements requires replacing traditional infrastructure with one that provides not only for higher performance, but also for significantly more flexibility, determinism, and customization. Traditional communications architectural has been oriented toward meeting the exacting requirements of a finite set of well-defined, centrally controlled and managed services, essentially, a fixed set of modalities, with known parameters. Consequently, this infrastructure is static and highly restrictive, constituting a major barrier to the deployment of new and enhanced capabilities. As an alternative, an innovative digital communications infrastructure is being designed, prototyped, and provisioned in early implementations. This new design provides for highly programmable, dynamic network services, based on a foundation infrastructure consisting of reconfigurable common, shared resources. This infrastructure is a programmable platform that can support many more services than traditional deployments, including highly differentiated and deterministic services. This approach enables the design, provisioning, and customization of an unlimited number of services, including those that are managed and controlled by distributed processes. This design provides for a large scale, distributed facility, which is in essence a highly distributed environment, within which it is possible to create many different networks, each with distinctive characteristics, and each capable of many individualized services. This design can be used to create flexible infrastructure foundations, or platforms, that can be major catalysts for innovation, enabling new communication services that cannot be implemented on traditional systems. Also, this design is highly complementary to emerging 100 Gbps services and infrastructure. This

new architecture is already emerging from research labs and is beginning to be implemented within metro, national, and international prototype facilities. These facilities are currently being used to demonstrate a wide spectrum of innovative, high performance large-scale applications, advanced data services, and specialized networks. Multi-100 Gbps versions of these facilities will be implemented by the end of 2011.

Biography



Joe Mambretti is Director of the International Center for Advanced Internet Research at Northwestern University, which is focused on developing digital communications for the 21st Century. The Center, which was created in partnership with a number of major high tech corporations (www.icair.org), designs and implements large scale infrastructure and applications (metro, regional, national, and global). He is also Director of the Metropolitan Research and Education Network (MREN, http://www.mren.org), an advanced high-performance network interlinking organization providing services in seven upper-midwest states. MREN, designed and developed the world's first GigaPOP. With its research partners, iCAIR has established multiple major network research testbeds, such as OMNInet, to develop new architecture and technology for dynamically provisioned communication services and networks, including those based on lightpath switching. iCAIR has partnered with the Electronic Visualization Lab of the University of Illinois at Chicago (UIC) to create StarLight (www.startap.net/starlight) an advanced international/national communications exchange facility based on leading-edge optical technologies in Chicago. He is a PI of the International Global Environment for Network Innovations (iGENI) initiative, funded by the National Science Foundation (NSF) through the GPO, the PI of StarWave, which is creating multi-100 Gbps exchange facility, the PI of several research projects directed at creating 100 Gbps services, network testbeds, and facilities, and one of the PIs of the national TeraFlow Network, also funded by the NSF, which is supporting a national Open Cloud Testbed, in partnership with the Advanced Computing Lab at the University of Chicago. He is one of the PIs of HPDMnet, an international optical testbed, a Co-Director of the Open Cloud Consortium, a member of the executive committee of I-WIRE (a state-wide optical research network in the Illinois), a founding member of the Global Integrated Lambda Facility, a world-wide distributed optical communications infrastructure, a member of Chicago's Council of Technology Advisors (MCTA), and Co-Chair of the Illinois Broadband Deployment Council's Committee on Infrastructure. He has been a member of numerous committees, projects, and initiatives directed at shaping national, state, local and international communications policy related to large-scale communications infrastructure. He has served on the advisory boards of major technology corporations, and he is a frequent speaker at national and international communications technology forums. He has published multiple articles in peer-reviewed scholarly journals. Among his publications are two co-authored books published by Wiley, "Next Generation Internet," and "Grid Networks: Enabling Grids with Advanced Communication Technology" and two co-edited books published by Springer on "Networks for Grid Applications."

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

Chair
Professor Huei Peng (彭暉)
Department of Mechanical Engineering, University of Michigan

Biography

Huei Peng received his Ph.D. from the University of California, Berkeley in 1992. He is currently a Professor at the Department of Mechanical Engineering, and the Executive Director of Interdisciplinary and Professional Engineering, at the University of Michigan, Ann Arbor. His research interests include adaptive control and optimal control, with emphasis on their applications to vehicular and transportation systems. His current research focuses include design and control of hybrid electric vehicles and vehicle active safety systems.

He is a leading researcher at the University of Michigan Automotive Research Center, and was involved in the design of several military and civilian concept vehicles, including FTTS, FMTV, and Super-HUMMWV. His team designed the power management algorithm for a prototype hybrid electric vehicle designed by Eaton, which later becomes the basis for their commercial hybrid buses and trucks. Thousands of units have been sold worldwide. He has more than 190 technical publications, including 80 in referred journals and transactions.

Huei Peng has been an active member of the Society of Automotive Engineers (SAE) and the ASME Dynamic System and Control Division (DSCD). He served as the chair of the ASME DSCD Transportation Panel from 1995 to 1997, and is a member of the Executive Committee of ASME DSCD. He served as an Associate Editor for the IEEE/ASME Transactions on Mechatronics from 1998-2004 and for the ASME Journal of Dynamic Systems, Measurement and Control from 2004-2009. He received the National Science Foundation (NSF) Career award in 1998. He is an ASME Fellow.

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

“ ”

Professor Lea-Der Chen
Associate Dean of Engineering & Computing Sciences
Professor of Mechanical Engineering
Texas A&M University at Corpus Christi
(德州農工大學陳立德教授)

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

"Parallel High-Speed Plasmonic Nano-Lithography"

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(西北大学機械工程系孙诚教授)

Abstract

Optical lithography has been the critical process for continuous size reduction of semiconductor devices and circuits manufacturing. As the industry is continually improving the lithography feature size, conventional optical lithography becomes more difficult and costive in satisfying the ever-increasing demands in nano-manufacturing because of the fundamental limit of diffraction. Many maskless processes are capable of creating feature sizes better than optical lithography, but they all suffer from the low throughput. Here we experimentally demonstrated the capability of parallel patterning with 50 nm linewidth with a high flying speed at 10 meter/second. This is a low-cost high-throughput nano-fabrication scheme, which has the potential of a few orders of magnitude higher throughput than current maskless techniques. It promises a new route towards the next generation nano-manufacturing. Besides its application in nanolithography, this technique can also be used for nanoscale metrology, imaging and data storage.

Biography

Prof. Sun received his PhD in Industrial Engineering from Pennsylvania State University (State College, PA, USA) in 2002. He received his MS and BS in Physics from Nanjing University (Nanjing, China) in 1993 and 1996, respectively.

He joined the Mechanical Engineering Department at Northwestern University as an Assistant Professor in September 2007. Prior to coming to Northwestern, he was the Chief Operating Officer and Senior Scientist at the NSF Nanoscale Science and Engineering Center for Scalable and Integrated Nanomanufacturing at University of California, Berkeley.

Prof. Sun has been the member of American Society of the Mechanical Engineers (ASME), the Materials Research Society (MRS), the Optical Society of America (OSA), and the International Society For Optics And Photonics (SPIE). He is the recipient of NIH Director Challenge Award in 2008 and NSF CAREER Award in 2010. He published more than 50 technical papers including publications in *Science, Nature Nanotechnology, and Nature Materials*.

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

"Offshore Wind Power Developments in Taiwan"

Professor Ta-Hui Lin
Distinguished Professor & Chairman
Department of Mechanical Engineering
National Cheng-Kung University, Tainan, 701 Taiwan
(成功大學機械工程系特聘教授兼系主任林大惠教授)

Abstract

Taiwan has substantial wind resources in which some onshore wind power plants have been built and under operation, however offshore wind power has richer potential but has not yet been developed. National target on renewable energy ratio in Taiwan is expected to reach 15.1% by the year of 2025, and herein 5.3% accounted for wind power. In comparison with all other renewable energy in Taiwan, wind power has higher potential in use and is expected to grow the fastest, showing the importance and urgency. However, Taiwan has unique geographic environment with high potential for natural disasters of typhoons and earthquakes, the experiences for offshore wind power development from Northern Europe are difficult to directly transfer for domestic use.

Considering Taiwan's situation, the master project of "Offshore Wind Power" in the NSTPE (National Science and Technology Program - Energy) of NSC (National Science Council) is proposed to promote implementation of "Demonstration Plant of Taiwan Offshore Wind Power". By selecting the appropriate demonstration sites, a wind-sea observing tower for collecting environmental data and wind turbines tested for extreme environment (typhoons and earthquakes) will be installed within five years (2012-2016). The installation and operation of the demonstration plant will give us useful information and experience, to promote research and industrial developments on offshore wind power, and further to exploit first phase (2017-2021) and second phase (2022-2026) of offshore wind farms in Taiwan.

This presentation reports briefly the progress on evaluation and planning of the offshore wind power demonstration plant, including (1) site evaluation and selection, and environmental impact assessment, (2) facilities planning (wind turbine, wind-sea observing tower, turbine support structure and foundation, landfall site and interconnection, maritime engineering, and balance of plant plan), (3) construction planning (construction plan, permit and license, financing plan, and operation and maintenance), and (4) future planning (demonstration and promotion, industrial developments and research developments).

Biography

Present Position: Distinguished Professor and Head, Department of Mechanical Engineering,
Vice Director (Education/Research), Research Center for Energy Technology & Strategy
National Cheng Kung University, Tainan, Taiwan 701, ROC
Tel: 886-6-2757575 ext. 62167 Fax: 886-6-2352973
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Education:

9/84 – 6/87 Northwestern University, Evanston, Illinois, USA; Ph.D. in Mechanical Engineering.
9/82 – 8/84 Northwestern University, Evanston, Illinois, USA; M.S. in Mechanical Engineering.
9/75 – 7/79 National Cheng Kung University, Taiwan, ROC; B.S. in Mechanical Engineering.

Research Areas:

1. Basic combustion researches: gaseous, droplets and spray combustion, flame synthesis.
2. Applied combustion researches: gas stoves, IC engines, industrial furnaces and boilers.
3. Combustion related researches: energy utilization, air pollution control and fire research.

Current Research Activities:

1. Basic researches on compound drops combustion, spray combustion, oxy-fuel combustion, flame synthesis of carbon nano-structures, flame interaction and flame stabilization.
2. Improved designs on combustion efficiency and CO emission of domestic gas stoves.
3. Researches on dual-injection (ethanol-gasoline or water-gasoline) SI engines, basic designs of GDI engines and HCCI engines.
4. Experimental evaluations on combustion efficiency, pollutant emissions, and combustion deposits of burning fuel oil, coal or biofuel used in industrial furnaces and boilers.
5. Technology developments on burning by-product combustible gases from manufacturing processes.
6. Technology developments on oxy-fuel combustion for CO_2 capture in industrial furnaces.
7. Developing experimental facilities for architecture fire-prevention and safety researches, including the 10MW fire calorimeter and test furnaces for door, column, beam and floor.
8. Full-scale analyses on burning motor scooters, fireproof performance of a glass plane (or a steel rolling shutter) with down-flowing water film,

smoke leakage through wall openings in a fire, and performance-based code evaluations of room fires.

9. Developments on offshore wind power in Taiwan, master project of National Science and Technology Program - Energy.

Publications:

Over 300 research articles including 75 international journal publications in *Proceedings of the Combustion Institute, Combustion and Flame, Combustion Science and Technology, Fuel, Physics of Fluids, Experiments in Fluids, International Journal of Heat and Mass Transfer, Energy Conversion and Management, Applied Thermal Engineering, Nanotechnology, Carbon, Atmospheric Environment, Building and Environment*, *Journal of Fire Sciences*, etc.

Technical Session D1-W2-T3: Medicine/ Public Health/ Biotechnology/ Bioinformatics

chair
Michael Chiao-An Wu
Assistant Professor, Department of Biostatistics, The University of North Carolina at Chapel Hill
Chapel Hill, North Carolina 27599
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Email: mwu@bios.unc.edu

Biography

Originally from Columbia, Maryland, Dr. Michael Chiao-An Wu received his B.S. in mathematical and computational science from Stanford University, Stanford CA, in 2000. He earned his A.M. and Ph.D. degrees in biostatistics from Harvard University, Cambridge MA, in 2006 and 2009, respectively. His Ph.D. research was conducted under the supervision of Drs. Xihong Lin and Tianxi Cai.

In fall 2009, he joined the Department of Biostatistics at The University of North Carolina at Chapel Hill, Chapel Hill NC, as an assistant professor. His group's current research focuses on the development of statistical methods for high-dimensional genomic data with an emphasis on variable selection and kernel machine based statistical learning approaches. Particular interested lies in development of tools for finding genes that modify response to environmental exposures and methods for analysis of high-throughput sequencing data.

Dr. Wu's is a member of the American Statistical Association (ASA), Eastern North American Region (ENAR) of the International Biometrics Society, International Society for Computational Biology, Institute of Mathematical Statistics, International Chinese Statistical Association (ICSA), Mu Sigma Rho National Statistics Honorary Society, American Society for Human Genetics, and International Genetic Epidemiology Society. His research has received awards from the ASA Section on Statistical Computing and ASA Section on Graphical Statistics, ENAR, and the ICSA.

Technical Session D1-W2-T3: Medicine/ Public Health/ Biotechnology/ Bioinformatics

"Family-based Pathway Analysis Method"

Professor Ren-Hua Chung
Head, Division of Statistical Genetics
Center for Genetic Epidemiology and Statistical Genetics
Hussman Institute for Human Genomics
University of Miami Miller School of Medicine
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(邁阿密大學人類基因研究所鍾仁華教授)

Abstract

Pathway analysis is useful for identifying the joint effects of genes grouped into biologically-based pathways on disease. Pathway analysis may be more powerful than single-marker association tests to identify variants with modest individual effects on a disease but accumulating across genes in a pathway. The development of pathway analysis methods has focused on using unrelated case-control datasets or p-values from genome-wide association tests. We developed Pathway-PDT, a family-based pathway analysis method and an extension of the Pedigree Disequilibrium Test (PDT) (Martin. AJHG 2000). Pathway-PDT defines a score for each gene based on the most significant PDT statistic from PDT statistics for SNPs within a gene (and 20 kb flanking region). Then the weighted Kolmogorov-Smirnov-like running-sum statistic (Wang. AJHG 2007) is calculated for each pathway. A permutation procedure is used in Pathway-PDT to approximate the distribution of the running-sum statistic. We used simulations to verify that Pathway-PDT maintains correct type I error rates under different scenarios. Our simulation results also suggested that Pathway-PDT can have more power than methods using p-values only.

Biography

Dr. Ren-Hua Chung was born in Hualien County in Taiwan on September 21, 1978. He received his B.S. degree in computer science from National Chiao-Tung University, Hsin-Chu Taiwan, in 2000. He completed his M.S. degree in computer science from University of California at Davis, Davis CA, in 2003. He earned his Ph.D. degree in bioinformatics from North Carolina State University, Raleigh NC, in 2007. From January 2007 to March 2008, he worked as a postdoctoral research associate at the Center for Human Genetics at Duke University, Durham NC. In April 2008, he joined the Hussman Institute for Human Genomics at University of Miami, Miami FL, as a research assistant professor. His research interests focus on method development for complex disease gene-mapping, particularly for family-based association analysis.

Dr. Ren-Hua Chung is currently a member of the American Society of Human Genetics and American Statistical Association.

Technical Session D1-W2-T3: Medicine/ Public Health/ Biotechnology/ Bioinformatics

"A Novel Method for Detecting Rare-Variant Associations with Deep Sequencing Data in Large Genomic Regions"

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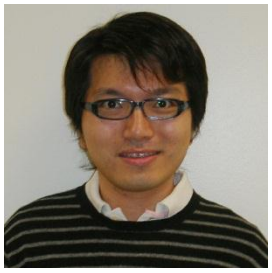
(哥倫比亞大學公共衛生學院張貽謙博士後研究員)

Abstract

Deep sequencing technology has enabled the paradigm shift in genetic association studies from common disease-common variant (CDCV) to common disease-rare variant (CDRV) hypothesis. Exome sequencing is shown to be an effective strategy for identifying rare-variant associations for Mendelian disorders. With exome sequencing data, the number of variant sites can range from a dozen in a gene to hundreds in a biological pathway dependent on the choice of genomic regions under test. The foreseeable arrival of full genome sequencing (FGS), despite opening up unprecedented opportunities, will substantially increase the number of variants involved. This calls for new rare-variant methods that are statistically powerful, robust against a high level of noise introduced by a large number of non-causal variants, and yet computationally efficient to handle high volume of generated data. In response to this challenge, we propose a statistic that combines the *p* values of individual SNPs using the weighted Fisher approach, with weights being inverses of their expected standard deviations. Type I error and statistical power were thoroughly evaluated and compared with five existing algorithms using simulated datasets based on a prevalent population genetics model for mildly deleterious variants and real data from the Dallas Heart Study (DHS). Our method generally outperforms the other methods over a wide range of simulation settings, in particular under a high level of interference from scores of non-causal variants. It is also powerful for uncovering associations in the DHS data.

Biography



Dr. Yee Him Cheung was born in Hong Kong. He received his B.Eng. degree with first-class honors and M.Phil. degree, both in electrical and electronic engineering, from the University of Hong Kong, and the Ph.D. degree in electrical engineering from Columbia University, NY in 2009.

His doctoral thesis work was on distributed signal processing in wireless sensor networks. During his internship at Philips Research, NY, he had co-authored an algorithm for DNA feature extraction through signal processing and spectral analysis, which was later on published and patented. After graduation, he joined the Center for Computational Biology and Bioinformatics of Columbia University as a postdoctoral research scientist, researching on the genetic associations for type 1 diabetes (T1D). Using novel techniques and methodologies, their work had led to the discovery of four additional candidate genes for T1D in the human major histocompatibility complex, and the results were published in *Human Genetics*. He is currently affiliated with the Division of Molecular and Clinical Genetics, and Department of Biostatistics, Mailman School of Public Health of Columbia University and his research interests include multiple rare-variant analysis, bi-clustering algorithms for genomic data, and exome sequencing analyses for various clinical studies.

Dr. Cheung was a recipient of the Sir Edward Youde Memorial Overseas Fellowship of Hong Kong. He won the best student paper award of IEEE Sarnoff Symposium 2008 and the best contribution paper award (second prize) of the Google Ph.D. Forum at IEEE Pervasive Computing Conference 2008 for his doctoral work on wireless sensor network. Dr. Cheung is a member of the Pediatric Cardiac Genomics Consortium.

Technical Session D1-W2-T3: Medicine/ Public Health/ Biotechnology/ Bioinformatics

"A Weighted Fisher's Method to Detect Rare-Variant Associations with Deep Sequencing Data for Complex Disorders"

Professor Shuang Wang
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(哥伦比亚大学公共卫生学院王爽教授)

Abstract

Deep sequencing technology has enabled the paradigm shift in genetic association studies from common disease-common variant to common disease-rare variant hypothesis. With exome sequencing data, the number of variants can range from a dozen in a gene to hundreds in a biological pathway. The foreseeable arrival of full genome sequencing, despite opening up unprecedented opportunities, poses challenges in statistical analysis. This calls for new methods to detect disease associated rare-variants that are statistically powerful, robust against a high level of noise introduced by the large number of non-causal variants, and yet computationally efficient. Here we proposed a new statistic that combines the disease-associated *p* values of individual variants using a weighted Fisher's approach, with weights being inverses of their expected standard deviations. The proposed method can also handle the situation when both risk disease variants and protective variants are present with almost no or only moderate decrease in statistical power. We tested the performance of the proposed method on simulated data and a real sequence data from the Dallas Heart Study. The results suggest that the proposed method generally outperforms the existing methods compared over a wide range of simulation settings. The proposed method is also powerful for uncovering associations in the Dallas Heart Study.

Biography

Dr. Shuang Wang received her bachelor degree in biological science from the University of Science and Technology of China (USTC), Hefei, Anhui, in 1998. She earned her Ph.D. degree in Biostatistics from Yale University, New Haven, CT, in 2003. Her Ph.D. research was under the supervision of Dr. Hongyu Zhao.

In 2004, she joined the Department of Biostatistics, Mailman School of Public Health, Columbia University, New York, NY, as an assistant professor after working at Pfizer Groton for a year. Her research area is in statistical genetics and genetic epidemiology, especially interested in gene-gene and gene-environment interactions. She also works on study design issues in the genome-wide association studies, and methods to detect differentially methylated markers and methods to detect rare variants most recently. Dr. Wang has produced sixty-two peer reviewed articles in both of her methodological works and collaborative works.

Dr. Wang is currently a member of the American Society of Human Genetics and International Genetic Epidemiology Society.

Technical Session D1-W2-T3: Medicine/ Public Health/ Biotechnology/ Bioinformatics

"Analysis of High-throughput Sequencing Data via the Sequence Kernel Association Test"

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The University of North Carolina at Chapel Hill, North Carolina 27599
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(北卡萊羅納大學教堂山分校生物統計系吳肇安教授)

Abstract

Advances in high-throughput genotyping have culminated in the development of large scale sequencing studies. With the goal of identifying gene variants that are related to complex traits, such studies hold the potential for comprehensive achievement of many important biological, medical, and public health goals that have eluded scientific efforts for decades. An important feature of sequencing studies is their ability to measure rare genetic variation. However, the limited power of classical association methods for rare gene variants poses a central challenge in such studies. We propose the sequence kernel association test (SKAT), a supervised, flexible, computationally efficient regression method to test for association between genetic variants (common and rare) in a region and a continuous or dichotomous trait, while easily adjusting for covariates. As a score-based variance component test, SKAT can quickly calculate p-values analytically by fitting the null model containing only the covariates, and so can easily be applied to genome-wide data. Using SKAT to analyze a genome-wide sequencing study of 1000 individuals, by segmenting the whole genome into 30kb regions, requires only 7 hours on a laptop. Through analysis of simulated data across a wide range of practical scenarios and triglyceride data from the Dallas Heart Study, we show that SKAT can substantially outperform several alternative rare-variant association tests. We also provide analytic power and sample size calculations to help design candidate gene, whole exome, and whole genome sequence association studies.

Biography

Originally from Columbia, Maryland, Dr. Michael Chiao-An Wu received his B.S. in mathematical and computational science from Stanford University, Stanford CA, in 2000. He earned his A.M. and Ph.D. degrees in biostatistics from Harvard University, Cambridge MA, in 2006 and 2009, respectively. His Ph.D. research was conducted under the supervision of Drs. Xihong Lin and Tianxi Cai.

In fall 2009, he joined the Department of Biostatistics at The University of North Carolina at Chapel Hill, Chapel Hill NC, as an assistant professor. His group's current research focuses on the development of statistical methods for high-dimensional genomic data with an emphasis on variable selection and kernel machine based statistical learning approaches. Particular interested lies in development of tools for finding genes that modify response to environmental exposures and methods for analysis of high-throughput sequencing data.

Dr. Wu's is a member of the American Statistical Association (ASA), Eastern North American Region (ENAR) of the International Biometrics Society, International Society for Computational Biology, Institute of Mathematical Statistics, International Chinese Statistical Association (ICSA), Mu Sigma Rho National Statistics Honorary Society, American Society for Human Genetics, and International Genetic Epidemiology Society. His research has received awards from the ASA Section on Statistical Computing and ASA Section on Graphical Statistics, ENAR, and the ICSA.

Technical Session D1-W3-T3: New Materials Science and Engineering, Nanotech

Chair
Professor Shi-Chern Yen (顏溪成),
Department of Chemical Engineering,
National Taiwan University

Biography

Technical Session D1-W3-T3: New Materials Science and Engineering, Nanotech

"Germanium Quantum Dots Optoelectronic Devices"

Professor Pei-Wen Li
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(中央大學電機工程學系李佩雯教授)

Abstract

Recent developments in the design and fabrication of semiconductor quantum dots (QDs) has opened up access to wide-ranging applications in computing, photovolatics, photonics, as well as in energy harvesting and conversion. For these applications to be optimally realized, an unprecedentedly high degree of control over the placement, shape, density or number, and sizes of QDs is required. Detailed knowledge and understanding of how the QDs are created, and especially their interactions with the local environment are therefore essential to achieving this high level of control on an otherwise random growth process. To date, QDs are largely created using "self-assembly" techniques, i.e. through random, non-lithographically-controlled nucleation and growth. A large ensemble of randomly distributed QDs is acceptable for the fabrication of QD laser and nanocrystal memory devices, but not appropriate for creating novel single QD devices such as single photon sources or single electron devices. These devices require strict control, not only of the numbers and the lateral locations of the QDs but also of the tunnel junctions formed with them. In addition, from a device fabrication perspective, making electrical contacts to specific nanoscale QDs presents a major challenge. The "holy grail" for device manufactures is therefore, to achieve precise control and repeatable growth of these structures with predictable electronic, optical and thermal properties and behavior. The most promising approach for precise control of locations and numbers of QDs appears to be the growth and fabrication of QDs on patterned substrates.[13-15] Among the possible materials choices for QDs, Ge-based QDs are particularly attractive since they exhibit considerable quantum confinement effects, which are much stronger than those of their counterpart Si QDs[16] because of Ge's higher dielectric constant and lower carrier effective mass leading to a larger exciton Bohr radius. Thus, in principle, the electronic structure around the band gap of Ge QDs should be more easily modified than for Si QDs, making them attractive for use in advanced optoelectronics applications.

The authors have developed a novel, complementary metal-oxide-semiconductor (CMOS) compatible approach for the generation of Ge QDs through the selective thermal oxidation of SiGe-on-insulator layers. Ge QDs have been fabricated on oxide, nitride or oxynitride substrates. We have successfully demonstrated several capabilities including the ability to grow dense arrays of Ge QDs by thermal oxidation of planar SiGe-on-insulator layers, as well as the precise placement and size control of Ge QDs within nano-patterned structures. Thereby we have successfully demonstrated the feasibility of Ge QD single electron transistors (SETs), floating-dot memory, and photo-detecting devices. Ge QD SETs exhibited significant Coulomb-blockade oscillations with a peak-to-valley ratio (PVCR) of 750 and negative differential conductances with a PVCR of 12 at room temperature. Incorporating dense Ge QDs arrays into the gate dielectrics of poly-Si thin-film transistors significantly enhances the photoconductivity in the wavelength of 350-450 nm as well as the thermal stability and transient responsivity, offering potential applications for optical modulators, sensors, and switches.

We believe that this new capability of precise placement and size control of Ge QDs on SiO_2 and Si_3N_4 substrates offers exciting possibilities for generating new classes of quantum tunneling devices, not only single-electron devices, memory, photodetectos, but also single photon light sources (SPSs), and possibly photovolatics and thermoelectrics.

Biography

Pei-Wen Li was born in Taichung, Taiwan on November 1st in 1967, and received the Bachelor degree in Electrophysics from National Chiao-Tung University in 1989, the Master and Ph.D. degree in Electrical Engineering from Columbia University in New York city in 1991 and 1994, respectively. Her Ph.D. dissertation was focused on the study of low temperature oxidation of SiGe alloys and she has successfully demonstrated the first pure SiGe-channel pMOSFETs.

In 1995, she joined the R/D technology division of Vanguard International Semiconductor Corporation to work on the process development and integration of 64M DRAM. Then, she joined I-Shou University as a faculty in the department of Electronic Engineering in 1996, where her research was focused on the characterization of InGaAsN material properties and its application on HEMT and HBT related devices. She joined the department of Electrical Engineering, National Central University as an associate professor in 2000, was promoted to be a Professor since August 2005, and served as the Department Chairman during 2007-2010. Dr. Li's main research theme focuses on experimental silicon-germanium nanostructures and devices. Her present research encompasses germanium quantum dot nano-optoelectronic devices, including single electron transistors, photodetectors, nonvolatile memory, and energy saving (photovoltaic and thermoelectric) devices, making use of self-assembly nanostructures in silicon integration technology.

Dr. Li is a member of IEEE and *Sigma Xi*. Dr. Li was awarded Distinguished Young Electrical Engineer from Chinese Electrical Engineering Society in 2005, Distinguished Professorship from National Central University in 2006-2012, Top 10 Rising Stars in Taiwan (Science and Technology) from Central News Agency in 2008, and listed in 2006-2008 Marquis Who's Who in the World. Her current research on germanium quantum dot single electron transistors and thermoelectric devices have being been granted by National research program for nanoscience and technology from National Science Council of Taiwan. Dr. Li has published more than 50 journal papers and holds 4 patents in Si device processing.

Technical Session D1-W3-T3: New Materials Science and Engineering, Nanotech

"Fast Flexible Electronics and Heterogeneous Integration with Transferrable Semiconductor Nanomembranes"

Professor Zhenqiang (Jack) Ma
Department of Electrical and Computer Engineering
Department of Nuclear Engineering and Engineering Physics
Materials Science Program
UW Energy Institute
University of Wisconsin-Madison
(威斯康辛大學電機與計算機工程系马振强教授)

Abstract

Rigid semiconductor-based integrated circuit chips have changed our life for many decades. While they offer superior performance with high packing density, the rigidity of these chips often makes them hard to be implemented in many critical applications, such as very large-area, conformal, easy-to-bend and space-limited systems, and particularly bio-implantation systems. Traditional flexible electronics employing organic semiconductors, amorphous and polycrystalline silicon can fulfill some of these applications, but lacking the high performance that is needed in many of the advanced systems. Mono-crystalline semiconductor nanomembranes that are released from various semiconductors are mechanically bendabe, stackable, strainable, transferrable and conformal to any flexible and rigid substrates, with equivalent electronic properties as their bulk counterparts. These unique properties of semiconductor nanomembranes provide us with the unprecedented opportunities to develop fast flexible electronics, optoelectronics and photonics devices. In this talk, I will give an overview presentation on the research and development activities in this area, including material creation, manipulation, fundamental sciences and various device demonstrations. Future research directions along this path will be outlined.

Biography

Zhenqiang (Jack) Ma received the B.S. degree in applied physics and the B.E. degree in electrical engineering from Tsinghua University, Beijing, China in 1991. He received the M.S. degree in nuclear science and the M.S.E. degree in electrical engineering from the University of Michigan, Ann Arbor in 1997, and the Ph.D. degree in electrical engineering from the University of Michigan, Ann Arbor in 2001. From 2001-2002, he was a member of the R&D team at Conexant Systems and later its spin-off Jazz Semiconductor, Newport Beach, CA. In 2002, he left Jazz to join the faculty of University of Wisconsin–Madison as an assistant professor in the Department of Electrical and Computer Engineering. He has been a full professor since 2011. His current research interest includes (a) high-speed RF devices and circuits, optoelectronic devices and nanophotonics, (b) Semiconductor materials processing and heterogeneous integration, (c) Flexible electronics, flexible optoelectronics and flexible photonics, (d) Energy conversion semiconductor devices, (e) Bioelectronics and biomimetics, (f) Semiconductor device physics, and (g) Power electronics. He is the author or co-author of over 200 peer-reviewed technical papers and book chapters related to his research and holds over 10 US and international patents. He was featured in *MIT's Technology Review* for his research innovations three times since 2004. He is a recipient of the 2007 Presidential Early Career Award for Scientists and Engineers (PECASE) and 2008 DARPA Young Faculty Award. He serves on the Editorial Board and as a reviewer of over 30 international journals.

Technical Session D1-W3-T3: New Materials Science and Engineering, Nanotech

"Nanophotonic Emitters for Future Communication, Energy, and Health Care"

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Email: peicheng@umich.edu
(密歇根大學安娜堡分校電機系古培正教授)

Abstract

Compact, solid-state light emitters play an enabling role in today's telecommunication networks, solid-state lighting, and biomedical devices. As the trend of the technology moves toward being smaller, more versatile, more energy-efficient, and more cost effective, it is critical to be able to control and manipulate light-matter interaction at an unprecedented level, i.e. at a much smaller length scale (<<), spanning a wider spectral range ( ), down to a single-photon level, and up to a terahertz bandwidth. Using state-of-the-art nanofabrication facilities and the combination of top-down and bottom-up approaches, researchers have been able to narrow the gap toward the above goals. Nanoscale lasers and light-emitting diodes have emerged in recent years. In this talk, we will present our latest efforts in this direction. We will present three types of nanophotonic emitters including semiconductor nanoring lasers, single-quantum-dot emitters, and emitters exhibiting ultrasmall (<<10^{-18} m^3) focusing volumes. We will also discuss the potential applications of these devices in on-chip interconnect, quantum information, medical diagnosis, and biomedical science.

Biography

P.-C. Ku received his BS degree from National Taiwan University in 1995 and PhD degree from University of California at Berkeley in 2003, both in Electrical Engineering. During PhD study, he was a recipient of the Berkeley Fellowship. From 2003-4, he was a postdoctoral researcher in DARPA Center for Optoelectronic Nanostructured Semiconductor Technology. From 2004-5, he was with Intel Corporation, working on advanced lithography and phase-change memory. He joined the University of Michigan as an assistant professor in 2006. His current research focuses on nanoscale materials and structures for energy-efficient photonic applications. He has received Ross Tucker Memorial Award in 2004 and DARPA Young Faculty Award in 2010.

Technical Session D1-W3-T3: New Materials Science and Engineering, Nanotech

"Graphene Nanomaterial for Sensors and Energy Applications"

Professor Mark Ming-Cheng Cheng
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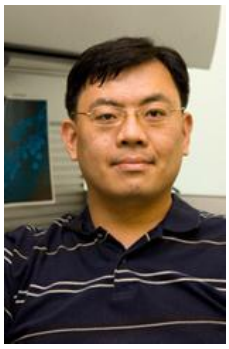
Abstract

In this talk, I will review recent research progresses in my laboratory in the application of graphene nanomaterial to emerging biomedical and energy applications. Graphene is a flat single atomic layer of *sp2* bonded carbon atoms that are packed in a honeycomb lattice. In recent years, graphene has been discovered to have exceptional electronic, mechanical and chemical properties. For example, graphene is a semiconductor with zero bandgap, where adsorbed chemical and biomolecules can be translated into an electrical signal by changing the conductivity of the device. In addition, graphene has extremely low carrier concentration around Dirac point, making it ideal for the detection of single gas or biological molecules. I will discuss the design, fabrication, functionalization and testing of graphene devices. In the end, I will also briefly update the progress in engineering novel silicon-graphene composites that have high specific capacity and long cyclic life for anode electrodes in lithium ion battery.

Biography



Dr. Mark Ming-Cheng Cheng is Assistant Professor in the Department of Electrical and Computer Engineering at Wayne State University (WSU) in Detroit, MI, USA. Dr. Cheng grew up in Taiwan, where he received his bachelor and PhD degrees both in Electrical Engineering from National Tsing-Hua University, Hsinchu Taiwan in 1995 and 2003, respectively. His PhD dissertation was entitled "Silicon Microspeakers for Hearing Aids Applications" under the supervision of Prof. Star Ruey-Shing Huang. From 2003-2006, he was a NIH postdoctoral fellow in the Comprehensive Cancer Center, the Ohio State University (OSU) under the supervision of Prof. Mauro Ferrari. At OSU, he led a pilot project entitled"Nanotechnology against Cancer" funded by National Cancer Institute (NCI). The goal of the NCI project is to apply nanotechnology to high throughput screenings including as proteomics and microarrays for the early diagnosis of cancer. Prior to joining WSU in 2008, he was Assistant Professor at the Department of Nanomedicine and Biomedical Engineering at the University of Texas Health Science Center at Houston, TX, where he focused on silicon multi-stage nanoparticles for the targeting and imaging of tumors.

Dr. Cheng is an expert in Micro electromechanical system (MEMS), biomedical devices, graphene and proteomic nanotechnology. At WSU, his research has been involved in the design, fabrication and characterization of micro/nanodevices for biological samples analysis, neural prosthesis and energy storage. Dr. Cheng received National Science Foundation (NSF) CAREER award in 2011. He served symposium chair of 2011 Annual Spring Symposium of American Vacuum Society (AVS) -Michigan Chapter on the theme of graphene nanomaterial and neural interfaces. He is a member of IEEE, AVS and Sigma Xi.

Technical Session D1-W4-T3: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

Chair
Professor Shanchieh Jay Yang (楊善傑)
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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 in the Department of Computer Engineering at Rochester Institute of Technology in Rochester NY, USA, and has been appointed as the department chair starting in fall 2011. 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.

Technical Session D1-W4-T3: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

"The Human-centric Cyber Situation Awareness MURI"

Professor John Yen (顏加輝)
Director, Strategic Research Initiatives
Professor of Information Sciences and Technology
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Abstract

Maintaining the situation awareness of cyberspace requires human analysts working closely with a range of tools for detecting and analyzing various alerts for cyber attacks, and for linking these alerts to identify or predict the targets and the path of attacks. However, there has been a gap between the computational world of the tools and the cognitive world of the human analysts. In this talk, I will describe a human-centric research effort aiming to address this gap by leveraging cognitive models about human decision making and situation awareness so that the experience of the human analysts can be captured using one or more computational realization of cognitive models, which can be further integrated with existing cyber situation awareness tools so that they can better support various human cognitive processes so that cyber analysts can deal with the complex dynamic cyber threats more effectively.

Biography

Education
Ph.D., Computer Science, University of California, Berkeley 1986
M.S., Computer Science, University of Santa Clara 1982
B.S., Electrical Engineering, Honors, National Taiwan University 1980

Research
He was a Research Scientist at USC/Information Sciences Institute. Before joining Penn State in 2011, he was on the faculty of Texas A&M University and the founding Director of Center for Fuzzy Logic and Intelligent Systems Research. He is currently University Professor of Information Sciences and Technology, Director of Strategic Research Initiatives, and Director of Intelligent Agent Lab at the College of Information Sciences and Technology at the Pennsylvania State University.

His research interests include social network analysis, intelligent agents, social media mining, smart health, and cloud computing.

Achievements
He is the co-chair of 2010 NIPS Workshop on Machine Learning for Social Computing, the co-chair of SNA- KDD (Social Network Mining and Analysis) Workshop of the ACM SIG KDD Conference from 2007 to 20111, and the sponsoring chair of 2008 International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS). He is a program committee member of many international conferences, including IEEE International Conference on Social Computing. He was an Editor, Associate Editor, or a member of the Editorial Board for nine international journals. He has published a book, two edited volumes, and over 170 refereed papers. His research has been sponsored by NSF, AFOSR, ARL, ARO, ONR, DOE, NIH, and MIT Lincoln Laboratory. Dr. Yen is the recipient of the NSF Young Investigator Award and IEEE Fellow.

Technical Session D1-W4-T3: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

"On Developing a Guideline for Establishing RFID Privacy Policies"

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Abstract

To establish standard rules for RFID applications on campuses, Taiwan's Ministry of Education (MOE) funded a pilot project, called RFID Applications for Campus Security and Safety Enhancement Project. The project focused on campus security and safety applications in elementary and special-education schools. Privacy is one of the most important issues in this project. Therefore, the project office develops a guideline for RFID application providers to establish their RFID privacy policies to disclose privacy practices about their applications. Because RFID application providers may hesitate to open details of their applications to competitors and malicious hackers, the guideline separates disclosed information about RFID applications into (1) privacy policies, and (2) detailed information proving that the policies are enforced.

Consequently, the RFID application providers can develop privacy policies that meet current regulations and best practices for RFID privacy using the guideline. Moreover, providers can use these policies to communicate with users to obtain consents of users. Furthermore, providers of RFID applications can provide evidence proving they are complying with policies to third parties trusted by both RFID applications providers and consumers. Consumers can contact the third parties to determine whether the privacy policy associated with an RFID application is trustworthy. While an increasing number of countries have started requesting that RFID application providers disclose their privacy policies, this experience of the Taiwan RFID Applications for Campus Security and Safety Enhancement Project will help countries develop guidelines and regulations for RFID applications and establish privacy policies for applications.

Biography

Shi-Cho Cha received his B.S. and Ph.D. in Information Management from the National Taiwan University in 1996 and 2003. He is currently an assistant professor at the Department of Information in the National Taiwan University of Science and Technology, where he has been a faculty member since 2006.

From 2003~2006, he worked at PricewaterhouseCoopers, Taiwan. When he left PricewaterhouseCoopers in 2006, he was a Senior Manager in the department of Performance Improvement. He helped several major Taiwan organizations to establish their information security management systems in those years. In addition to publishing several papers about information security risk management and RFID privacy, he engaged in several big projects in Nation Taiwan University of Science and Technology recently. Major projects include developing a guideline for establishing RFID privacy policies for RFID Center and establishing Web applications source codes security inspection service for the TaiWan Information Security Center. His current research interests are in the area information security management, identity management, and RFID privacy.

Prof. Cha is a certified PMP, CISSP, CSSLP, and CISM and a member of ACM, IEEE, and IEICE.

Technical Session D1-W4-T3: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

"Secure Computation Outsourcing in Cloud Computing"

Professor Kui (Quinn) Ren
Department of Electrical and Computer Engineering
Illinois Institute of Technology
(伊利诺理工大学电机与计算机工程系任奎教授)

Abstract:

Cloud computing enables customers with limited computational resources to outsource large-scale computational tasks to the cloud, where massive computational power can be easily utilized in a pay-per-use manner. However, security is the major concern that prevents the wide adoption of computation outsourcing in the cloud, especially when end-user's confidential data are processed and produced during the computation. Thus, secure outsourcing mechanisms are in great need to not only protect sensitive information by enabling computations with encrypted data, but also protect customers from malicious behaviors by validating the computation result. Such a mechanism of general secure computation outsourcing was recently shown to be feasible in theory, but to design mechanisms that are practically efficient remains a very challenging problem. Focusing on engineering computing and optimization tasks, this talk investigates secure outsourcing of widely applicable linear programming (LP) computations. In order to achieve practical efficiency, our mechanism design explicitly decomposes the LP computation outsourcing into public LP solvers running on the cloud and private LP parameters owned by the customer. The resulting flexibility allows us to explore appropriate security/efficiency tradeoff via higher-level abstraction of LP computations than the general circuit representation. In particular, by formulating private data owned by the customer for LP problem as a set of matrices and vectors, we are able to develop a set of efficient privacy-preserving problem transformation techniques, which allow customers to transform original LP problem into some random one while protecting sensitive input/output information. To validate the computation result, we further explore the fundamental duality theorem of LP computation and derive the necessary and sufficient conditions that correct result must satisfy. Such result verification mechanism is extremely efficient and incurs close-to-zero additional cost on both cloud server and customers. Our security analysis and experiment results show the immediate practicability of the proposed mechanism design.

Biography

Dr. Kui Ren is currently an Assistant Professor of Electrical and Computer Engineering Department at the Illinois Institute of Technology (IIT). He received his Bachelor's and Master's Degrees from Zhejiang University and a PhD degree from Worcester Polytechnic Institute. Kui's research interests include Security & Privacy in Cloud Computing, Lower-layer Security Mechanisms for Wireless Networks, Smart Grid Security, and Sensor & Mesh Network Security. He is a recipient of US National Science Foundation Faculty Early Career (CAREER) Award in 2011. Kui serves as an associate editor for IEEE Wireless Communications and IEEE Transactions on Smart Grid and is a senior member of IEEE.

Technical Session D1-W4-T3: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

"Mobile Cloud Computing: Opportunities, Technologies, and Challenges"

Professor Yung-Hsiang Lu
School of Electrical and Computer Engineering
Purdue University
(普度大學電機與計算機工程學院陸永祥教授)

Abstract

In the past few years, computing has been dramatically changed. First, cloud computing is being adopted as a way to share resources and reduce cost. Second, mobile systems have become the primary platforms for millions of users. Third, sensors are deployed to continuously monitor our environment. In the coming years, these three types of systems--cloud servers, mobile computers, and sensors-- will be integrated to provide a new way for collecting, analyzing, and storing information. Mobile computers and sensors will produce large amounts of data; the data will span a wide range of contents and formats, including image, audio, video, text, and sensor reading. Cloud servers will be used to analyze these data and transform the data into information, knowledge, and eventually intelligence for decision making. Some applications would impose stringent timing constraints and real-time cloud computing will be required. Data protection will be a critical issue determining the success of mobile cloud computing.

This presentation will give an overview of the potential of mobile cloud computing, describe the challenges, and then provide snapshots of the projects in my research group.

Biography

Yung-Hsiang Lu is an associate professor at the School of Electrical and Computer Engineering, Purdue University, USA. His research focuses on resource management, in particular energy management. He is a senior member of the IEEE and the ACM. He is an associate editor of ACM Transactions on Embedded Computing Systems and ACM Transactions on Design Automation of Electronic Systems. In 2004, he received the Career Award from National Science Foundation. He received BSEE from National Taiwan University, MSEE and PhD from Stanford University, USA.

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

Chair
Professor Huei Peng (彭暉)
Department of Mechanical Engineering
University of Michigan at Ann Arbor

Biography

Huei Peng reeived his Ph.D. from the University of California, Berkeley in 1992. He is currently a Professor at the Department of Mechanical Engineering, and the Executive Director of Interdisciplinary and Professional Engineering, at the University of Michigan, Ann Arbor. His research interests include adaptive control and optimal control, with emphasis on their applications to vehicular and transportation systems. His current research focuses include design and control of hybrid electric vehicles and vehicle active safety systems.

He is a leading researcher at the University of Michigan Automotive Research Center, and was involved in the design of several military and civilian concept vehicles, including FTTS, FMTV, and Super-HUMMWV. His team designed the power management algorithm for a prototype hybrid electric vehicle designed by Eaton, which later becomes the basis for their commercial hybrid buses and trucks. Thousands of units have been sold worldwide. He has more than 190 technical publications, including 80 in referred journals and transactions.

Huei Peng has been an active member of the Society of Automotive Engineers (SAE) and the ASME Dynamic System and Control Division (DSCD). He served as the chair of the ASME DSCD Transportation Panel from 1995 to 1997, and is a member of the Executive Committee of ASME DSCD. He served as an Associate Editor for the IEEE/ASME Transactions on Mechatronics from 1998-2004 and for the ASME Journal of Dynamic Systems, Measurement and Control from 2004-2009. He received the National Science Foundation (NSF) Career award in 1998. He is an ASME Fellow.

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

"Can We Produce Energy from the Carbohydrate of Lignocellulloses?"

Professor Junyong (JY) Zhu
Department of Biological Systems Engineering
University of Wisconsin at Madison &
USDA Forest Products Laboratory, USDA Forest Service

Abstract

The concept of producing cellulosic biofuel and bioproducts, chemicals through biorefinery using lignocelluloses has been around for over a century. The recent interest in this old concept arises from the promises of mitigating climate change by substituting petroleum based economy, achieving energy independence and sustainable economic developmen, as well as the advances in biotechnology in the last 2-3 decades. Despite much research efforts and progresses have been made in the last three decades with many breakthroughs in bio-chemical technologies. The realization of this concept remains a challenge.

This presentation will focus on the energy production from carbohydrate in lignocelulosic biomass through the biochemical conversion pathway, one of the two major pathways of lignocellulosic biomass conversion to bioenergy. Carbohydrate is the major component of lignocellulosic biomass with content of approximately 65%. The biochemical conversion or the sugar platform relies on hydrolyzing carbohydrates to sugars to produce energy and various chemicals. Despite a very significant amount of literature has been published in sugar/biofuel production from lignocellulosic biomass that covers from pretreatment, hydrolysis, fermentation, metabolic engineering, transgenic breeding science, and catalysis, the issue of energy production has only been philosophically debated, such as feed vs food, without detailed analysis using data. As a matter of fact, the scientific community has been primarily focused on sugar/biofuel yield driven by the economics for commercialization. The issue of net energy production has been large overlooked. Leading economic analyses often predict the cost of biofuel production by assuming fairly low cost of energy without providing net energy output. Only a few publications produced by this proposer provided a fairly complete mass and energy balance data. Our analysis suggests that most process conditions published in the literature will result in negative net energy output from lignocellulosic biomass carbohydrates. Unfortunately, a biorefinery without net energy output from carbohydrate is no different from a traditional pulp mill. We will end up with looking for energy from somewhere else.

This presentation will walk the audience through the entire biofuel

production process through the sugar platform. We will point out the key energy barriers of biorefinery. Specifically, we will briefly discuss energy cost for biomass transportation. We will discusses energy consumption for lignocellulosic biomass size reduction, the prerequisite step for any conversion technologies (thermal and biochemical pathways), energy for biomass thermo-chemical pretreatment and mixing of substrate under high solids enzymatic saccharification. We will present mass and energy balance analyses based on the work conducted at our laboratory as well as several leading institutions using various technologies and feedstocks in the field to illustrate the potentials of net energy production from lignocellulosic biomass. These technologies includes dilute acid, steam explosion, Organosolv, SPORL, alkaline including AFEX processes. We will propose the concept of energy efficiency for pretreatment and for biofuel production. The concept along with yield will be used to benchmark existing pretreatment technologies. We will point out the key steps needed to be taken to improve energy efficiency in biofuel production from lignocellulosic biomass. The issue related to energy quality will also be discussed.

Biography

Dr. Junyong (J.Y.) Zhu received his Ph.D in Engineering from the University of California-Irvine in 1991. He is a scientific leader in cellulosic biofuel, bioproducts, and bio-nano-materials research at the USDA Forest Service, Forest Products Laboratory, Madison, Wisconsin. Dr. Zhu holds an adjunct Professorship at the University of Wisconsin-Madison. Before he joined the current position, he had been on the faculty at the Institute of Paper Science and Technology for 10 years (now Georgia Institute of Technology, Atlanta, GA). He has devoted most of his research efforts to forest resource utilization for fiber, nanocellulose, and sugar/biofuel productions. His research experiences encompasses laboratory studies and commercial scale demonstrations of his laboratory research findings, including the commercial demonstration of fiber production using small diameter softwood trees from forest thinnings at the most modern thermomechanical pulp mill in North America with capacity of 800 ton/day. He is the co-inventor of the robust pretreatment technology SPORL for efficient sugar production from (woody) biomass, especially those of softwoods. The SPORL technology outperforms most existing technologies in terms of yield and energy efficiency and has attracted significant industry interest for commercialization. This research was selected as Exemplary R&D in Agricultural, Food, Nutrition, and Natural Resources by the American Association for Advancement of Science (AAAS) to participate a Round Table in DC in March, 2011.

Dr. Zhu is a Technical Editor of TAPPI Journal, the official scientific publication of the Technical Association of the Pulp and Paper Industry (TAPPI), a member of the editorial board of several technical journals, such as *BioEnergy Research* (also an associate Editor), *J. Biobased Materials and Bioenergy*, *China Pulp and Paper,* the official scientific publication of the China Technical Association of the Paper Industry (CTAPI). He is the Secretary of the AIChE Forest Bioproducts Division and a Panel Member of the State of Wisconsin Research Forum on Energy, Economics, and Environment. He has published extensively in leading technical Journals, such as *Green Chemistry, Langmuir, Bioresource Technology, Enzyme and Microbial Technology*, with over 100 peer reviewed articles. He delivered over 100 presentations at various national and international conferences. He is a co-inventor of a dozen US Patents.

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

"Utilization of Biofuel and Biomass Energy for Transportation and Heat Generation"

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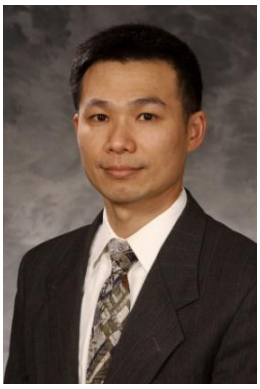
(愛荷華州州立大學龔松長教授)

Abstract

Biofuel plays an important role in helping reduce the oil dependence of many countries. In addition to biodiesel and ethanol, an emerging biofuel is bio-oil. Bio-oil, also called pyrolysis oil, is produced form fast pyrolysis of solid biomass and has peculiar combustion properties. Bio-oil can be mixed with other fuels and used in an engine. Bio-oil can also be catalytically upgraded to regular gasoline and diesel fuel. Engine performance using mixtures of bio-oil and other fuels will be discussed.

Biomass can also be used for heat and power generation via gasification process. Biomass gasification has the potential to produce carbon neutral energy by using renewable resources. When the biomass-derived gas is burned, NOx emissions are a critical factor that can limit the use of the system. Experiments were conducted in a pilot-scale fluidized bed gasifier using biomass feedstock with different nitrogen contents. Producer gas from the gasifier undergoes a gas cleaning phase before its combustion in a burner. Producer gas and the exhaust flue gas were analyzed. Results show that there is a direct and proportional relationship between nitrogen in biomass, ammonia in producer gas, and NOx emissions in the flue gas. NOx emissions do not vary noticeably with the overall equivalence ratio in the burner but vary significantly with increased heat rate. It was also found that thermal NOx is less significant than fuel NOx, which constitutes a majority of the total NOx emissions when biomass-derived producer gas is used.

Biography



Dr. Song-Charng Kong graduated from National Tsing-Hua University. He received his PhD from Department of Mechanical Engineering, University of Wisconsin–Madison. His research is focused on multiphase, chemically reacting flows with applications in engine spray combustion and biomass gasification for renewable power generation.

He was a faculty member at Chung-Hua University, Taiwan after receiving his doctoral degree. He then worked at the Engine Research Center, University of Wisconsin–Madison as a Research Scientist. In 2005, he joined Mechanical Engineering Department, Iowa State University as a faculty member. His research is aimed at developing a fundamental understanding of energy conversion processes, creating accurate numerical models, and developing enabling technologies to utilize energy effectively. His engine research includes both experimental and modeling study using conventional and alternative fuels. He developed algorithms to couple computational models with detailed chemistry to conduct integrated simulation of practical combustion systems. His recent research on biomass gasification is intended to explore the clean and efficient way to utilize biomass energy for renewable heat and power generation.

Dr. Kong serves as a conference organizer and chair for Society of Automotive Engineers, American Society of Mechanical Engineers, Institute of Liquid Atomization and Spray Systems, and Combustion Symposium. He also reviews grant proposals for various federal, state, and private agencies. In recognition of his achievements in combustion research, he received Myers-Uyehara Meritorious Paper Award and Ralph R. Teetor Educational Award. Dr. Kong was also named William and Virginia Binger Professor of Mechanical Engineering at Iowa State University.

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

"Biofuel and Biomaterials from Renewable Biomass"

Professor Zaohui Tong
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Abstract

To simultaneously consider preserving our natural resources and alleviating the depletion of petroleum oil, a shift of renewable resources to produce fuel and value-added chemicals is becoming a significant sustainable development approach. In this project, lignocelluloses biomass (sugar bagasse) has been investigated as a potential feedstock to produce renewable fuels (such as ethanol) and biomaterials (such as biodegradable composite). Firstly, we discuss a simple process to produce ethanol from sugarcane bagasse. The bagasse was pre-treated by a low level of phosphoric acid (1% w/w dry bagasse basis) followed by the steam explosion (160 ^{0}C and above, 10min) pretreatment. Then the pretreated and enzyme-hydrolyzed bagasse (10% w/w solid content) can be effectively fermented in a single vessel by the so-called L+SSCF(liquefaction plus simultaneous saccharification and co-fermentation) process using hydrolysate-resistant *Escherichi coli*. The highest yield (over 0.25 g ethanol/g bagasse dry weight, 313 L/tonne; 76 gal/US ton) was produced after 96hr of fermentation in our scale-up process. Secondly, we present our current research to produce poly (lactic acid) (PLA) composites reinforced by sugarcane bagasse residues from different bioprocessing stages via twin-extrusion. These composites are not only 100% renewable and biodegradable, but also have the competitive cost in comparison with petroleum-based composites. The sugarcane bagasse residues (30 wt.%), containing different content of fibers and all the remaining lignin, were used to prepare lignocelluloses reinforced PLA composite with desirable physical and chemical properties. The varieties of different bagasse residues include the composition, particle size and its surface reactivity during the chemical and biological (enzymes, microbes) treatments that the biomass is subjected to. The effect of these varieties on the morphologies, thermal properties, mechanical properties and the molecular weight of PLA composites was studied as well. Furthermore, a coupling agent (Desmodur® VKS 20) was used to increase the interfacial bonding of PLA with lignocelluloses. Its effect on the properties of PLA composites was also under investigation.

Biography

Education:

PhD/2007, Georgia Institute of Technology, chemical engineering, Atlanta, GA
MS/2005, Georgia Institute of Technology, chemical engineering, Atlanta, GA
MS/2001, Tianjin University of Science and Technology, pulp and paper engineering, Tianjin, China

Work Experience:

2010-present	Assistant Professor	University of Florida, Gainesville, FL
2007-2010	Consulting Engineer	Ch2mHill Engineering Ltd., Atlanta, GA
2002-2007	Graduate Research Assistant	Georgia Institute of Technology, Atlanta,GA
2004	Research Engineer	Kemira Chemicals Co. Ltd., Atlanta, Georgia
2001-2002	Assistant Manager	Sonoco Packaging Co. Ltd., Shanghai, Chin
1995-1998	Process Engineer	Tiger Forestry and Paper Group Co. Ltd., China

Technical Session D2-W2-T1: Medicine/Public Health/Biotechnology/ Bioinformatics

Chair
Professor Wei-Jen Tang (湯惟仁)
Ben May Department for Cancer Research,
The University of Chicago

Biography

A. Personal Statement:
My research program involves in elucidating the molecular basis of cellular signal transduction. The research is based on the premise that the better understanding of protein-protein and protein-ligand interaction is key to elucidating the fundamental principles governing cellular signaling network. I apply X-ray crystallography and various biochemical, biophysical, cellular and pharmacological tools to address the protein functions and regulations. I am known for the studies on the catalysis and regulation of mammalian adenylyl cyclase, anthrax and pertussis adenylyl cyclase toxins, and insulin degrading enzyme. I am a very strong believer in collaboration.

B. Positions and Honors.

Positions:
1988 Postdoctoral fellow with Dr. William R. Folk, U Texas Austin
1988-1991 Postdoctoral fellow with Dr. Alfred G. Gilman, U Texas Southwestern Medical School
1991-1993 Instructor, Dept. of Pharmacology, University of Texas Southwestern Medical School
1993-1994 Assistant Professor, Dept. of Pharmacology, UT Southwestern Medical School
1994-1998 Assistant Professor, Dept. of Pharmacol. & Physiol. Sciences, U of Chicago
1998-2001 Assistant Professor, Dept. of Neurobiol. Pharmacol. & Physiol., U of Chicago
2001-2007 Associate Professor, Ben-May Institute for Cancer Research, U of Chicago
2007- Professor, Ben-May Department for Cancer Research, U of Chicago

Honors and Federal Government Public Advisory Committee:
1987-1988 University Fellowship, University of Texas, Austin
1999-2002 American Heart Association Established Investigator
1998-present Ad Hoc NIH and NSF grant reviewing panels

2007-2011 Regular member of NIH MSF-C study section
2009-present The advisory Board, Structure Biology Center, APS, Argonne National Lab.

C. Selected peer-reviewed publications (Selected from 101 peer-reviewed publications).

1. Tang, W.-J., Krupinski, J., and Gilman, A.G. (1991) Expression and characterization of calmodulin activated (type I) adenylyl cyclase. J. Biol. Chem. 266:8595-8603.

2. Tang, W.-J. and Gilman, A. G. (1991) Type-specific regulation of adenylyl cyclase by G protein βγ subunits. Science 254:1500-1503.

3. Tang, W.-J. and Gilman, A.G. (1995) Forskolin and $G_{s\alpha}$ sensitive soluble adenylyl cyclase. Science 268:1769-1772.

4. Drum, C.L., Yan, S.-Z., Bard, J., Shen, Y.-Q., Lu, D., Soelaiman, S., Grabarek, Z., Bohm, A., and Tang, W.-J. (2002) Structural basis for the activation of anthrax adenylyl cyclase exotoxin by calmodulin, Nature 415:396-402.

5. Shen, Y.-Q., Lee, Y.-S., Soelaiman, S., Bergson, P., Lu, D., Chen, A., Beckingham, K., Grabarek, Z., Mrksich, M., Tang, W.-J. (2002) Physiological calcium concentrations regulate calmodulin binding and catalysis of adenylyl cyclase exotoxins. EMBO J. 21: 6721-6732.

6. Shen, Y.-Q., Zhukovskaya, N.L., Zimmer, M.I., Soelaiman, S., Wang, C.R., Gibbs, C.S., Tang, W.-J. (2004) Selective inhibition of anthrax edema factor by adefovir: a prototype for adjunctive therapy and probe of anthrax pathogenesis. Proc. Natl. Acad. Sci. USA 101:3242-3247.

7. Lee, Y.-S., Bergson, P., He, W.-S., Mrksich, M., Tang, W.-J. (2004) Discovery of a small molecule that inhibits the interaction of anthrax edema factor with its cellular activator, calmodulin. Chem. & Biol. 11:1139-46.

8. Shen, Y., Zhukovskaya, N.L., Guo, Q., Florián, J., and Tang, W.-J. (2005) Calcium-independent calmodulin binding and two-metal-ion catalytic mechanism of anthrax edema factor. EMBO J. 24:929-941.

9. Guo, Q., Shen, Y., Lee, Y.-S., Gibbs, C.S., Mrksich, M., and Tang, W.-J. (2005) Structural basis for the interaction of adenylyl cyclase toxin of *Bordetella pertussis* with calmodulin. EMBO J. 24:3190-3201.

10. Shen, Y., Joachimiak, A., Rosner, M.R., and Tang, W.-J. (2006) Structures of human insulin degrading enzyme reveal a new substrate recognition mechanism. Nature 443:870-874.

11. Im, H., Manolopoulou, M., Malito, E., Shen, Y., Zhao, J., Neant-Fery, M., Sun, C.-Y., Meredith, S.C., Sisodia, S.S., Leissring, M., and Tang, W.-J. (2007) Structure of substrate-free human insulin degrading enzyme (IDE) and biophysical analysis of ATP-induced conformational switch of IDE. J.

Biol. Chem. 282:25453-63.

12. Malito, E., Hulse, R.E., and Tang, W.-J. (2008) Amyloid-β degrading cryptidase: insulin degrading enzyme, presequence peptidase, and neprilysin. CMLS 65:2574-85. (PMC2756532)

13. Malito, E., Ralat, L.A. Manolopoulou, M., Tsay, J.L., Wadlington, N.L. and Tang, W.-J. (2008) Molecular Bases for the recognition of short peptide substrates and cysteine-directed modifications of human insulin-degrading enzyme. Biochemistry 47:12822-12834. (PMC2652632)

14. Manolopoulou, M., Guo, Q., Malito, E. Schilling, A, and Tang, W.J. (2009) Molecular basis of catalytic chamber-assisted unfolding and cleavage of human insulin by human insulin degrading enzyme. J. Biol. Chem. 284:14177-88. (PMC2682866).

15. Ren, M., Guo, Q., Guo, L., Lenz, M., Qian, F., Koenen, R.R., Xu, H., Schilling, A.B., Weber, C., Ye, R.D., Dinner, A.R., and Tang, W.-J. (2010) Polymerization of MIP-1 chemokine (CCL-3 and CCL-4) and clearance of MIP-1 by insulin degrading enzyme. EMBO J. 29:3952-3966.

Technical Session D2-W2-T1: Medicine/ Public Health/ Biotechnology/ Bioinformatics

"How to Activate Cell-surface Receptors: RTKs and Neuronal Receptors"

Professor Xiaolin He
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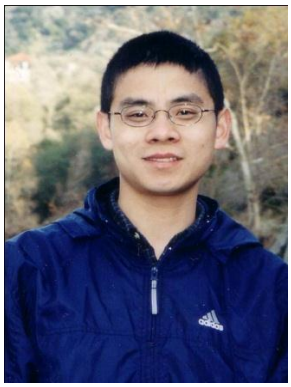
(西北大学何小林教授)

Abstract

The transmembrane receptors serve to translate extracellular signals into intracellular signals. The extracellular ligands are recognized by the receptors, and induce a change in oligomerization state, or a change in three-dimensional conformation, or a combination of both, of the receptors. These changes are the means to mediate signal transduction across the plasma membrane, and have been major targets in therapeutic development against cancer, and immune and neurological diseases. We will discuss a few ligand-receptor systems well know in tumorigenesis and the patterning of the neural system, in particular the class III receptors tyrosine kinases (RTKs) and the Plexin family of axon guidance receptors. Class III, or the PDGFR family of, receptor tyrosine kinases (RTKs), including KIT, FMS, FLT3, PDGFR-alpha, and PDGFR-beta, are highly pursued cancer targets. We will discuss the specific geometry, diverse recognition schemes, and regulation of this prototypic group of RTKs. The signaling of Semaphorins, through the Plexin receptors and the Neuropilin coreceptors, is important in angiogenesis (normal and cancer-related) and axon guidance as in the vascular and neural systems. We will discuss the architecture of the Semaphorin-Plexin complex, and how repulsive signaling is initiated upon the reception of Semaphorin by Plexins.

Biography



Xiaolin He is born in Hubei Province, China in 1973. He received a BS degree (1995) from Peking University (Beijing University), Beijing, China, where he studied radiochemistry at the Department of Technical Physics, and a PhD degree in molecular biology (2000) from Institute of Biophysics, Chinese Academy of Sciences at Beijing, China.

He completed a one-year military service at the Xinyang Army Academy (1990-1991), and completed a Dean's fellowship and a Fritz Krauth Fellowship at Stanford University in K. Christopher Garcia's lab at the Departments of Microbiology and Immunology, and Structural Biology (2000-2005). Currently he is an assistant professor of molecular pharmacology and biological chemistry at Northwestern University's Feinberg School of Medicine, and a member of the Robert H. Lurie Comprehensive Cancer Center, at Chicago, Illinois, USA. His research has been focused on the structural biology of cell-surface receptors relevant to cancer or neural development.

Dr. He is a member of the American Society of Biochemistry and Molecular Biology. He has won the Atorvastatin Research Award by Pfizer, Inc. He has also been awarded of the Special Prize of Presidential Scholarship from Chinese Academy of Sciences.

Technical Session D2-W2-T1: Medicine/ Public Health/ Biotechnology/ Bioinformatics

"Mechanism for the Assembly of Co-transcriptional RNA Capping Complex"

Professor Jianhua Fu
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(威斯康星医科大学大学生物化学系傅建华教授)

Abstract

The processing of RNA transcripts synthesized by RNA polymerase II (Pol II) occurs cotranscriptionally. To accomplish the first step of processing—5'-capping of nascent transcripts—RNA capping enzyme (CE) is recruited specifically to Pol II transcription sites to attain efficiency and specificity, and this recruitment is temporally coincident with the transition of Pol II from initiation into elongation. The common model to explain this specific recruitment to Pol II as opposed to the homologous Pol I and Pol III has rested on the interaction between CE and the phosphorylated C-terminal domain (CTD) of Pol II largest subunit Rpb1, and more specifically between the CE nucleotidyl-transferase (NT) domain and the phosphorylated CTD (CTD-P). Through biochemical and diffraction analyses, we demonstrate the existence of a distinctive stoichiometric complex between CE and the phosphorylated Pol II (Pol IIO). Analysis of this complex revealed an additional and unexpected Polymerase-CE Interface (PCI) located on the multi-helical Foot domain of Rpb1. We have named this interface PCI1 and the previously known NT/CTD-P interface PCI2. While PCI1 and PCI2 individually contribute to weak interactions with CE, a dramatically stabilized and stoichiometric complex is formed when PCI1 and PCI2 are combined *in cis* as they occur in an intact Pol IIO molecule. Disrupting either PCI1 or PCI2 by alanine-substitution or deletion diminishes CE association with Pol II and causes severe growth defects *in vivo*. Evidence from manipulating PCI1 indicates that the Foot domain contributes to the specificity in CE interaction with Pol II as opposed to Pol I and Pol III. Our results indicate that the dual interface based on combining PCI1 and PCI2 is required for directing CE to Pol II elongation complexes. Moreover, our results suggest for the first time that a Pol II-associated factor binds a specific segment of 2-3 heptads (PCI2) within the length of CTD and forms a functional bridge between the unstructured CTD and the Pol II globular core. This spatially defined mode of CTD function contrasts the commonly held view that

processing factors access the CTD indiscriminately along its linear length. We discuss the mechanistic nature of this interaction and functional implications of this mechanism for the regulation of Pol II early elongation.

Biography

Born in Shanghai, China. Jianhua Fu received his education from Fudan University in Shanghai and graduated in 1983 with a B.S. degree in biophysics. He moved on to conduct research for four years in Shanghai Institute of Biochemistry, Academia Sinica in the field of structural biology. He furthered his training in the united states and earned a Ph.D. degree in protein crystallography from University of Pittsburgh, in Pittsburgh, Pennsylvania.

He performed research as a postdoctoral fellow at Stanford University School of Medicine, where he solved the key crystallographic problem for RNA polymerase II structure in the laboratory of Roger D. Kornberg (Fu et al., 1999, http://www.ncbi.nlm.nih.gov/pubmed/10499797). He has since served as a faculty member first at Cornell University (Ithaca, NY) and now at Medical College of Wisconsin (Milwaukee, WI).

Dr. Fu is a member of the American Crystallographic Association (ACA). His lab has published on methods related to the structural determination of large multi-protein complexes, and most recently, on the structural and biochemical characterization of the complex between Pol II and RNA capping enzyme (Suh et al., 2010, http://www.ncbi.nlm.nih.gov/pubmed/20720002). Dr. Fu has served on various university committees and as advisors to undergraduate and graduate students. Dr. Fu also serves as a peer reviewer for the journals *Structure*, *Proteins*, *Protein Sciences*, *PNAS*, *Molecular Cell* and *Genes & Dev.*, a panelist for the NIH study section Molecular Genetics-A (MGA), and a standing reviewer of research proposals for synchrotron X-ray beam-time usage at MacCHESS (Cornell Univ., US) and APS (Advanced Photon Source, Argonne National Lab, US).

Technical Session D2-W2-T1: Medicine/ Public Health/ Biotechnology/ Bioinformatics

"Experimental Models for Androgen Receptor Functions: Tools for Studying Androgens-related Disorders in Human"

Professor Hong-Yo Kang
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Chang Gung University
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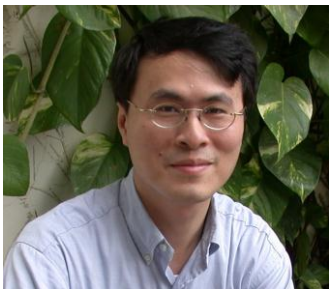
Email: hkang3@mail.cgu.edu.tw
(長庚大學臨床醫學研究所康宏佑教授)

Abstract

Steroidal androgens, mainly testosterone and its derivatives, have been used clinically as replacement therapies for androgen deficiency, including osteoporosis, frailty, and sexual dysfunction in both men and women. Antiandrogens are used to counteract the undesirable actions of excessive androgens (e.g. to treat acne, hirsutism, male-pattern baldness, and androgen-dependent prostate cancer). Androgens exert their biological activities through binding to the androgen receptor (AR). The AR belongs to the nuclear receptor superfamily and acts as a ligand-inducible transcriptional factor. AR dysfunction causes a diverse range of clinical conditions, such as testicular femalization (Tfm) syndrome, prostate cancer, and spinal and bulbar muscular atrophy (SBMA). However, the molecular basis of the AR function underlying these AR-related disorders remains largely unknown due to the limitation of stable genetic models. Here we review recent results of our studies into genetic models of the loss of AR function in mice and the gain of AR function in stem cells.

Biography



Hong-Yo Kang received his B.S. (1991) in Pharmacy and M.S. (1993) in Microbiology from the National Taiwan University. He received his Ph.D. (1999) from the University of Wisconsin, Madison in Endocrinology and Reproductive Physiology, and was a postdoctoral fellow at the University of Rochester till 2000.

He is currently a Professor of the Graduate Institute of Clinical Medical Sciences, Chang Gung University and the Director of the Center for Menopausal and Reproductive Research, Chang Gung Memorial Hospital at Kaohsiung Medical Center. He also serves as an Adjunct Professor in the Department of Biological Sciences, National Sun Yat-Sen University in Taiwan. He has conducted many medical research projects in several major human diseases such as infertility, menopause, osteoporosis, rheumatoid arthritis, prostate cancer and androgenic alopecia by analyzing human sample biopsies. His primary research interests are focusing on studying the roles of sex steroid hormones such as androgens and gonadal peptide hormones such as activins in both normal and abnormal development of reproductive organs, bone and cancer by combining molecular biology and genomics tools with animal models and advanced *in vivo* imaging technologies. He has published more than forty (40) papers with seventy five (75) papers presented at conferences and symposia. He has also served as the primary investigator (PI) of seven (7) research grants and Co-PI of more than thirty (30) funded research projects over 2.0 million US dollars in Taiwan for the past three years.

Dr. Kang's exceptional achievements have been recognized by many prestigious awards in the world, including the 84th Endocrine Society Young Investigator Award (2002), the Young Investigator Award for 11th International Congress on Hormone steroids and 7th International Congress on Hormones and Cancer (2002), the Young Investigator Award for 1st joint meeting of the International Bone and Mineral Society and Japanese Society for Bone and Mineral Research (2003), the Young Scientist Award for 2nd Scientific Meeting of the Asia Pacific Menopause Federation (2004) and the Young Investigator Award for International Osteoporosis Foundation of World Congress on Osteoporosis (2006).

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

Chair
Professor Ching-Fuh Lin (林清富),
Graduate Institute of Photonics and Optoelectronics and Department of Electrical Engineering,
National Taiwan University

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 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 single-crystal Si thin-film solar cells, organic-inorganic composite thin-film solar cells and optoelectronic devices, Si-based photonics, and physics in broadband semiconductor lasers and optical amplifiers.

He is currently 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 300 conference papers and hold over 30 patents. He had obtained the Distinguished Research Award and 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 and many other awards, including 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.

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

"Vapor-Based Reactive Polymer Coatings: Surface Engineering Tools for Biotechnology"

Professor Hsien-Yeh Chen
Department of Chemical Engineering
National Taiwan University
No.1, Sec. 4 Roosevelt Rd. Taipei 106, Taiwan
Tel: +886-2-33669476, Fax: +886-2-23623040
Email: hsychen@ntu.edu.tw
(台灣大學化學工程學系陳賢燁教授)

Abstract

Functionalized poly(*p*-xylylenes) constitute an versatile class of *Reactive Polymers* that can be prepared in a solventless process via chemical vapor deposition (CVD) polymerization. The resulting ultra-thin coatings are typically pinhole-free and can be conformally deposited to a wide range of substrates and materials. More importantly, the equipped functional groups can serve as anchoring sites for tailoring surface properties. These *Reactive polymers* provide a technology platform that creates active, long-term control and may lead to improved mimicry of biological systems for effective bio-functional modifications. I herein will outline our recent works of using these reactive polymers as tools to deal with sophisticated surface engineering problems including precisely-controlled surface chemistries, e.g. using alkyne-functionalized coatings for Huisgen 1,3-dipolar cycloaddition reactions, non-fouling modifications and controlled cell adhesion, surface modifications within confined microgeometries, e.g. microfluidic devices, patchy-surface/micro- and nano-patterning on 2-D and 3-D surfaces.

Biography

Dr. Hsien-Yeh Chen is a now an assistant professor in Chemical Engineering Department at NTU. Before joining NTU, he was a research scientist from August 2009 to July 2010 in Institute of Functional Interfaces (IFG) at Karlsruhe Institute of Technology (KIT) in Germany. He also worked for AST Products, Inc. from February 2008 to July 2009 as a senior scientist in developing functional medical coatings. Dr. Chen received a B.S degree in Chemical Engineering from NTU in 1999, a M.S. degree in Chemical Engineering from University of Michigan in 2004, and a Ph.D. degree in Chemical Engineering from University of Michigan in 2007. His research is about surface modification technology for biomedical applications, which he uses advanced polymer coatings for the engineering of biointerfaces between man-made biomaterials and biological environments and to tailor surface properties for desired functions.

The first paragraph may choose to contain a place and/or date of birth (list place, then date). Next, the author's educational background is listed. The degrees should be listed with type of degree in what field, which institution, city, state or country, and year degree was earned. The author's major field of study should be lowercased.

The second paragraph uses the pronoun of the person (he or she) and not the author's last name. It lists military and work experience, including summer and fellowship jobs. Job titles are capitalized. The current job must have a location; previous positions may be listed without one. Information concerning previous publications may be included. Try not to list more than three books or published articles. The format for listing publishers of a book within the biography is: title of book (city, state: publisher name, year) similar to a reference. Current and previous research interests end the paragraph.

The third paragraph begins with the author's title and last name (e.g., Dr. Smith, Prof. Jones, Mr. Kajor, Ms. Hunter). List any memberships in professional societies. Finally, list any awards, work, service, and publications. If a photograph is provided, the biography will be indented around it. The photograph is placed at the top left of the biography. Personal hobbies will be deleted from the biography.

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

"Nanostructured Materials: From Lotus Leaf to Phase Change Process"

Professor Yen-Wen Lu
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Abstract

One of the most significant influences of the micro- and nano-technology is utilizing tiny objects to create perturbations, which later magnify into critical differences in macro world. Our research work employs dominant phenomena in micro scale — surface tension — for various applications. The effort starts with emulating the nature as a guide to control surface properties. In nature, lotus leaf, due to its two-tiered surface structures -microscopic bumps and hair-like nanostructures, which trap air and create nano air cavities akin to nanostructures, has an unusual dirt-repelling and self-cleaning ability. We develop technologies to employ this unique capability, and apply it for biological applications.
The utilization of nanostructures is also extended on the applications to study the evaporation and boiling phenomena – both are critical and common-seen phase change processes in many heat transfer applications – on topologically different nano-surfaces. The issues related to performance, ease of fabrication and durability (whenever available) are discussed and recommendations are made for future research in these emerging areas.

Biography

Yen-Wen Lu received his Ph.D. in Mechanical and Aerospace Engineering from the University of California, Los Angeles (UCLA) in 2004. He received an M.S. from the University of Michigan and a B.S. from the National Taiwan University. He was in Mechanical and Aerospace Engineering Department and Institute for Advanced Materials, Devices, and Nanotechnology (IAMDN) at Rutgers University and Microsystems Engineering Doctoral Program at Rochester Institute of Technology. He is currently with National Taiwan University. He has received several awards, including FEAD Faculty Award, and Texas Instrument/Harvey Award. His research projects have been supported by federal agency and industrial company in the United States and Taiwan; they include biosensor, nanostructured material, optical device and microsurgical tool development. His research interests focus the design, fabrication, and system integration in MEMS and nanotechnology.

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

"High Pressure, High Temperature Route to Diamond Aerogel"

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Abstract

Amorphous carbon aerogels have attracted much interest in recent years due to their low density, large intrinsic surface areas (>1000 m^2/g), large pore volume, low dielectric constant, and high strength. High-pressure (~20 GPa) laser-heating (>1500°C) within a diamond anvil cell (DAC) is used to convert the amorphous network of a low-density (40 mg/cc) carbon aerogel into a nanocrystalline diamond aerogel. Optical microscopy shows that the newly formed diamond aerogel material is optically transparent while unheated carbon aerogel precursors remain opaque. Raman spectroscopy is used to provide evidence for a newly formed diamond phase following laser heating in the DAC. Transmission electron microscopy is used to image the newly formed network of interconnected diamond grains. Photoluminescence spectroscopy and confocal time-correlated single-photon counting indicate the recovered material contains negatively-charged nitrogen-vacancy (NV^-) point defects. Synchrotron scanning transmission x-ray microscopy (STXM) is used to compare the carbon electronic density-of-states of the amorphous starting material with the recovered diamond aerogel with ~100 meV energy resolution. The method is general and can be extended to produce unexplored crystalline aerogel materials.

Biography

Peter Pauzauskie was born in Anchorage, Alaska in 1979. Pauzauskie attended Kansas State University in Manhattan, KS and attained B.S. degrees in chemical engineering, mathematics, and chemistry in 2002 and continued his studies at the University of California, Berkeley where he earned a Ph.D. degree in physical chemistry in 2007 focused on the synthesis, characterization, and optoelectronic assembly of solid-state nanowires.

He accepted a post-doc offer for the E.O. Lawrence post-doctoral fellowship at the Lawrence Livermore National Laboratory in 2007 where he conducted independent research on high-pressure, high-temperature phase transitions in amorphous aerogels. In 2010 he accepted an offer from the department of Materials Science & Engineering at the University of Washington. Current efforts in his research group are focused on the synthesis and characterization of nanoscale optoelectronic materials for optomechanics.

Prof. Pauzauskie is a member of the MRS and ACS. He has been awarded the Barry M. Goldwater scholarship, the National Science Foundation graduate research fellowship, as well as the MRS graduate student gold award.

Technical Session D2-W4-T1: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

Chair
Professor Li-Chun Wang (王蒞君)
Department of Electrical Engineering,
National Chiao-Tung University

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

Technical Session D2-W4-T1: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

"Hybrid Cloud and Iterative MapReduce for Scalable Data Intensive Applications"

Professor Judy Qiu
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Abstract

Clouds and MapReduce have shown themselves to be a broadly useful approach to scientific computing especially for parallel data intensive applications. However they have limited applicability to some areas such as data mining because MapReduce has poor performance on problems with an iterative structure present in the linear algebra that underlies much data analysis. Such problems can be run efficiently on clusters using MPI leading to a hybrid cloud and cluster environment. This motivates the design and implementation of an open source Iterative MapReduce system Twister. Comparisons of Amazon, Azure, and traditional Linux and Windows environments on common applications have shown encouraging performance and usability comparisons in several important non iterative cases. These are linked to MPI applications for final stages of the data analysis. Further we have released the open source Twister Iterative MapReduce and benchmarked it against basic MapReduce (Hadoop) and MPI in information retrieval and life sciences applications. We show our preliminary results of Mapreduce4Azure as the first MapReduce on Microsoft Azure Cloud Platform. The hybrid cloud (MapReduce) and cluster (MPI) approach offers an attractive production environment while Twister promises a uniform programming environment for many life sciences applications.

Biography

Dr. Judy Qiu graduated from Syracuse University with an Outstanding Graduate Student Award, completing her Ph.D. in Computer Science. Her areas of study include parallel and distributed systems, Cloud/Grid computing and high performance computing.

She started the multicore project with Microsoft, Inc. in 2006 and initial Post Doctoral work focusing on performance of threading versus MPI in both kernels and data mining application. This research effort has evolved into the current SALSA project (http://salsahpc.indiana.edu/) encompassing data-intensive computing at the intersection of Cloud and multicore technologies. Her research interests involve the architecture and use of leading-edge technologies, with special emphasis on their value to important applications such as life science applications and data intensive technologies using Dryad and Hadoop. An extended research beyond MapReduce is to support iterative algorithms in data mining and machine learning and we have released both Java and Azure versions of Twister iterative MapReduce system. She is a major contributor for Distributed and Cloud Computing, a new book from Morgan Kaufmann Publishers, ISBN: 978-0-12-385880-1, September 2011.

Prof. Qiu is an Assistant Director of Digital Science Center of Indiana University. She leads the SALSA research team and supervises research activities of both professional staff and PhD students from the IU School of Informatics and Computing. Prof. Qiu is also active in program service and supporting diversity in computing, which include serving as a Program Co-Chair of the 2nd IEEE International Conference of Cloud Computing Technology and Science 2010 and on editorial board of International Journal of Cloud Computing.

Technical Session D2-W4-T1: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

"The Security Issues of a XBRL Demo Site"

Professor Deron Liang
Director, Software Research Center
Department of Computer Science & Information Engineering
National Central University
(中央大學資訊工程系教授兼軟體研究中心主任梁德容教授)

Abstract

Recently, the smartphone has become a widely used handheld device for entertainments and commercial activities in daily life. However, currently, the smartphone has no transparent and continuous authentication mechanisms to improve the security level especially on commercial applications. In this paper, we consider a XBRL (Extensible Business Reporting Language) demo site that is deployed by the Taiwan Stock Exchange Company (TSEC) for public demonstration. The purpose of this deployment is to promote the public awareness of the XBRL technology with which public investors are able to acquire, store, and analyze the certified financial statements of companies listed in all stock exchanges around the world on a single information platform. An information platform in this scale faces system security challenges in all aspects. In this paper, a non-intrusive and continuous approach for authenticating the smartphone user is proposed. The proposed approach uses the orientation sensor, which is a built-in device of a smartphone, to perceive the way of a user for holding the smartphone for biometrics. To test the proposed approach, we have developed an application that emulates two general functions of a smartphone, namely, the address book and the gallery, to collect orientation-sensor-based biometrics. Our empirical results for eleven participants show that the proposed approach has a false positive rate of 16% and a false negative rate of 15%. Therefore, the orientation-sensor-based feature may be used as a part for user verification.

Biography

Deron Liang -2003

Deron Liang received a BS degree in electrical engineering from National Taiwan University in 1983, and an MS and a Ph.D. in computer science from the University of Maryland at College Park in 1991 and 1992 respectively. He is on the faculty of Computer Science Department, National Taiwan Ocean University, Taiwan since 2001. He also holds joint appointment with the Institute of Information Science (IIS), Academia Sinica, Taipei, Taiwan, Republic of China. He was with IIS from 1993 till 2001. Dr. Liang's current research interests are in the areas of software fault-tolerance, system security, and system reliability analysis. Dr. Liang is a member of ACM and IEEE.

Deron Liang -2011

Deron Liang received a BS degree in electrical engineering from National Taiwan University in 1983, and an MS and a Ph.D. in computer science from the University of Maryland at College Park in 1991 and 1992 respectively. He is on the faculty of the Department of Computer Science and Information Engineering, National Central University, Taiwan since 2008. He served as the director of Software Research Center from 2008 to 2011. He was on the faculty of Computer Science Department, National Taiwan Ocean University, Taiwan from 2001 to 2008, and was with the Institute of Information Science (IIS), Academia Sinica, Taipei, Taiwan, Republic of China from 1993 till 2001. Dr. Liang's current research interests are in the areas of computer system security, software fault-tolerance, and system reliability analysis. Dr. Liang is a member of ACM and IEEE.

Technical Session D2-W4-T1: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

"Characterizing Hacker Behavior for Cyber Situation Awareness"

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Abstract

Previous works in the area of computer network security have emphasized the creation of Intrusion Detection Systems (IDSs) to flag malicious network traffic and computer usage. Raw IDS data may be correlated and form attack tracks, each of which consists of an ordered collection of alerts belonging to a single hypothesized attack. Assessing an attack track in its early stage may reveal the attacker's capability and behavior trends, leading to projections of future intrusion activities. Behavior trends were captured via Variable Length Markov Models (VLMM) without predetermined attack plans. A virtual terrain schema was developed to model network and system configurations, to estimate critical elements and vulnerabilities exposed to each attacker given his/her progress as well as the effect of cyber attacks. In addition, clustering-based analysis enables the differentiation of attack types and discovery of potentially collaborative attack patterns from the Internet. This talk will discuss this set of research work that aims at characterizing cyber attack behavior for enhancing cyber situation awareness.

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 in the Department of Computer Engineering at Rochester Institute of Technology in Rochester NY, USA, and has been appointed as the department chair starting in fall 2011. 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.

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

Chair
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Biography

Present Position:
Distinguished Professor and Head, Department of Mechanical Engineering,
Vice Director (Education/Research),
Research Center for Energy Technology & Strategy,
National Cheng Kung University,

Education:
9/84 – 6/87 Northwestern University, Evanston, Illinois, USA; Ph.D. in Mechanical Engineering.
9/82 – 8/84 Northwestern University, Evanston, Illinois, USA; M.S. in Mechanical Engineering.
9/75 – 7/79 National Cheng Kung University, Taiwan, ROC; B.S. in Mechanical Engineering.

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

"Microbial Syntrophy in Methanogenic Treatment Processes"

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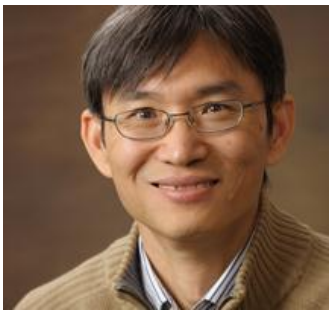
(伊利諾大學香檳校區土木及環境工程學系劉文佐教授)

Abstract

Due to the needs in developing sustainable energy, anaerobic treatment processes that can produce methane have received increasing attentions. In these methanogenic treatment processes, organic matters are converted into mostly methane as a biogas through microbial syntrophy between fermentative bacteria and methane-producing archaea. The instability of this microbial interaction can lead to the failure of the processes. To illustrate the importance of microbial syntrophy, a methanogenic reactor degrading terephthalate (TA), one of the top 50 chemicals produced worldwide, is used as an example in my presentation. TA production can result in a TA-containing wastewater that is treated by anaerobic processes through a poorly understood methanogenic syntrophy. Using metagenomics, the methanogenic consortium inside the TA-degrading bioreactor was characterized. The results successfully identified genes belonging to dominant *Pelotomaculum* species presumably involved in TA degradation through decarboxylation, dearomatization, and modified β-oxidation to H_2/CO_2 and acetate. These intermediates are converted to CH_4/CO_2 by three novel hyper-mesophilic methanogens. Additional secondary syntrophic interactions were predicted in other microbial populations. These observations suggest that the TA-degrading consortium consists of additional syntrophic interactions beyond the standard H_2-producing syntroph – methanogen partnership that may serve to improve community stability.

Biography



Professor LIU Wen-Tso is a faculty member at the Department of Civil and Engineering at the University of Illinois at Urbana-Champaign (UIUC). He has received PhD degree from University of Tokyo in 1995. Before joining UIUC in 2008, he worked as a researcher fellow at NSF-Center for Microbial Ecology (Michigan State University) and Northwestern University, and as a faculty member at National Central University, Taiwan (1998-2001) and National University of Singapore (2001-2008).

His research interests and efforts focus on the microbial ecology and molecular microbiology aspects of water and wastewater treatment processes. This is based on the facts that the microorganisms are the key catalyst for wastewater treatment, and the primary causative agents for the failure of water purification systems and the occurrences of infectious diseases. To better design, improve and optimize treatment processes in the long run, he collaborates with process-based researchers to study water and wastewater treatment processes with emphases on microbial diversity, community structure, function and interaction. It is reasonable to assume that those microbial populations in treatment process will need to closely interact with each other through special and sometimes yet-to-be-discovered physical, chemical and biological means, forming a structured microbial community. This microbial community serves a basic element to achieve desired and possibly collective microbial functions or process performance.

Professor Liu has served as a member of the editorial board for several leading journals in Environmental Microbiology (e.g., App*lied Environmental Microbiology*, *Microbial Ecology,* and the *ISME* journal by Nature publisher), and has contributed as a reviewer for more than 15 leading journals. He also served as the sectary for IWA technical group in Activated Sludge Population Dynamics. He has received the Asian Young Biotechnologist Prize (2005) and National Science Council research award, Taiwan (2000).

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

"Colossal electrical conductivity of nano-scale YSZ thin films for SOFC"

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Abstract

Performance of the electrolype is a key issue of a successful solid oxide fuel cell (SOFC). Electrical conductivity of Yttria Stabilized Zirconia (YSZ) thin films deposited on various substrates at thickness of nanometer level was found significantly enhanced by employing semiconductive/conductive substrates. Previous evaluation methods on ionic conductivity of nano-scaled YSZ thin films were analyzed and compared in this report. An evaluation scheme for ionic conductivity of eletrolytes/substrates was proposed and employed for ionic conductivity of YSZ thin films in the present work. A limitting current measurement was carried out to preclude the contribution of electrons on conductivity at YSZ thin films. Existance of lateral interfacial conductance was re-evaluated and can be precluded. Our evidences show that the colossal electrical conductivity of YSZ thin films may be attributed to a field-induced catalytic behavior and the conductance of the substrates, indicating that evaluation of electrical conductivity of electrolytes is highly correlated with conductance of the substrates. Possibility of employing the YSZ thin films at an appropriate substrate for SOFC or other electro-chemical applications will be discussed.

Biography

Prof. Chen-Chia Chou was born in Hualien, Taiwan on Aug. 16, 1959, He was educated at Chiao-Tung University in Hsin-Chu, Taiwan for his Bachelor degree on mechanical engineering (1981) and Sun Yat-Sen University (Kaohsiung, Taiwan) for his Master's degree on materials science and engineering (1983). After two years military service in Army, he studied in the University of Illinois at Urbana-Champaign on materials science and engineering, working on transmission electron microscopy and spinglass behavior as well as phase transformation in materials.
He worked as a research assistant and on material processing for medium carbon steels in China Steel Corporation before his military service. He served as an officer in a transportation troop in the army. After he was conferred a Ph. D degree in 1990, He stayed in the University of Illinois at Urbana-Champaign for two years post-doctoral researches and then was appointed visiting assistant professor at the same University, where he studied phase transformation and properties of ferroelectrics. He obtained an associate professorship in the Department of Mechanical Engineering at National Taiwan University of Science and Technology in Taipei in 1992 and He became a Professor since 1999. His research interests were on phase transformation behavior and properties of ferroelectric/ferroelastic materials and their applications. He used laser and microwave as well as wet chemical techniques to process materials. Currently, his research interests include microwave-communication dielectrics, ultrasonic actuator and system, oxygen sensors and solid oxide fuel cells.

Prof. Chou was a member in American Ceramic Society, Materials Research Society, and he is currently a member of Chinese Ceramic society and Materials Research Society of Taiwan. He has published more than a hundred journal papers.

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

"Quantum Research on Biofuel Cells, Bio Solar Cells and OLEDs"

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Abstract

To reduce the greenhouse gas effect, two emerging techniques are proposed. The first one is the solar cell which coverts the solar energy into electricity. Fuel cells are the other more practical technology which transforms the chemical energy into the electric energy. Both are green technologies, however, the fuel cell is independent of the weather condition and is able to produce power at any time any place, provided that the fuel is available. Biological materials are normally abundant and cheap in our living environment. Biofuel cells have the advantage to operate in a living system, because they are operable in a neutral environment and easy to miniaturization. Bio solar cells use biological pigments, extracted from plants, as the sensitizers which are cheaper and controllable in band gaps. This speech mainly focuses on the computational quantum mechanics research on biofuel cells and bio solar cells. In addition, organic light emitting diodes (OLEDs) using Alq3 and Gaq3 as the emitting layer are also introduced.

Biography

Prof. Che-Wun Hong was born in Kaohsiung city, Taiwan on March 15th, 1956. He received bachelor degree in Mechanical Engineering from National Cheng-Kung University in 1978. After graduation from the university, he served in the army as an armored vehicle officer (1978~1980), then worked as a mechanical engineer in the Ford Motor Company (1980~1981), and then transferred to the Industrial Technology Research Institute (ITRI) as an engine researcher (1981~1982). In the fall of 1982, after saving enough money, he went to United Kingdom to study higher degrees. He received his MSc degree from the UMIST (Manchester, UK) in 1983 and a PhD degree from the Imperial College (London, UK) in 1987, all majored in Mechanical Engineering.

In 8/1987, he returned to Taiwan and joined the Department of Power Mechanical Engineering of National Tsing Hua University as an associate professor. He was promoted to full professor in 1997. Being a faculty member for 24 years, his research area ranges from internal combustion engines, turbochargers to the automotive engineering; and then he switched to the green power engineering at the millennium. His current research focuses on the fuel cells, solar cells, LEDs, lithium-ion batteries, ultra-capacitors and thermoelectric chips by means of the academic fundamentals, such as: quantum mechanics, molecular dynamics, Boltzmann modeling, computational fluid dynamics and control system dynamics. He has published more than 200 technical papers, including archived journals, proceedings of national and international conferences and technical reports; also he has registered for two patents in Taiwan and USA.

Technical Session D2-W2-T2: Medicine/ Public Health/ Biotechnology/ Bioinformatics

Chair
Professor Hong-Yo Kang (康宏佑)
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Biography

Hong-Yo Kang received his B.S. (1991) in Pharmacy and M.S. (1993) in Microbiology from the National Taiwan University. He received his Ph.D. (1999) from the University of Wisconsin, Madison in Endocrinology and Reproductive Physiology, and was a postdoctoral fellow at the University of Rochester till 2000. He is currently a Professor of the Graduate Institute of Clinical Medical Sciences, Chang Gung University and the Director of the Center for Menopausal and Reproductive Research, Chang Gung Memorial Hospital at Kaohsiung Medical Center. He also serves as an Adjunct Professor in the Department of Biological Sciences, National Sun Yat-Sen University in Taiwan. He has conducted many medical research projects in several major human diseases such as infertility, menopause, osteoporosis, rheumatoid arthritis, prostate cancer and androgenic alopecia by analyzing human sample biopsies. His primary research interests are focusing on studying the roles of sex steroid hormones such as androgens and gonadal peptide hormones such as activins in both normal and abnormal development of reproductive organs, bone and cancer by combining molecular biology and genomics tools with animal models and advanced *in vivo* imaging technologies. He has published more than forty (40) papers with seventy five (75) papers presented at conferences and symposia. He has also served as the primary investigator (PI) of seven (7) research grants and Co-PI of more than thirty (30) funded research projects over 2.0 million US dollars in Taiwan for the past three years._Dr. Kang's exceptional achievements have been recognized by many prestigious awards in the world, including the 84th Endocrine Society Young Investigator Award (2002), the Young Investigator Award for 11th International Congress on Hormone steroids and 7th International Congress on Hormones and Cancer (2002), the Young Investigator Award for 1st joint meeting of the International Bone and Mineral Society and Japanese Society for Bone

and Mineral Research (2003), the Young Scientist Award for 2nd Scientific Meeting of the Asia Pacific Menopause Federation (2004) and the Young Investigator Award for International Osteoporosis Foundation of World Congress on Osteoporosis (2006).

Technical Session D2-W2-T2: Medicine/ Public Health/ Biotechnology/ Bioinformatics

"Intestine Lipid Metabolism and Energy Balance"

Professor C-L. Eric Yen
Department of Nutritional Sciences
University of Wisconsin at Madison
(威斯康辛大學顏齊良教授)

Abstract

Triacylglycerols, the bulk of dietary fat, are condensed metabolic fuels and can be readily stored as body fat. Compared to other energy-yielding nutrients, triacylglycerols exert a lower thermic effect of food (also known as diet-induced thermogenesis), the obligatory energy cost for digestion, absorption, and other metabolic activities needed for the assimilation of nutrients. The absorption of dietary fat involves the re-synthesis of digested triacylglycerol in enterocytes, mainly through a pathway catalyzed by the acyl CoA: monoacylglycerol acyltransferase (MGAT) 2. In mice, MGAT2 is highly expressed only in the intestine. Consistent with a role of MGAT2 in promoting conservation of dietary fat, mice lacking the enzyme are resistant to obesity and other metabolic disorders induced by high-fat feeding. This presentation will discuss our recent findings, supporting the concept that MGAT2 normally reduces diet-induced thermogenesis, enhances metabolic efficiency, and favors positive energy balance, surprisingly, even in the absence of dietary fat.

Biography

Eric Yen grew up in the intensely food-oriented culture of Taiwan, fascinated with the relationship between nutrition and health. After graduating from Taipei Medical College with a major in Nutrition and Health Sciences, he entered the graduate program in Nutritional Biochemistry at the University of North Carolina at Chapel Hill in 1995. Under the direction of Dr. Steven Zeisel, he studied how nutrient availability early in life modulates health in adulthood, using apoptosis induced by choline deficiency as a model. From that experience, he was exposed to the fields of phospholipid metabolism and lipid second messengers, including diacylglycerol. Encouraged by his graduate program director Dr. Rosalind Coleman, Eric joined the Gladstone Institutes in San Francisco to work on genes that code for enzymes catalyzing triacylglycerol synthesis in 2000. Under the mentorship of Dr. Bob Farese, Jr., he cloned and identified several human and mouse acyltransferases, including acyl CoA:monoacylglycerol acyltransferase (MGAT) 1 and 2, and he studied the physiological functions of these enzymes, using genetically modified mice. This line of investigation formed the basis for the ongoing studies of the research team Eric established in the Department of Nutritional Sciences at the University of Wisconsin-Madison in 2007. The main goal of the Yen Lab's research is to understand how intestinal lipid processing controls systemic lipid metabolism and energy balance. Current focus is on the role of MGAT2 in regulating nutrient assimilation and energy expenditure.

Technical Session D2-W2-T2: Medicine/ Public Health/ Biotechnology/ Bioinformatics

"Systems Biology in Translational Medicine Research"

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(陽明大學國際事務處國際合作組組長)

Abstract

In this post-genomic era it is clear that the sum of the cellular gene expression state determines the cellular phenotypes. The advance in genomics technology permits the recognition of disease-associated proteins or genomic traits that may serve as clinical markers or survival indexes. The challenge we now face is to keep up the bioinformatics analysis, to understand the genome blueprint, and to determine how errors lead to disease. Bearing these in mind, we developed bioinformatics pipelines and applied systems biology tools for deciphering transcriptome data generated by gene expression microarray and RNA-Seq technologies, as well as setup wetlab functional validation platforms. Novel diagnostic markers, prognosis markers and therapeutic targets for cancers are obtained, and some of the identified oncogenes or oncomiRs also play crucial roles in stem cell differentiation, consisting with the concept that cancer cells possess characters similar to normal stem cells, and the degree of cell dedifferentiation correlates with poor prognosis. Our current effort is to deduce the relationships between filtrated genes and tumor progression, stem cell differentiation, and to develop new drugs targeting mined oncogenes. Further challenge will be to apply cloud computing technologies to facilitate next-generation sequencing (NGS) data, as well as to further integrate NGS information with systems biology algorithms.

Biography

Dr. Hsei-Wei Wang (PhD in Virology & MSc in Bioinformatics) now is an Associate Professor, Director of the Division of International Collaboration, of the National Yang Ming University, and head of the Bio-Bank of the Taipei City Hospital, Taiwan. He got his BSc in Medical Technology and PhD in Oncogenic Virology at the Taiwan University. During his 4-year post-doc life at the University College London, he also got MSc in Bioinformatics from the Birckeck College, University of London, UK. During his stay in London he published papers in high-ranking journals such as *Nature Genetics, PNAS* and *EMBO J*. Current Dr. HW Wang's research focus on transcriptomes of tumor stem cells and normal stem cells. Dr. HW Wang applies genomics technologies, mainly transcriptome-based ones, for his translationlation research. The main goals are to discover novel cancer biomarkers and therapeutic targets from systems biology studies. His research results in Taiwan these years have also been published in high-ranking journals such as *Gastroenterology, Bioinformatics*, *Stem Cells* and *Blood*. Dr. HW Wang got the *Research Excellency* Reward from the National Yang-Ming University in 2006.

Technical Session D2-W2-T2: Medicine/ Public Health/ Biotechnology/ Bioinformatics

"Development of Novel Vaccines Against Tuberculosis"

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(西北大學醫學院王瓊如教授)

Abstract

Tuberculosis (TB) is one of the leading causes of mortality due to infection worldwide. In spite of this, an effective vaccine against *Mycobacterium tuberculosis* (Mtb), the causative agent of TB, is lacking. Studies in humans have shown that various lipid components of the mycobacterial cell wall can be recognized by a unique subset of unconventional T cells. However, the contribution of these T cells to immunity against Mtb is poorly understood due to the lack of a suitable animal model. My lab has developed several novel animal models both to characterize the immune responses mediated by these unconventional T cells during Mtb infection, and to test the ability of lipid vaccines to confer resistance to Mtb infection. Combinatorial vaccines that activate both conventional T cells as well as unconventional T cells are likely to be more effective than current subunit vaccines for tuberculosis.

Biography

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

Chair
Professor Shi-Chern Yen
Department of Chemical Engineering
National Taiwan University
(台灣大學化學工程學系顏溪成教授)

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

"Nanocrystal Solids: A Modular Approach to Materials Design"

Professor Dmitri Talapin
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Abstract

Colloidal nanocrystals can combine the advantages of inorganic semiconductors with size-tunable electronic structure and inexpensive solution-based device fabrication. Single- and multicomponent nanocrystal assemblies, also known as superlattices, provide a powerful general platform for designing two- and three-dimensional solids with tailored electronic, magnetic, and optical properties. Such assemblies built of "designer atoms" can be considered as a novel type of condensed matter, whose behavior depends both on the properties of the individual building blocks and on the interparticle exchange interactions. The ability to assemble precisely engineered nanoscale building blocks into complex structures is opening the door to materials where components and functionalities can be added, tuned or combined in a predictable manner. I will show how self-assembly of nanocrystals can lead to a palette of amazingly sophisticated structures including Archimedean tilings and dodecagonal quasicrystals.

Efficient charge transport is crucial for performance of all nanocrystal-based electronic and optoelectronic devices. The insulating nature of surface ligands traditionally used for nanocrystal synthesis results in the poor electronic coupling between individual nanocrystals. To facilitate charge transport in nanocrystal solids, we introduced the concept of inorganic ligands for colloidal nanocrystals. These ligands, namely metal chalcogenide complexes, can be applied to a broad range of inorganic nanomaterials. I will demonstrate the power of this approach on several examples of prospective electronic, thermoelectric and photovoltaic materials.

Biography

Dmitri Talapin is an Associate Professor in the Department of Chemistry at University of Chicago. His research interests revolve around colloidal inorganic nanomaterials, spanning from synthetic methodology to device fabrication, with the desire of turning colloidal nanostructures into competitive electronic materials. He received his doctorate degree from University of Hamburg, Germany in 2002 under supervision of Horst Weller. In 2003 he joined IBM Research Division at T. J. Watson Research Center as a postdoctoral fellow to work with Chris Murray on synthesis and self-assembly of semiconductor nanostructures. In 2005 he moved to Lawrence Berkeley National Laboratory as a staff scientist at the Molecular Foundry and finally joined faculty at the University of Chicago in 2007. Dr. Talapin recent recognitions include Materials Research Society Outstanding Young Investigator Award (2011), Camille Dreyfus Teacher Scholar Award (2010); David and Lucile Packard Fellowship in Science and Engineering (2009); NSF CAREER Award (2009) and Alfred P. Sloan Research Fellowship (2009).

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

"Inkjet-Printed Analytical Devices"

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Abstract

In this research, we developed a versatile and low-cost process to manufacture micro-analytical devices via inkjet printing method. A layer-by-layer printing strategy was used to manufacture micro-analytical devices to detect hydrogen peroxide produced by bio-chemical reactions, such as glucose oxidation, uricase oxidation and cholesterol oxidation. Carbon black was surface modified and suspended in aqueous solutions. The resulting carbon inks were printed on regular transparency films to fabricate a conductive layer for electrochemical measurements. Next, a mediator layer, which converted chemical reactions to electric signals, was manufactured by printing insoluble Prussian blue (PB) nanoparticles on top of the carbon electrodes. Effects of PB particle sizes on signal conversion were investigated by cyclic voltammetry. Enzymes, such as glucose oxydase, were printed above the PB layer and immobilized by conductive polymers for bio-chemical sensing. Scanning electron microscopy was used to examine the surface topology and grains packing in each layer. The devices were tested with standard analytical or bio-chemical protocols and showed reproducible detection signals. Detection limits of various devices were investigated and showed comparable results as those in the literature.

Biography

Ying-Chih Liao received bachelor degree in chemical engineering from National Taiwan University, Taipei, Taiwan in 1995. He obtained his PhD degree in 2004 under the guidance of Professors Elias Franses and Osman Basaran at Purdue University, West Lafayette, IN, USA. His doctoral dissertation was engaged in both fluid dynamics and interfacial adsorption to describe adsorption dynamics and hydrodynamics in aqueous surfactant solutions with free surface flow.

From 2004 to 2006, he worked as a postdoc researcher at University of Minnesota, where he was involved with surface modification of aerosolized silicon nanoparticles. In 2006, he joined Hewlett-Packard Company as a CFD Specialist working on inkjet device design and ink formulation. He then joined Department of Chemical Engineering at National Taiwan University as an assistant professor in 2009. His research interests involve printing technology, biosensors, and fluid mechanics.

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

"TEM Applications in the Data Storage Industry"

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Abstract

The digital data storage industry is extremely competitive where survival depends on the ability of producing ever cheaper, reliable, smaller in size and higher in capacity solutions for enterprise and consumers. In spite of the progress of solid state non volatile memory devices, the most common data storage are hard disc drives because they offer a well known technology that continues to improve capacity, now in the terabits, small form factor, reliability, speed and ever cheaper memory (now about 10 cents per gigabits). At the core of the competition for market share are much R&D nanotechnology challenges in a race for continuously improve areal density, leading to ever smaller readers, writers, supporting structures, and media microstructure. We will overview briefly some of the principles of operation of hard disc drives leading to the need for microstructural characterization of materials and device structures for the development and fabrication of magnetic read-write heads. As miniaturization of the heads evolved, so did the need to complement the commonly used scanning electron microscope (SEM) and the focused ion beam (FIB) inspection and analysis tools with the improved spatial resolution of the transmission electron microscope (TEM). We will review some examples of TEM applications from the more demanding R&D characterization of thin film materials to the simpler but irreplaceable applications of TEM imaging to device integration and process control at the wafer fabrication level. Fundamental materials understanding and the three dimensional complexity of the reader and writer elements is now pushing for the newer generation of commercial Scanning-TEMs capable of angstrom resolution, tomography, improved analytical capability and ease of use ideal for the industrial laboratory environment.

Biography

Dr. Augusto A. Morrone received his B.S. in Physics from the University of Buenos Aires, Argentina in 1979, with a thesis on fatigue crack initiation and arrest in structural alloys. He received his PhD in continuum Mechanics/Materials Science from Brown University in 1986, where he also completed a Post Doc working on microstructure-property relations of single crystals and ceramic composites under various conditions of strain and strain rate, with emphasis on TEM characterization. From 1988 to 1998 worked as a TEM leader in the TEM characterization facility at the Univ. of FL. He has been with Seagate Technology since 1998 when he was hired to develop the TEM characterization capability for the Recording Head Organization. There he has taken several leading and management roles and is currently a Senior Staff Engineer in materials science.

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

"Develop Solution-based Processes for Printing Electronics"

Professor Chih-Hung (Alex) Chang
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(奥勒岡州立大學化學工程系張至弘教授)

Abstract

Low cost and flexible integrated circuits will enable many new applications for our daily life. Amorphous silicon (a-Si) is the current material of choice for low-cost thin film transistors (TFTs) that are widely used as switching devices in active-matrix liquid-crystal displays. Organic (molecular crystals or polymeric) semiconductors with the advantages of flexibility and compatibility with solution-based low-cost processes (e.g. spin coating and ink jet printing) and plastic substrates are major candidates. Another promising but less explored approach is to deposit inorganic compound semiconductors using solution-based processes. Inorganic compound semiconductor has higher carrier mobility and better long-term stability. The recent advance in soft solution processing of inorganic materials offers an exciting opportunity to develop large area manufacturing technologies for inorganic TFTs. In this talk, I will report our progress towards developing solution-based processes that are suitable for printing of inorganic semiconductors.

Biography

Chih-hung (Alex) Chang was born in Taipei, Taiwan 1969. He received a B.S. degree from the Department of Chemical Engineering, National Taiwan University in June 1991. He received his PhD degree in chemical engineering from University of Florida, Gainesville Florida in December 1999. His dissertation research concerned the development of a manufacturing process for the growth of thin-film photovoltaic (PV) cells using rapid thermal processing (RTP) under Prof. Timothy J. Anderson's guidance. He joined Oregon State University in January, 2000. He is a Professor in the School of Chemical, Biological, and Environmental Engineering. He was a visiting professor in the Materials Science and Engineering Department at National Taiwan University from April 2008 till September 2008 sponsored by the National Science Council of Taiwan. He is a SHARP Labs of America scholar and a recipient of AVS Graduate Research award, National Science Foundation's CAREER award, and awardees of W.M. Keck Foundation. His group has studied solution based thin film deposition processes, ink jet printing, microreaction technology, and X-ray absorption fine structure. He has more than 60 refereed publications, 3 issued patents, and 9 pending patents in these areas.

Technical Session D2-W4-T2: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

Chair
Professor Sheng-Tzong Cheng (鄭憲宗)
National Cheng-Kung University

Biography

Sheng-Tzong Cheng received the BS (1985) and MS (1987) in Electrical Engineering from the National Taiwan University, Taipei, Taiwan. He received the MS (1993) and PhD (1995) in Computer Science from the University of Maryland, College Park, MD, USA. He was an Assistant Professor of Computer Science and Information Engineering at the National Dong Hwa University, Hualien, Taiwan, in 1995. He joined the Department of Computer Science and Information Engineering (CSIE), National Cheng-Kung University (NCKU), Tainan, Taiwan in 1997 and became an Associate Professor and a Professor in 1999 and 2004 respectively.
Dr. Cheng was the recipient of the Lee, Kuo-Din Research Award (李國鼎研究獎) in 2002 to highlight his research on multimedia and wireless communications. He advised many students to receive several top-prize awards from the contests held by the Ministry of Education and the Institute of Information Industry in Taiwan, etc.
Currently, Prof. Cheng is directing the wireless communication and mobile network laboratory in CSIE, NCKU. He also serves as the director of the Medical Computing and Communication (MCC) Software Center in NCKU. He is serving as the department chair of CSIE, NCKU from 2009. He has published more than 100 papers in the international journals and conferences. He holds one ROC patent and several pending patents. He is enlisted in Marquis *Who's Who in Asia*, and *Who's Who in Engineering and Sciences* in 2006 to 2008, and *International Educators of the Year* in 2009. His research interests include design and performance analysis of mobile computing, wireless communications, multimedia, quantum computing, and real-time systems.

Technical Session D2-W4-T2: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

"GNSS 2020 Outlook, Applications and Challenges"

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Abstract

Global Navigation Satellite Systems (GNSS), including GPS III/Galileo/Glonass/Compass, is evolving and will become one of most important infrastructures for technology in the near future. The evolution of GNSS is progressing through multilateral satellite constellation upgrades and creations, improved satellite clock and orbit estimation and prediction, and additional radio-frequency (RF) navigation signals with improved signal structures. The operation of multiple GNSS provides great improvements in positioning, velocity and time (PNT) information to global users.

With an ever increasing number of services relying on GNSS (mainly GPS for now), the accuracy, continuity and integrity that PNT information provided from GNSS ultimately decides the applicability for various applications. In this work, the roadmap and performance expectation of GNSS in the year 2020 are introduced. The opportunities and required system performance to enable various services are described. Meanwhile, a number of technical difficulties still remain for some GNSS applications. The challenges that GNSS users face include, but are not limited to, RF signal acquisition and tracking in obstructed environments, RF interference, fault detection and identification and robust PNT estimation. Research in augmented (i.e. differential systems) and sensor-integrated navigation systems to overcome these challenges will be discussed.

Biography

Fang-Cheng Chan received his B.S. in mechanical engineering from National Taiwan University, Taipei, Taiwan, in 1991, and received his M.S. (in 2001) and Ph.D (in 2008) in mechanical and aerospace engineering from Illinois Institute of Technology, Chicago, IL. He is a Senior Research Associate at Navigation and Guidance Laboratory in the Department of Mechanical and Aerospace Engineering of Illinois Institute of Technology in Chicago since 2008.

Dr. Chan is currently developing and analyzing Advanced Receiver Autonomous Integrity Monitoring (ARAIM) algorithms for Technical Subgroup of EU/US Working Group C (WGC) on ARAIM, and providing technical support to the FAA for the efforts of the LAAS Cat I/III integrity analysis.

Beside the integrated GPS navigation system research (GPS/INS, GPS/atomic receiver clock), Dr. Chan has participated research for the GNSS Evolutionary Architecture Study (GEAS) program supported by the FAA, developed and analyzed GPS navigation systems for aircraft precision approach. He also has supervised the analysis for Local Area Augmentation System (LAAS) CAT I orbit ephemeris monitoring implemented in Honeywell SLS-4000 Global Navigation Satellite System (GNSS) Landing System (GLS) testbed, and developed raw WAAS correction decoding software and validating navigation algorithms using the decoded WAAS correction and raw GPS measurements.

His research interests are GPS, INS and navigation sensor integration, high integrity navigation system and linear and non-linear optimal estimations. His expertise includes fault detection and navigation system integrity analysis, GPS receiver autonomous integrity monitoring (RAIM) algorithms, multiple navigation-sensor integration (GPS/INS/atomic receiver clock), fault-tolerant position estimation, carrier-phase differential GPS (DGPS) positioning and integers fixing algorithms, GPS signal error analysis, Kalman filtering and GPS receiver tracking theory.

Dr. Chan is currently a member of American Institute of Aeronautics and Astronautics, and a member of Institute of Navigation.

Technical Session D2-W4-T2: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

"Bandwidth Recycling in Broadband Wireless Networks"

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Abstract

The Worldwide Interoperability for Microwave Access (WiMAX), based on IEEE 802.16 standards, is designed to facilitate services with high transmission rates for data and multimedia applications in metropolitan areas. In this talk, we propose a scheme, named Bandwidth Recycling, to recycle the unused bandwidth without changing the existing bandwidth reservation. The idea of the proposed scheme is to allow other Subscriber Station (SS) to utilize the unused bandwidth when it is available. Thus, the system throughput can be improved while maintaining the same QoS guaranteed services. This talk will summarize the protocol design, performance analysis and simulation results of Bandwidth Recycling in WiMAX.

Biography

Dr. J. Morris Chang is an associate professor at Iowa State University. Dr. Chang received the M.S. degree in electrical engineering and the Ph.D. degree in computer engineering from North Carolina State University. His industrial experience includes positions at Texas Instruments, Microelectronic Center of North Carolina and AT&T Bell Laboratories. He received the University Excellence in Teaching Award at Illinois Institute of Technology in 1999. Dr. Chang's research interests include: Wireless Networks, Performance study of Java Virtual Machines (JVM), and Computer Architecture. Currently, he is a handling editor of Journal of Microprocessors and Microsystems and the Middleware & Wireless Networks subject area editor of IEEE IT Professional. He is a senior member of IEEE.

Technical Session D2-W4-T2: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

"A Fair Non-Repudiation Framework for Cloud Storage"

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Abstract

Data storage is one of the most profitable applications on the Cloud computing platforms. Although a transparent service model provides more flexibility and convenience, it may be subject to the loss of data integrity. Our study revealed vulnerability in some commercial Cloud storage services, which potentially will lead to disputation problems. In this paper, we propose a framework that supports a fair data transmission procedure without the risk of disputation. A basic two-party non-repudiation (TPNR) protocol and an advanced multi-party non-repudiation protocol (MPNR) are proposed. Rationales behind the new protocol's design and its working modes are presented in detail. We also discuss its robustness in the face of typical malicious network attacks.

Biography

Dr. Yu Chen was born in Chongqing, China, in April 1973. He received the Ph.D. in Electrical Engineering from the University of Southern California (USC), Los Angeles, California, USA in 2006.

He is an Assistant Professor of Electrical and Computer Engineering at the State University of New York (SUNY) – Binghamton, Binghamton, New York, USA since 2007. He has authored or co-authored more than 60 research papers in refereed journals, conferences, and book chapters. His research interest lies in Cyber Security, Network Infrastructure, and Computer Architectures. Specifically, his current work covers wired/wireless networks and Cloud/Grid computing systems; cyber infrastructure security; trust, security and privacy in pervasive computing; and security-oriented reconfigurable/embedded hardware based accelerators.

Dr. Chen is a member of ACM, IEEE (Computer Society & Communication Society), and SPIE. He has organized the 1st to 3rd International Workshop on Security in Cloud Computing (SCC'09, SCC'10, and CloudSec'11). Since Sept. 2009, he has been serving as the Vice Chair of IEEE Communication Society, Binghamton Chapter. One of his papers has won the Best Paper Award of the ChinaCom'08.

Technical Session D2-W4-T2: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

"On Security Protocols and Attacks in WiMAX Networks"

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Abstract

WiMAX technology, the commercialization of the evolving IEEE 802.16 standard, aims to solve the last-mile problem with broadband wireless access at the scale of metropolitan area networks. WiMAX has attracted significant attention and interest because of its wide transmission range, high transmission rate, and mobility support. However, to make WiMAX networks usable and reliable, several security issues must be addressed in the standards and its protocols. In this talk, we give an introduction to the security protocols used in IEEE 802.16 standards and then discuss why these protocols are deficient in terms of anti-replay, efficiency, scalability, forward and backward secrecy, and rogue BS or RS attacks, as well as how they can be enhanced to address these issues for real applications.

Biography

Dr. Chin-Tser Huang was born in Taichung, Taiwan. He received the B.S. degree in computer science and information engineering from National Taiwan University, Taipei, Taiwan, in 1993, and the M.S. and Ph.D. degrees in computer sciences from the University of Texas at Austin in 1998 and 2003, respectively.

He served the obligatory military service from 1993 to 1995 in Matsu as a personnel officer. After retiring from the military, he worked as a research assistant with Institute of Information Science, Academia Sinica, from 1995 to 1996. After he graduated from the University of Texas at Austin with his Ph.D. degree in 2003, he joined the faculty at the University of South Carolina at Columbia in 2003 and is now an Associate Professor in the Department of Computer Science and Engineering. He is the director of the Secure Protocol Implementation and Development (SPID) Laboratory at the University of South Carolina. He is the author (along with Mohamed Gouda) of the book "Hop Integrity in the Internet," published by Springer in 2005. His research interests include network security, network protocol design and verification, and distributed systems.

Dr. Huang is a member of Sigma Xi, Upsilon Pi Epsilon, IEEE, and ACM. In the summers of 2008, 2009, and 2010, he received the Summer Faculty Fellowship (SFFP) award from Air Force Office of Scientific Research (AFOSR). He is serving as an editor for Journal of High Speed Networks, International Journal of Distributed Sensor Networks, Editor, International Journal of Security and Networks, and International Journal of Security and Its Applications. He has published more than 40 journal and conference papers.

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

Chair
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Biography

Prof. Che-Wun Hong was born in Kaohsiung city, Taiwan on March 15th, 1956. He received bachelor degree in Mechanical Engineering from National Cheng-Kung University in 1978. After graduation from the university, he served in the army as an armored vehicle officer (1978~1980), then worked as a mechanical engineer in the Ford Motor Company (1980~1981), and then transferred to the Industrial Technology Research Institute (ITRI) as an engine researcher (1981~1982). In the fall of 1982, after saving enough money, he went to United Kingdom to study higher degrees. He received his MSc degree from the UMIST (Manchester, UK) in 1983 and a PhD degree from the Imperial College (London, UK) in 1987, all majored in Mechanical Engineering.

In 8/1987, he returned to Taiwan and joined the Department of Power Mechanical Engineering of National Tsing Hua University as an associate professor. He was promoted to full professor in 1997. Being a faculty member for 24 years, his research area ranges from internal combustion engines, turbochargers to the automotive engineering; and then he switched to the green power engineering at the millennium. His current research focuses on the fuel cells, solar cells, LEDs, lithium-ion batteries, ultra-capacitors and thermoelectric chips by means of the academic fundamentals, such as: quantum mechanics, molecular dynamics, Boltzmann modeling, computational fluid dynamics and control system dynamics. He has published more than 200 technical papers, including archived journals, proceedings of national and international conferences and technical reports; also he has registered for two patents in Taiwan and USA.

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

"Estimation and Control of Electric Ground Vehicles with In-Wheel Motors"

Professor Junmin Wang
Director, Vehicle Systems and Control Laboratory
Department of Mechanical and Aerospace Engineering
The Ohio State University
(俄亥俄州立大學王俊敏教授)

Abstract

Electric ground vehicle (EGV) with four independently-actuated in-wheel motors is one of the promising future vehicle architectures. Besides the energetic and environmental advantages, the actuation flexibility and redundancy furnished by in-wheel motors also provide new opportunities for further improving EGV operational efficiency and safety. This talk presents some recent research progresses on the estimation and control of an in-wheel motor powered EGV, which was developed at Ohio State University. By utilizing the in-wheel motor actuation redundancy, the simulation and experimental results show the potentials of EGV with in-wheel motors in terms of energy efficiency and safety improvements.

Biography

Junmin Wang received the B.E. degree in Automotive Engineering and M.S. degree in Power Machinery and Engineering from the Tsinghua University, Beijing, China in 1997 and 2000, respectively, the M.S. degrees in both Electrical Engineering and Mechanical Engineering from the University of Minnesota, Twin Cities in 2003, and the Ph.D. degree in Mechanical Engineering from the University of Texas at Austin in 2007.

He has five years of full-time industrial research experience (May 2003–August 2008) with the Southwest Research Institute, San Antonio, TX. Since September 2008, he has been an Assistant Professor with the Department of Mechanical and Aerospace Engineering, The Ohio State University, Columbus. He is an author/coauthor of over 85 peer-reviewed papers in journals and conference proceedings and holds 9 U.S. patents. His research interests include control, modeling, estimation, and diagnosis of dynamical systems, specifically for engine, powertrain, after-treatment, hybrid, flexible fuel, alternative/renewable energy, (electric) ground vehicles, transportation, sustainable mobility, and mechatronic systems. Dr. Wang is the Chair (2010–2012) of the Society of Automotive Engineers (SAE) International Control and Calibration Committee. He is also the Secretary (2010–2012) of the American Society of Mechanical Engineers (ASME) Automotive and Transportation Systems Technical Committee. He serves as an Associate Editor for the IEEE Transactions on Vehicular Technology, the American Control Conference, and the ASME Dynamic Systems and Control Conference.

He received the Office of Naval Research Young Investigator Award and the Oak Ridge Associate Universities Ralph E. Powe Junior Faculty Enhancement Award in 2009. He is one of the recipients of the 2009 SAE Vincent Bendix Automotive Electronics Engineering Award.

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

"Mode Transition Control between SI and HCCI Combustions"

Professor Guoming (George) Zhu
Mechanical Engineering
Electrical and Computer Engineering
Michigan State University

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

"Power Electronics for Future Energy and Grid Systems"

Professor Jih-Sheng (Jason) Lai
Director, Future Energy Electronics Center
Virginia Tech
(維吉尼亞理工大學未來能源研究中心主任賴日生教授)

Abstract

Power electronics is the essential part of the future grid systems. The electrical energy produced from various energy sources cannot be effectively and efficiently delivered to electrical loads or grid without power electronics. Examples of future energy sources include wind, solar, and hydrogen fuel cells. The talk will introduce the power electronics circuits such as DC-DC converters and DC-AC inverters and how they can fit into the future energy systems. The advancement of power electronics technologies will also be discussed. With the advent of high-voltage high-power wide bandgap semiconductor devices, the industry is going through the second wave of electronics revolution. More and more power electronic based energy sources will penetrate into utility grid to make the alternative energy more cost effective and more intelligent.

Biography

Jih-Sheng (Jason) Lai received M.S. and Ph.D. degrees in electrical engineering from the University of Tennessee, Knoxville, in 1985 and 1989. In 1989, he joined the Electric Power Research Institute (EPRI) Power Electronics Applications Center (PEAC), where he managed EPRI-sponsored power electronics research projects. From 1993, he worked with the Oak Ridge National Laboratory as the Power Electronics Lead Scientist, where he initiated a high power electronics program and developed several novel high power converters including multilevel converters and auxiliary resonant snubber based soft-switching inverters. He joined Virginia Tech in 1996. Currently he is professor and director of Future Energy Electronics Center (FEEC). He published more than 250 refereed technical papers and 2 books. He received 20 U.S. patents in the area of high power electronics and their applications.

His work brought him several distinctive awards including a Technical Achievement Award in Lockheed Martin Award Night, seven International conference paper awards. Dr. Lai is an IEEE Fellow. He was the founding chair of the 2001 IEEE Future Energy Challenge for Inverter Competition, General Chairs of IEEE Workshop on Computers in Power Electronics (COMPEL 2000), IEEE Applied Power Electronics Conference and Exposition (APEC 2005), and 2008 NSF Workshop on Power Electronics for Alternate Energy and Distributed Generation.

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

"Design and Control of Electrified Vehicles"

Professor Huei Peng
Executive Director, Interdisciplinary and Professional Engineering Programs
Department of Mechanical Engineering
The University of Michigan at Ann Arbor
(密歇根大學安娜堡分校機械工程系彭暉教授)

Abstract

Personal ground transportation is an important engineering field. Hybrid Electric Vehicles (HEV), vehicles equipped with a battery/electric drive to augment the internal combustion engine, received a lot of attention because of their potential to improve fuel economy, energy diversity and connect to renewable power sources. Hybrid vehicles are now about 3% of the overall vehicle sales in the US. Within a few months, plug-in hybrid vehicles and battery electric vehicles from GM and Nissan will also become available for purchase.

The main goal of this talk is to present current development trend of electrified vehicles. The common theme of these three topics will be on modeling, analysis and control. Examples on model generation for electric and hydraulic split hybrids, application of dynamic programming on "vehicle design", and key issues in integration of plug-in hybrids with the electric grid will be introduced.

Biography

Huei Peng received his Ph.D. from the University of California, Berkeley in 1992. He is currently a Professor at the Department of Mechanical Engineering, and the Executive Director of Interdisciplinary and Professional Engineering, at the University of Michigan, Ann Arbor. His research interests include adaptive control and optimal control, with emphasis on their applications to vehicular and transportation systems. His current research focuses include design and control of hybrid electric vehicles and vehicle active safety systems.

He is a leading researcher at the University of Michigan Automotive Research Center, and was involved in the design of several military and civilian concept vehicles, including FTTS, FMTV, and Super-HUMMWV. His team designed the power management algorithm for a prototype hybrid electric vehicle designed by Eaton, which later becomes the basis for their commercial hybrid buses and trucks. Thousands of units have been sold worldwide. He has more than 190 technical publications, including 80 in referred journals and transactions.

Huei Peng has been an active member of the Society of Automotive Engineers (SAE) and the ASME Dynamic System and Control Division (DSCD). He served as the chair of the ASME DSCD Transportation Panel from 1995 to 1997, and is a member of the Executive Committee of ASME DSCD. He served as an Associate Editor for the IEEE/ASME Transactions on Mechatronics from 1998-2004 and for the ASME Journal of Dynamic Systems, Measurement and Control from 2004-2009. He received the National Science Foundation (NSF) Career award in 1998. He is an ASME Fellow.

Technical Session D2-W2-T3: Medicine/ Public Health/ Biotechnology/ Bioinformatics

Chair
Professor Chyung-Ru Wang
Department of Microbiology and Immunology,
Feinberg School of Medicine
Northwestern University
Chicago, IL 60611, USA
Tel: 312-503-9748, Fax: 312-503-9594
Email: chyung-ru-wang@northwestern.edu
(西北大學醫學院王瓊如教授)

Biography

EDUCATION:

1979-1982 National Taiwan University, Taiwan, R.O.C. B.S. (Zoology)
1982-1987 University of Texas, Austin, TX Ph.D. (Biology)

PROFESSIONAL APPOINTMENTS:

1987-1991 Postdoctoral Associate (Sponsor: Dr. Kirsten Fischer Lindahl)
Howard Hughes Medical Institute, University of Texas Southwestern Medical School
1991-1993 Postdoctoral Associate (Sponsor: Dr. Johann Deisenhofer)
Department of Biochemistry, University of Texas Southwestern Medical School
1993-1994 Instructor (Sponsor: Dr. Johann Deisenhofer)
Department of Biochemistry, University of Texas Southwestern Medical School
1994-2001 Assistant Professor
Department of Pathology, Committee on Immunology, University of Chicago
2001-2007 Associate Professor
Department of Pathology, Committees on Immunology and Microbiology, University of Chicago
2007-2008 Professor
Department of Pathology, Committees on Immunology and Microbiology, University of Chicago
2008-present Professor

Department of Microbiology and Immunology, Northwestern University

HONORS AND AWARDS:

1979-1982 Book Coupon Awards (National Taiwan University)
1980-1982 Natural Science Fellowship
1982 Member of Phi Tau Phi Scholastic Honor Society
1995 Cancer Research Foundation Young Investigator Awards
1996-1999 Searle Scholars Award
2006 Future Faculty Mentorship Award (University of Chicago)

MEMBERSHIP IN PROFESSIONAL SOCIETIES

1994-present American Society of Immunology

Technical Session D2-W2-T3: Medicine/ Public Health/ Biotechnology/ Bioinformatics

"Akt Signaling in Cancer Progression and Metastasis"

Professor Hui-Kuan Lin
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The University of Texas M. D. Anderson Cancer Center
Unit 108, Y7.6079 1515 Holcombe Blvd Houston, TX 77030
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(德州大學安得生癌症中心林慧觀教授)

Abstract

Akt signaling plays a central role in cell proliferation, cell survival, metabolism and tumorigenesis. Although membrane recruitment of Akt kinase by growth-factor stimuli is a critical step for Akt phosphorylation, it remains a puzzle as to how Akt is recruited to the plasma membrane for subsequent phosphorylation and activation. Moreover, although Akt signaling regulates cell cycle progression, tumorigenesis and metastasis, it remains elusive as to how Akt regulates these processes. Our research goals aim to address these outstanding questions. Our recent studies have discovered important upstream regulator and downstream effcotor for oncogenic Akt. Namely, TRAF6 is a upstream regulator for Akt activation by triggering Akt ubiquitination and Skp2 serves as a critical downstream effector for Akt mediated cell cycle progression, tumorigenesis and cancer metastasis. Our studies have not only advanced our current understandings of how Akt signaling activation is regulated but also provided novel paradigms for the treatment of human cancers

Biography

Dr. Hui-Kuan Lin was born in 1971 in Taiwan, receiving his Bachelor degree in 1993 from National Taiwan University in Taiwan with a major in Pharmacy and Master degree in 1997 at National Taiwan University in Taiwan with a major in Pharmacology. He then received his Ph.D. degree in 2002 at University of Rochester in New York, with a major in Pathology (Cancer Biology).

He did his postdoctoral training at Memorial Sloan-Kettering Cancer Center in New York with Dr. Pier Paolo Pandolfi from 2002 to 2007 in the area of the cancer biology and genetics. He then received the tenure-track assistant professor position in 2007 at M.D. Anderson cancer Center. His past and current research interest is to identify the downstream effectors critical for the PTEN/PI3K/Akt-driven tumorigenesis by using the biochemical approaches and genetic mouse modeling with a particular emphasize on ubiquitination pathways.

Dr. Lin is currently an associate professor and trust scholar at M.D. Anderson cancer center and has received numerous awards including Gordon Research Travel Award in 1999, The GSS Travel award with Honorable Mention for Outstanding Quality from University of Rochester in 2000, the Travel Award in 2004 from Annual Meeting of the American Society of Hematology, the first author student award in 2004 from Molecular Endocrinology Journal, Research Trust Scholar Award in 2007 from M.D. Anderson Cancer Center, New Investigator Award in 2009 from Department of Defense, CPRIT individual investigator Award in 2010, and Faculty Scholar Award in 2011 from MD Anderson Cancer Center. He serves an editorial advisory member in Biochemical Journal and editorial board member in Frontiers in Molecular and Cellular Oncology. He also serves a reviewer in numerous Journals such as Science Signaling, Cancer Research, Oncogene, Clinical Can. Res., Biochemical Journal and so on. He has served many grant review panels including cell biology and genetic study section from Department of Defense, NHRI, and Italian Ministry of Health. He has published more than 34 peer-reviewed articles in leading journals such as Nature, Science, and Nat. Cell Biol., Mol. Cell, Science Signaling, PNAS, and EMBOJ.

Technical Session D2-W2-T3: Medicine/ Public Health/ Biotechnology/ Bioinformatics

"Understanding the Human Genome through Single Cell Analysis"

Professor Honghua Li
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Abstract

Understanding the human genome and its functionality is not only complicated by genetic variation and more than 25,000 genes expressed differently in various tissue and cell types but also by different parental origins of genetic materials within each cell and by genes that are expressed at different development and cell cycle stages in the same cell. To understanding the human genome in a great depth that cannot be reached by analyzing bulk cells or diploid cells, a highly sensitive and efficient experimental system has been developed for genome-scale analyses of genetic composition and gene activity using either single diploid or haploid cells. The system allows separate study of genetic materials from different parents and study of single cells expressing different groups of genes including those from the same tissue but at different cell cycle stages. This system was used to determine the genetic composition of the highly variable human immunoglobulin heavy chain gene complex on single chromosomes, for high resolution study of meiotic recombination, and for detailed genetic structure of chromosomal regions containing copy number variants. It is also was successfully used for gene expression profiling of single cells at different cell cycle stages. It is also possible to study the impact of genetic variation on gene activity without *in vitro* gene knockout. Effort is being made to identify key cells and genes playing important role in the life processes but may not be detected if bulk cells are used. Determination of complete sequence of the entire genome in single sperm cells may change the landscape of many ongoing genome-scale studies including those based on high-throughput sequencing.

Biography

Dr. Honghua Li was born in Shandong, China. He earned his bachelor's degree in agronomy from the Shandong University of Agriculture, China, Ph.D. degree in 1989 in Human Genetics and Molecular Biology from the University of Southern California, Los Angeles, California, USA, and received his postdoctoral training from 1990 to 1993 in Human Genetic and Genomics at the California Institute of Technology, Pasadena, California, USA.

He worked as a TEACHING ASSISTANT and then RESEARCH ASSISTANT during his graduate study and POSTDOCTORAL ASSOCIATE after graduate study. He accepted an ASSISTANT PROFESSOR position after postdoctoral training. Currently he is an ASSOCIATE PROFESSOR at the University of Medicine and Dentistry of New Jersey Robert Wood Johnson Medical School, Piscataway, New Jersey, USA. His research interest is in understanding genetic impact on biological processes in a comprehensive way.

Dr. Li is a member of the American Society of Human Genetics and American Association for the Advancement of Science. He has served on a number of scientific review committees for the National Institutes of Health, as an editor for two scientific journals, and a reviewer for many scientific journals. He is a member of Cancer Institute of New Jersey. His laboratory received several awards from the Cancer Commission of New Jersey. The following publications (out of 54) were based on part of his work during his graduate, postdoctoral and independent research:

1. Li, H. H., Gyllensten, U. B., Cui, X. F., Saiki, R. K., Erlich, H. A., and Arnheim, N. Amplification and analysis of DNA sequences in single human sperm and diploid cells. Nature, 335: 414-417, 1988.
2. Cui, X. F., Li, H. H., Goradia, T. M., Lange, K., Kazazian, H. H., Jr., Galas, D., and Arnheim, N. Single-sperm typing: determination of genetic distance between the G gamma-globin and parathyroid hormone loci by using the polymerase chain reaction and allele-specific oligomers. Proc Natl Acad Sci U S A, 86: 9389-9393, 1989.
3. Li, H., Hood, L.: Multiplex genotype determination at a DNA sequence polymorphism cluster in the human immunoglobulin heavy-chain region. Genomics 26:199-206, 1995.

4. Lin, Z., Cui, X., and Li, H. Multiplex genotype determination at a large number of gene loci. Proc Natl Acad Sci U S A, 93: 2582-2587, 1996.
5. Cui, X. and Li, H. Determination of gene organization in individual haplotypes by analyzing single DNA fragments from single spermatozoa. Proc Natl Acad Sci U S A, 95: 10791-10796, 1998.
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7. Cui, X. and Li, H. Human immunoglobulin VH4 sequences resolved by population-based analysis after enzymatic amplification and denaturing gradient gel electrophoresis. Eur J Immunogenet, 27: 37-46, 2000.
8. Pramanik, S. and Li, H. Direct detection of insertion/deletion polymorphisms in an autosomal region by analyzing high-density markers in individual spermatozoa. Am J Hum Genet, 71: 1342-1352, 2002.
9. Chimge, N. O., Pramanik, S., Hu, G., Lin, Y., Gao, R., Shen, L., and Li, H. Determination of gene organization in the human IGHV region on single chromosomes. Genes Immun, 6: 186-193, 2005.
10. Wang, H. Y., Luo, M., Tereshchenko, I. V., Frikker, D. M., Cui, X., Li, J. Y., Hu, G., Chu, Y., Azaro, M. A., Lin, Y., Shen, L., Yang, Q., Kambouris, M. E., Gao, R., Shih, W., and Li, H. A genotyping system capable of simultaneously analyzing >1000 single nucleotide polymorphisms in a haploid genome. Genome Res, 15: 276-283, 2005.
11. Greenawalt, D. M., Cui, X., Wu, Y., Lin, Y., Wang, H. Y., Luo, M., Tereshchenko, I. V., Hu, G., Li, J. Y., Chu, Y., Azaro, M. A., Decoste, C. J., Chimge, N. O., Gao, R., Shen, L., Shih, W. J., Lange, K., and Li, H. Strong correlation between meiotic crossovers and haplotype structure in a 2.5-Mb region on the long arm of chromosome 21. Genome Res, 16: 208-214, 2006.
12. Hu, G., Wang, H. Y., Greenawalt, D. M., Azaro, M. A., Luo, M., Tereshchenko, I. V., Cui, X., Yang, Q., Gao, R., Shen, L., and Li, H. AccuTyping: new algorithms for automated analysis of data from high-throughput genotyping with oligonucleotide microarrays. Nucleic Acids Res, 34: e116, 2006.
13. Hu, G., Yang, Q., Cui, X., Yue, G., Azaro, M. A., Wang, H. Y., Li, H.: A highly sensitive and specific system for large-scale gene expression profiling. BMC Genomics 9: 9, 2008.
14. Luo, M., Cui, X., Fredman, D., Brookes, A. J., Azaro, M. A., Greenawalt, D. M., Hu, G., Wang, H.-Y., Tereshchenko, I. V., Shentu, Y., Gao, R., Shen, L., Li, H.: Genetic structure of duplicated sequences revealed by genotyping single sperm. PLoS One, PLoS One 2009, 4: e5236.

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Technical Session D2-W2-T3: Medicine/ Public Health/ Biotechnology/ Bioinformatics

"Genome-wide Discovery and Clinical Validation of Pharmacogenomic Markers"

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Department of Medicine, The University of Chicago
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Tel: +1-773-702-9363, Fax: +1-773-702-4441
Email: rhuang@medicine.bsd.uchicago.edu
(芝加哥大学医学系黄榕教授)

Abstract

Pharmacogenomics is emerging as an important component in facilitating both new drug development and in improving the utility of existing chemotherapeutic agents. However, the process of identifying these genetic variants is still evolving and there are a number of different approaches that can be employed. Typically, identification of the genetic contribution to drug response comes from clinical observations; but these clinical studies are limited by our inability to control environmental factors *in vivo*, the difficulty of manipulating the *in vivo* system to evaluate biological changes and the lack of single drug regimens in large oncology trials. Therefore, we have developed a whole genome, cell-based model for identifying genetic variation(s) important in cellular sensitibility to chemotherapeutic agents using lymphoblastoid cell lines (LCLs) derived from the International HapMap project that have been subject to extensive genotyping. LCLs from different world populations allow for an evaluation of inter-ethnic differences in sensitivity to chemotherapy. For example, LCLs from Asians are more sensitive to platinating agents and LCLs from Africans are more sensitive to antimetabolites as compared to Caucasians. We have identified that SNPs associated with drug sensitivity are enriched in expression quantitative trait locus (eQTLs). The presentation will include an overview of current cell-based models used in pharmacogenomic discovery, replication and translation into the clinical arena. As technology advances, a more comprehensive evaluation of the human genome, including the examination of rare SNPs, copy number variations, tandem repeats, epigenetic effects, will further improve our understanding of the relationship between genetics and drug response in oncology.

Biography

I was born in Beijing, China on September 23rd, 1975. I obtained my bachelor of science degree in Pharmacy from Shanghai Medical University in 1998 and subsequently received my master and doctoral degrees from Purdue University in 2005 majored in Clinical Pharmacology.

After graduation, she started her post doctoral/Clinical Pharmacology Fellowship training at the University of Chicago and stayed on as a faculty. She is currently Assistant Professor of Medicine; Director, the Pharmacogenomics of Anticancer Agents Research (PAAR) Cell Line Core; Member, Committee on Clinical Pharmacology and Pharmacogenomics, the University of Chicago Comprehensive Cancer Center, Center for Personalized Therapeutics and Faculty Oversight Committee for Pharmacology Core facility. The Huang lab has a focus on translational pharmacogenomic research with particular interest in the pharmacogenomics of anticancer agents. By systematically evaluating the human genomes and their relationships to drug response and toxicity, her goal is to develop clinically useful models that predict risks for adverse drug reactions and non-response prior to administration of chemotherapy. She utilize cell lines, and clinical samples to discover and functional characterize genetic variations, gene and microRNA expression for their role in chemotherapeutic sensitivity.

Dr. Huang is a member of American Association for Cancer Research (AACR), American Society of Human Genetics (ASHG) and American Society of Clinical Pharmacology and Therapeutics (ASCPT). She serves on the editorial board of Genomics, Proteinomics and Bioinformatics, and as a reviewer for Clinical Pharmacology & Therapeutics, Genetic Epidemiology, Human Mutation, Pharmacogenomics, Journal of Cellular & Molecular Medicine, Pharmacogenetics & Genomics, Neoplasia and Molecular Cancer Therapeutics. Award and Honors along with detailed publication see below:

Technical Session D2-W2-T3: Medicine/ Public Health/ Biotechnology/ Bioinformatics

"Structural and functional analyses of human insulin degrading enzyme"

Professor Wei-Jen Tang
Ben May Department for Cancer Research
The University of Chicago
(芝加哥大學湯惟仁教授)

Abstract

Insulin degrading enzyme (IDE) is a zinc metalloprotease vital for the clearance of insulin and amyloid β, peptides important for the progression of diabetes and Alzheimer's disease, respectively. We have solved structures of human IDE in complex with various peptide substrates to decipher how IDE uses unique size, charge, and location of reaction center of its catalytic chamber to preferentially degrade the amyloidogenic peptides. Based on such unique substrate-recognition properties, we search and identify CC chemokine, CCL3 as a novel substrate of IDE. CCL3 is a proinflammatory cytokines crucial for the immune responses toward infection and inflammation. Our structural, biochemical, and functional analyses reveal how the regulated CCL3 polymerization and selective inactivation of CCL3 monomer by IDE can aid in controlling the chemotactic gradient for immune surveillance.

Biography

A. Personal Statement:

My research program involves in elucidating the molecular basis of cellular signal transduction. The research is based on the premise that the better understanding of protein-protein and protein-ligand interaction is key to elucidating the fundamental principles governing cellular signaling network. I apply X-ray crystallography and various biochemical, biophysical, cellular and pharmacological tools to address the protein functions and regulations. I am known for the studies on the catalysis and regulation of mammalian adenylyl cyclase, anthrax and pertussis adenylyl cyclase toxins, and insulin degrading enzyme. I am a very strong believer in collaboration.

B. Positions and Honors.

Positions:

1988 Postdoctoral fellow with Dr. William R. Folk, U Texas Austin
1988-1991 Postdoctoral fellow with Dr. Alfred G. Gilman, U Texas Southwestern Medical School
1991-1993 Instructor, Dept. of Pharmacology, University of Texas Southwestern Medical School
1993-1994 Assistant Professor, Dept. of Pharmacology, UT Southwestern Medical School
1994-1998 Assistant Professor, Dept. of Pharmacol. & Physiol. Sciences, U of Chicago
1998-2001 Assistant Professor, Dept. of Neurobiol. Pharmacol. & Physiol., U of Chicago
2001-2007 Associate Professor, Ben-May Institute for Cancer Research, U of Chicago
2007- Professor, Ben-May Department for Cancer Research, U of Chicago

Honors and Federal Government Public Advisory Committee:

1987-1988 University Fellowship, University of Texas, Austin
1999-2002 American Heart Association Established Investigator
1998-present Ad Hoc NIH and NSF grant reviewing panels
2007-2011 Regular member of NIH MSF-C study section
2009-present The advisory Board, Structure Biology Center, APS, Argonne National Lab.

C. Selected peer-reviewed publications (Selected from 101 peer-reviewed publications).

1. Tang, W.-J., Krupinski, J., and Gilman, A.G. (1991) Expression and characterization of calmodulin activated (type I) adenylyl cyclase. J. Biol. Chem. 266:8595-8603.

2. Tang, W.-J. and Gilman, A. G. (1991) Type-specific regulation of adenylyl cyclase by G protein βγ subunits. Science 254:1500-1503.

3. Tang, W.-J. and Gilman, A.G. (1995) Forskolin and $G_{s\alpha}$ sensitive soluble adenylyl cyclase. Science 268:1769-1772.

4. Drum, C.L., Yan, S.-Z., Bard, J., Shen, Y.-Q., Lu, D., Soelaiman, S., Grabarek, Z., Bohm, A., and Tang, W.-J. (2002) Structural basis for the activation of anthrax adenylyl cyclase exotoxin by calmodulin, Nature 415:396-402.

5. Shen, Y.-Q., Lee, Y.-S., Soelaiman, S., Bergson, P., Lu, D., Chen, A., Beckingham, K., Grabarek, Z., Mrksich, M., Tang, W.-J. (2002) Physiological calcium concentrations regulate calmodulin binding and catalysis of adenylyl cyclase exotoxins. EMBO J. 21: 6721-6732.

6. Shen, Y.-Q., Zhukovskaya, N.L., Zimmer, M.I., Soelaiman, S., Wang, C.R., Gibbs, C.S., Tang, W.-J. (2004) Selective inhibition of anthrax edema factor by adefovir: a prototype for adjunctive therapy and probe of anthrax pathogenesis. Proc. Natl. Acad. Sci. USA 101:3242-3247.

7. Lee, Y.-S., Bergson, P., He, W.-S., Mrksich, M., Tang, W.-J. (2004) Discovery of a small molecule that inhibits the interaction of anthrax edema factor with its cellular activator, calmodulin. Chem. & Biol. 11:1139-46.

8. Shen, Y., Zhukovskaya, N.L., Guo, Q., Florián, J., and Tang, W.-J. (2005) Calcium-independent calmodulin binding and two-metal-ion catalytic mechanism of anthrax edema factor. EMBO J. 24:929-941.

9. Guo, Q., Shen, Y., Lee, Y.-S., Gibbs, C.S., Mrksich, M., and Tang, W.-J. (2005) Structural basis for the interaction of adenylyl cyclase toxin of *Bordetella pertussis* with calmodulin. EMBO J. 24:3190-3201.

10. Shen, Y., Joachimiak, A., Rosner, M.R., and Tang, W.-J. (2006) Structures of human insulin degrading enzyme reveal a new substrate recognition mechanism. Nature 443:870-874.

11. Im, H., Manolopoulou, M., Malito, E., Shen, Y., Zhao, J., Neant-Fery, M., Sun, C.-Y., Meredith, S.C., Sisodia, S.S., Leissring, M., and Tang, W.-J. (2007) Structure

of substrate-free human insulin degrading enzyme (IDE) and biophysical analysis of ATP-induced conformational switch of IDE. J. Biol. Chem. 282:25453-63.

12. Malito, E., Hulse, R.E., and Tang, W.-J. (2008) Amyloid-β degrading cryptidase: insulin degrading enzyme, presequence peptidase, and neprilysin. CMLS 65:2574-85. (PMC2756532)

13. Malito, E., Ralat, L.A. Manolopoulou, M., Tsay, J.L., Wadlington, N.L. and Tang, W.-J. (2008) Molecular Bases for the recognition of short peptide substrates and cysteine-directed modifications of human insulin-degrading enzyme. Biochemistry 47:12822-12834. (PMC2652632)

14. Manolopoulou, M., Guo, Q., Malito, E. Schilling, A, and Tang, W.J. (2009) Molecular basis of catalytic chamber-assisted unfolding and cleavage of human insulin by human insulin degrading enzyme. J. Biol. Chem. 284:14177-88. (PMC2682866).

15. Ren, M., Guo, Q., Guo, L., Lenz, M., Qian, F., Koenen, R.R., Xu, H., Schilling, A.B., Weber, C., Ye, R.D., Dinner, A.R., and Tang, W.-J. (2010) Polymerization of MIP-1 chemokine (CCL-3 and CCL-4) and clearance of MIP-1 by insulin degrading enzyme. EMBO J. 29:3952-3966.

Technical Session D2-W3-T3: New Materials Science and Engineering, Nanotechnologies

Chair
Professor Chih-Hung (Alex) Chang (張至弘)
School of Chemical, Biological and Environmental Engineering
Oregon State University
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Biography

Chih-hung (Alex) Chang was born in Taipei, Taiwan 1969. He received a B.S. degree from the Department of Chemical Engineering, National Taiwan University in June 1991. He received his PhD degree in chemical engineering from University of Florida, Gainesville Florida in December 1999. His dissertation research concerned the development of a manufacturing process for the growth of thin-film photovoltaic (PV) cells using rapid thermal processing (RTP) under Prof. Timothy J. Anderson's guidance. He joined Oregon State University in January, 2000. He is a Professor in the School of Chemical, Biological, and Environmental Engineering. He was a visiting professor in the Materials Science and Engineering Department at National Taiwan University from April 2008 till September 2008 sponsored by the National Science Council of Taiwan. He is a SHARP Labs of America scholar and a recipient of AVS Graduate Research award, National Science Foundation's CAREER award, and awardees of W.M. Keck Foundation. His group has studied solution based thin film deposition processes, ink jet printing, microreaction technology, and X-ray absorption fine structure. He has more than 60 refereed publications, 3 issued patents, and 9 pending patents in these areas.

Technical Session D2-W3-T3: New Materials Science and Engineering, Nanotechnologies

"Semiconductor Nanoelectronic and Nanophotonic Devices:
towards controllability and manufacturability"

Professor Xiuling Li
Department of Electrical and Computer Engineering
University of Illinois, Urbana-Champaign
http://mocvd.ece.illinois.edu/

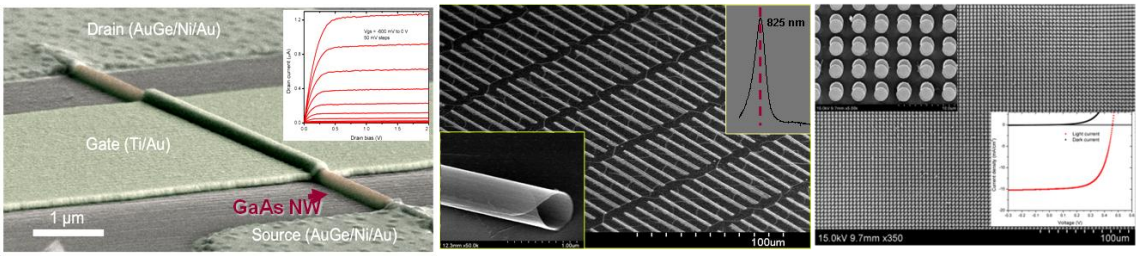
Abstract

This talk focuses on three types of scalable semiconductor nanotechnology platforms and their applications in nanoelectronics, photonics, and energy harvesting.

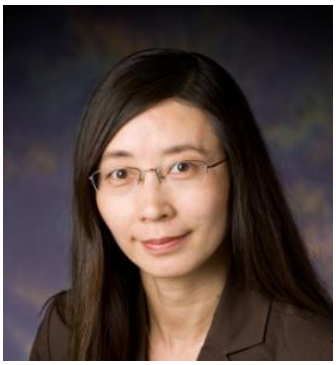
Interests in semiconductor nanowires have increased exponentially over the past decade because of their unique optical and electrical properties. Integration of semiconductor nanowire based devices has been challenging for vertical nanowire devices since ex-situ assembly techniques are required to align planar nanowire devices. I will present our discovery of a type of nanowires that is planar, self-aligned, twin-defect free, high carrier mobility, and transfer-printable. The planar nanowire growth and doping mechanism by MOCVD, as well as the device characteristics of MESFET and HEMT using such GaAs nanowire as the channel material will be analyzed.

Self-rolled-up tubes on the other hand are a relatively new platform that possesses the potential to provide a wide range of functionalities. It is formed by a combination of top-down and bottom-up approach through the self-rolling of strained thin films. This allows feasible large area assembly and integration with existing semiconductor technology, while maintaining the control of the tube size and heterojunction formation in the tube wall. I will discuss the formation process, large area assembly, and optical characterization of $In_xGa_{1-x}As/GaAs$ micro and nanotubes with active light emitting media incorporated in the tube wall. Device prospects of these tubes for nanophotonics will be explored. Metal assisted chemical etching (MacEtch), an anisotropic wet etch method, produces high aspect ratio semiconductor nanostructures free of high energy ion induced damage in contrast to dry etch. I will show ordered vertical silicon and III-V nanowire or micropillar

arrays fabricated by MacEtch and discuss the implication of this technology.



Biography



Xiuling Li received her Ph.D. degree from the University of California at Los Angeles. She joined the faculty of the University of Illinois in 2007, after working at a startup company for six years. She is currently an assistant professor in the Department of Electrical and Computer Engineering. Her research interests are in the area of nanostructured semiconductor materials and devices. She has won the NSF CAREER award (2008), DARPA Young Faculty Award (2009) and ONR Young Investigator Award (2011). Her group's work on the planar nanowires has won one of the best student paper awards at the 2008 IEEE Photonic Society annual meeting. The micro and nanotube work has been identified as an outstanding symposium paper presented at the 2008 MRS meeting.

Technical Session D2-W3-T3: New Materials Science and Engineering, Nanotechnologies

"Self-Assembly of Solution Processing Graphitic Nanomaterials**"**

Dr. Vincent C. Tung
Department of Materials Science and Engineering
Northwestern University
(西北大學材料科學與工程學系童俊智博士)

Abstract

Heterojunctions between different graphitic nanostructures including fullerenes, carbon nanotubes and graphene-based sheets have attracted significant interest for light to electrical energy conversion. Because of their poor solubility, fabrication of such all-carbon nanocomposites typically involves covalently linking of the individual constituents or extensive surface functionalization to improve their solvent processibility for mixing. However, such strategies often deteriorate or contaminate the functional carbon surfaces. Here we report that fullerenes, pristine single walled carbon nanotubes and graphene oxide sheets can be conveniently co-assembled in water to yield a stable colloidal dispersion for thin film processing. After thermal reduction of graphene oxide, a solvent-resistant photoconductive hybrid of fullerene-nanotube-graphene was obtained with on-off ratio of nearly six orders of magnitude. Photovoltaic devices made with the all-carbon hybrid as the active layer and an additional fullerene block layer showed unprecedented photovoltaic responses among all known all-carbon based materials. The ease of making such surfactant-free, water-processed, carbon thin films could lead to their wide applications in organic optoelectronic devices.

Biography

Dr. Tung received a Ph.D. in material chemistry from the University of California, Los Angeles in 2009. Under the Professor Richard B. Kaner and Yang Yang's guidance, Dr. Tung's research focuses on identifying high throughput solution processing of carbon-based materials for optoelectronic and energy application. Currently, Dr. Tung is an ISEN (Initiative for Sustainability and Energy at Northwestern University) postdoctoral fellow in Professor Jiaxing Huang's lab in the Department of Materials Science at Northwestern University.

Technical Session D2-W3-T3: New Materials Science and Engineering, Nanotechnologies

"Solution-processed Nanostructured Oxide Material Deposition for Antireflective Coating"

Dr. Seung-Yeol Han
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Abstract

Nanostructured thin films were deposited by microreactor-assisted chemical solution processes. This technique uses continuous flow microreactors for the synthesis and deposition of nanomaterials. In synthesis, microreactor technology offers large surface-area-to-volume ratios within microchannel structures to accelerate heat and mass transport. This accelerated transport allows for rapid changes in reaction temperatures and concentrations leading to more uniform heating and mixing in the deposition process. Consequently, microreactor technology provides several advantages with new opportunities for tailoring novel nanostructures and nanoshaped features. In this study, the nature structure of moth-eye inspired idea for low reflectance and enhance the solar efficiency with high transmittance. We have developed a novel nanostructured AR coatings based on ZnO and SiO_2 NPs. The novel nanoarchitecture retains the moth-eye like nanostructures. The nanostructured AR coatings mimicked moth-eye like structure using our low-cost solution-based process. Nanostructured ARCs was prepared by direct deposition on solar cell and cover glass and tested. These results also suggest the possibility of producing many types of nanostructured films using low cost solution chemistry. Our recent advances in applying this process for photovoltaics will be presented.

Biography

Seung-Yeol Han was born in Daegu, South Korea in 1976. He is currently a Postdoctoral Research Associate under Prof. Chih-hung (Alex) Chang in School of Chemical, Biological & Environmental Engineering at Oregon State University. He earned B.S. (February 2003) and M.S. (February 2006) degrees in Chemical Engineering at Yeungnam University, Gyeongsan, South Korea. He was a research scholar in Chemical Engineering, Oregon State University from 2004 to 2005 supported by Korea Science and Engineering Foundation (KOSEF). He earned a Ph.D. in the School of Chemical, Biological, and Environmental Engineering, Oregon State University, Corvallis Oregon in December 2010. Dr. Han is a member of professional societies including The Electrochemical Society and Material Research Society. Dr. Han is also a member of Korean-American Scientists and Engineers Association (KSEA) and serves as representative of KSEA in Oregon State University. His research interests are solution processed thin films deposition processes, ink-jet printing and microreactor technology for nanostructured optical films and metal oxide transparent thin film transistors.

Technical Session D2-W3-T3: New Materials Science and Engineering, Nanotechnologies

"Si-based Nano-Structures for Photovoltaic and Photonics"

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Chair, Graduate Institute of Photonics and Optoelectronics and
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National Taiwan University
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Abstract

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. Therefore, one of the issues in this talk is the use of Si-based nanostructures for photovoltaic applications. Here we will discuss two major parts for the photovoltaics: the combination of the Si nanowires with the organic materials to form p-n junction and the technique to form single crystalline Si thin film to lower the material cost. The fabrication of Si-nanowire/PEDOT solar cells is simple in terms of process steps. The device so far demonstrates a power conversion efficiency of 8.4%. On the other hand, the single crystalline Si thin-film is fabricated using two-step etching techniques. The film thickness could be from around 5 um to 15 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 Si wafer.

The second issue is the use of Si technology for photonics. Because Si is the most mature material for electronics, it is highly desired to use it for photonics and fully integrate electronics and photonics in a single chip. Here we will present the fabrication of nearly cylindrical waveguides on regular (100) wafers using laser reformation technique. Because the possibly selective exposure at designed areas under laser pulses, this technique provides the promising possibility of integration with electronics. The details will be discussed.

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 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 single-crystal Si thin-film solar cells, organic-inorganic composite thin-film solar cells and optoelectronic devices, Si-based photonics, and physics in broadband semiconductor lasers and optical amplifiers.

He is currently 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 300 conference papers and hold over 30 patents. He had obtained the Distinguished Research Award and 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 and many other awards, including 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.

Technical Session D2-W4-T3: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

Chair
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Biography

Hsi-Pin Ma was born in Nantou, Taiwan, on January 17, 1973. He received the B.S. and Ph.D. degrees in electrical engineering from the National Taiwan University, Taiwan, in 1995 and 2002.

At the summer of 2000, he interned at Siemens Telecommunication Systems Limited, for feasibility study and establishment of a dual-mode base station for WCDMA and cdma2000. Since 2003, he has been with the Department of Electrical Engineering/Institute of Communications Engineering, National Tsing Hua University, Hsinchu, Taiwan, where he is currently as an Associate Professor.

Dr. Ma's research interests include communications system design, power efficient baseband DSP techniques, and communications SoC implementation. His group is working on the system design, signal processing algorithm development, and SoC implementation for advanced communications systems such as multi-user mobile MIMO communications, cognitive radio and for applications such as smart grid and biomedical electronics.

Technical Session D2-W4-T3: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

"Robust CMOS Millimeter-Wave Integrated Circuits"

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Abstract

Nano-scale CMOS technologies have enabled the cost effective implementation of many millimeter wave (mm-wave) frequency applications such as wireless HDMI, automotive radar and passive imaging systems. However, due to the limitations of the existing passive/active device modeling, together with the parasitic and coupling effects at very high frequencies, multiple silicon iterations are often needed to predict the performance of wireless transceiver circuits. Furthermore, the ultra-high frequency operation often invalidates many programmable methods, leading to transceiver front-end circuits hard to adjust for various performance requirements and compensate the ever increasing process variations. We investigate circuit techniques and design methodologies to enhance the robustness of mm-wave ICs. In this talk, the design of a 77GHz CMOS receiver suitable for automotive radar will firstly be introduced. Then the configurable Coplanar Waveguide (CPW) based sub-nH inductor structures, together with a unique ESD protection method for mm-wave front-end will be discussed toward robust implementation of mm-wave ICs.

Biography

Dr. Yang Xu is an assistant professor in the department of Electrical and Computer Engineering in Illinois Institute of Technology. He received the B.S. and M.S. degrees in electrical engineering from Fudan University, Shanghai, China, in 1997 and 2000, respectively, and the Ph.D. degree in electrical and computer engineering from Carnegie Mellon University, Pittsburgh, PA, in 2004. He was a visiting Assistant Professor in the department of Electrical Engineering at Stanford University in 2010. Prior to joining the faculty at IIT, he was a senior researcher with Qualcomm Inc. where he worked on GPS/mobile TV and 3G cellular transceiver design. He was a recipient of the Inventor Recognition Award from the Microelectronics Advanced Research Consortium (MARCO) in 2004 and 2005. He is also a three time Qualcomm Inventor's Award recipient. He is a Senior Member of IEEE and a Member of Association for Computer Machinery (ACM).

Technical Session D2-W4-T3: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

"AES Chip Implementation and Oscillator-based DPA Countermeasure Circuit"

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Abstract

The AES algorithm approved in 2001 has become the most popular symmetric-key encryption algorithm because of its high security, low complexity, and excellent performance. The AES algorithm is widely adopted in numerous applications such as wireless communications, storage devices, smart cards, or banking systems. Several implementations have been published but few of them considered the hardware efficiency, processing throughput, and power analysis resistance as a whole. In this talk, we first investigate the area-efficient architectures for high throughput applications. The proposed AES engine, which is optimized by a very compact on-the-fly key expansion unit, can be capable of both encryption and decryption with three different key lengths. After manufactured in 90nm CMOS technology, the AES test chip with 15,577 equivalent gates can achieve 1.69 Gb/s throughput.

In addition, we will present another AES crypto chip with resistance to the differential power analysis (DPA) attacks based on digital ring oscillators and an on-chip true random number generator. Compared with previous DPA-resistant work by exploiting data masking circuits or equalizing the power consumption, our proposed DPA countermeasure circuit can significantly reduce the area overhead without throughput degradation. After manufactured in 90nm CMOS technology, the AES test chip with 34,691 equivalent gates, only 6.2% area overhead, can achieve 2.97 Gb/s throughput. The measurement to disclosure (MTD) can be enhanced from several thousands to more than 10^7 traces, leading to much higher security level.

Biography

Hsie-Chia Chang received the B.S., M.S., and Ph.D. degrees in electrical engineering from National Chiao Tung University, Hsinchu, Taiwan, in 1995, 1997, and 2002, respectively. From 2002 to 2003, he was with OSP/DE1 in MediaTek Corp., working in the area of decoding architectures for Combo single chip. In February 2003, he joined the faculty of the Electronics Engineering Department, National Chiao Tung University, where he is currently an professor from August 2010. His research interests include algorithms and VLSI architectures in signal processing, especially for error control codes and crypto-systems. Recently, he also committed himself to joint source/channel coding schemes and multi-Gb/s chip implementation for wireless communications.

Technical Session D2-W4-T3: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

"Optimal Layered Video IPTV Multicast Streaming over Mobile WiMAX Systems"

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Abstract

A WiMAX radio resource allocation (WRA) problem is investigated in the context of IPTV broadcasting over mobile WiMAX multicast, broadcast services (MBS) channels. The goal is to maximize quality of services, in terms of number of subscribers served, number of IPTV channels carried, and perceived video qualities of individual viewers; subject to constraints on multicast channel capacities and space-time channel quality variations. We present an efficient heuristic algorithm based on the Pareto principle that achieves near-optimal results in polynomial time complexity. Extensive simulations are conducted to compare this new approach against state-of-the-art heuristic algorithms and consistent superior performance has been observed.

Collaborators of this work include Prof. J. N. Hwang and graduate student P.-H. Wu, of University of Washington, Seattle, WA.

Biography

Yu Hen Hu received BSEE from National Taiwan University, Taiwan ROC in 1976, and MSEE and PhD degrees from University of Southern California, Los Angeles, CA, USA in 1982. He was in the faculty of the Electrical Engineering Department of Southern Methodist University, Dallas, Texas. Since 1987, he has been with the Department of Electrical and Computer Engineering, University of Wisconsin, Madison where he is currently a professor.

Dr. Hu's broad research interests range from design and implementation of signal processing algorithms, computer aided design and physical design of VLSI, pattern classification and machine learning algorithms, and image and signal processing in general. He has published more than 300 technical papers, edited or co-authored three books and many book chapters in these areas.

Dr. Hu has served as an associate editor for the IEEE Transaction of Acoustic, Speech, and Signal Processing, IEEE signal processing letters, European Journal of Applied signal Processing, Journal of VLSI Signal Processing, and IEEE Multimedia magazine. He has served as the secretary and an executive committee member of the IEEE signal processing society, a board of governor of IEEE neural network council representing the signal processing society, the chair of signal processing society neural network for signal processing technical committee, and the chair of IEEE signal processing society multimedia signal processing technical committee. He was also a steering committee member of the international conference of Multimedia and Expo on behalf of IEEE Signal processing society.

Dr. Hu is a fellow of IEEE.

Technical Session D2-W4-T3: C4I and SoC - Broadband Technologies and Applications, Cyber Security, Cloud Computing, and SoC (System-on-a-Chip)

"A Fault-Tolerant NoC Scheme Using Bidirectional Channel"

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Abstract

A novel Bidirectional Fault-Tolerant NoC (BFT-NoC) capable of mitigating both static and dynamic channel failures is proposed. In a traditional NoC platform, a faulty data channel will force blocked packets to make costly detours, resulting in significant performance hits. In this work, novel fault tolerance measures for a bidirectional NoC platform are proposed. The dynamically reconfigurable bidirectional channels of the BFT-NoC offer great flexibility to contain data-link permanent or transient faults while incurring negligible performance loss. Potential performance advantages in terms of failure rate reduction and reliability enhancement of the BFT-NoC architecture are carefully analyzed. Extensive experimental results clearly validate the fault-tolerance performance of BFT-NoC at both synthetic and real world network traffic patterns.

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 System Level Design, 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 2009, he was a visiting professor in the Department of Electrical and Computer Engineering, University of Wisconsin, Madison, USA. He was also an International Adjunct Professor in the Department of Electrical and Computer Engineering, University of Illinois, Urbana-Champaign, for the Spring Semester, 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.

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