The Third EITA Young Investigator Conference
(The EITA-YIC 2013)

"Leadership, Innovation, Growth"

Conference Proceedings

Ray and Maria Stata Center
Massachusetts Institute of Technology
Cambridge, MA, U.S.A.

Thursday-Friday, August 1-2, 2013

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Welcome Message

Conference Themes

"**Leadership, Innovation, Growth**"

The EITA-YIC 2013 consists of following workshops:

- **Workshop 1 (W1) (Thursday, 8/1/13 only)**: Earth and Atmospheric Sciences, Aerospace and Ocean Engineering
- **Workshop 2 (W2)**: Medicine, Public Health, Biomedical Science and Engineering
- **Workshop 3 (W3)**: New Materials Science and Engineering, Nanotechnology and New Green Energy
- **Workshop 4 (W4) (Friday, 8/2/13 only)**: Broadband and Wireless Computing, Web, Cloud Computing, Cyber Security, and Machine Learning

Planning Committee

Conference Chairs

Lin-Wen Hu	(胡玲文)	Massachusetts Institute of Technology
Yi-Hsiang (Sean) Hsu	(許益祥)	Harvard University

Conference Organizers

Li-San Wang	(王立三)	University of Pennsylvania
Jiashing Yu	(游佳欣)	National Taiwan University
Yu-Bin Chen	(陳玉彬)	National Cheng-Kung University
I-Chun Cheng	(陳奕君)	National Taiwan University
Howard Chen	(陳浩)	IBM T.J. Watson Research Center (Retired)
Chi (Alice) Lu		Massachusetts Institute of Technology
Alina Rei		Massachusetts Institute of Technology
Yi-Chang Shih	(施易昌)	Massachusetts Institute of Technology
How-Huan "Hope" Chen	(陳晧寰)	Harvard University
Meredith Kuo	(郭思妤)	Harvard University
Chih-Ning (Amanda) Tseng	(曾之寧)	Harvard University

Project Manager

Jiashing Yu	(游佳欣)	National Taiwan University

Program Committee

Workshop Track Co-Chairs

Workshop 1 (Thursday, 8/1/13 only): Earth and Atmospheric Sciences, Aerospace and Ocean Engineering

Wen-Wen Tung	(董文文)	Purdue University
Shu-Hua Chen	(陳淑華)	University of California, Davis

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

Li-San Wang	(王立三)	University of Pennsylvania
Jiashing Yu	(游佳欣)	National Taiwan University

Workshop 3: New Materials Science and Engineering, Nanotechnology and New Green Energy

Lin-Wen Hu	(胡玲文)	Massachusetts Institute of Technology
Jung-Tsung Shen	(沈榮聰)	Washington University in St. Louis

Workshop 4 (Friday, 8/2/13 only): Broadband and Wireless Computing, Web, Cloud Computing, Cyber Security, and Machine Learning

Chen-Hsiang (Jones) Yu	(余禎祥)	Zappix, Inc. and PetPace, LTD
Ping-Cheng Yeh	(葉丙成)	National Taiwan University

Conference Manager

Yi-Chang Shih	(施易昌)	Massachusetts Institute of Technology

Publication

Conference Program:

Jiashing Yu	(游佳欣)	National Taiwan University
Alvin Wei-Cheng Wong	(翁唯城)	University of Texas at Dallas

Conference Proceedings:

Yu-Bin Chen	(陳玉彬)	National Cheng-Kung University
Ula Huang	(黃婉柔)	National Cheng-Kung University

Conference Treasurer

Chinese Institute of Engineers – USA
(美洲中國工程師學會大紐約分會)

Local Management (Student Volunteers)

The Republic of China Student Association of M. I. T.
Harvard Taiwan Student Association

On-Site Registration

The Republic of China Student Association of M. I. T.
Harvard Taiwan Student Association

Web Development

Michael Hwa-Han Wang	(王華漢)	EBMedia, LLC

Conference Program

Day 1 (Thursday, August 1, 2013)

8/1 (Thu) 8:30 am - 6:00 pm: Registration
Room: **32-155**

8/1 (Thu) 9:00 am - 9:50 am: Opening Speech
Chair: **Dr. Lin-wen Hu,** Associate Director & Principal Research Scientist, Nuclear Reactor Laboratory (NRL), Massachusetts Institute of Technology
(麻省理工學院核子反應爐實驗室副主任胡玲文博士)
Room: **32-155**

Welcome Remarks:

Ms. Anne Hung
Director General, Taipei Economic and Cultural Office in Boston
(駐波士頓台北經濟文化辦事處洪慧珠處長)

Parallel Sessions:
8/1 (Thu) 9:50 am - 11:20 am: Technical Session D1-W1-T1: Earth and Atmospheric Sciences, Aerospace and Ocean Engineering
Chair: **Dr. Erwan Monier,** Research Scientist, Joint Program on the Science and Policy of Global Change, Center for Global Change Science, Massachusetts Institute of Technology
Room: **32-124**

"Modeling Land Surface Processes in Earth System Models"
Dr. Zong-Liang Yang
Professor and Jackson Chair
Director, Center for Integrated Earth System Science
Jackson School of Geosciences
University of Texas at Austin

Dr. Chien Wang
Senior Research Scientist of Atmospheric Chemistry
Center for Global Change Science
Massachusetts Institute of Technology
(麻省理工学院全球变化科学中心大气化学实验室王謙博士)

"Water Vapor Isotope Analyzer: a New Tool for Atmospheric Research"
Dr. Xiahong Feng
Frederick Hall Professor of Earth Sciences
Dartmouth College

8/1 (Thu) 9:50 am - 11:20 am: Technical Session D1-W2-T1: Medicine, Public Health, Biomedical Science and Engineering
Chair: **Dr. Woei-jyh (Adam) Lee,** Scientist, National Institutes of Health
(美國國家衛生研究院李偉智博士)
Room: **32-155**

Dr. Yun Li
Assistant Professor, Department of Genetics
The University of North Carolina at Chapel Hill

Dr. Jing Maria Zhang
Assistant Professor, Department of Statistics
Yale University

Dr. Hungyun Lin
Senior Scientist
Pfizer Inc.

Dr. Jr-Shin Li
Associate Professor, Department of Electrical and Systems Engineering
Washington University in St. Louis
(聖路易華盛頓大學電機與系統工程學系李智新教授)

8/1 (Thu) 9:50 am - 11:20 am: Technical Session D1-W3-T1: New Materials Science and Engineering, Nanotechnology and New Green Energy

Chair: **Dr. Lin-wen Hu,** Associate Director & Principal Research Scientist, Nuclear Reactor Laboratory (NRL), Massachusetts Institute of Technology
(麻省理工學院核子反應爐實驗室副主任胡玲文博士)
Room: **32-144**

"Designer Germanium Quantum Dots for Novel Nano-electronics, Photonics, and Energy Saving Devices"
Dr. Pei-Wen Li
Professor, Department of Electrical Engineering
National Central University
(中央大學電機工程學系李佩雯教授)

"Photonics and plasmonics for solar energy"
Dr. Jeremy Nathan Munday
Assistant Professor, Institute for Research in Electronics and Applied Physics
University of Maryland, College Park

"Electrochemical Fabrication of Optical Transparent and Tunable Wettability Nickel Hydroxide for 2D Microfluidic Channels"
Dr. Shien-Ping Feng
Assistant Professor, Department of Mechanical Engineering
The University of Hong Kong
(香港大學機械工程系馮憲平教授)

"Plasma-Assisted Nanoprinting and Doping Technology for Manufacturing MoS2-Based Nanoelectronic Devices"
Dr. Xiaogan Liang
Assistant Professor, Department of Mechanical Engineering
The University of Michigan, Ann Arbor

8/1 (Thu) 11:20 am - 11:35 am: Break

Parallel Sessions:

8/1 (Thu) 11:35 am – 1:05 pm: Technical Session D1-W1-T2: Earth and Atmospheric Sciences, Aerospace and Ocean Engineering

Chair: **Dr. Wen-Wen Tung,** Associate Professor, Department of Earth and Atmospheric Sciences, Purdue University
(普渡大學地球與大氣科學系董文文教授)
Room: **32-124**

"Understanding The Wake in Tidal Turbines Arrays: Experimental Investigation of Turbulence Budget Using Porous Disks"
Dr. Heng Xiao
Assistant Professor, Department of Aerospace and Ocean Engineering
Virginia Polytechnic Institute and State University

"Offshore Wind Energy in Taiwan"
Dr. Hsin-Haou Huang
Assistant Professor, Department of Engineering Science and Ocean Engineering
National Taiwan University
(臺灣大學工程科學及海洋工程學系黃心豪教授)

"Local air-sea feedback mechanisms over the shallow water region of the Maritime Continent"
Dr. Pengfei Xue
Postdoc Associate, Department of Earth, Atmospheric and Planetary Sciences
Massachusetts Institute of Technology

"Improving Regional Evapotranspiration Simulation"
Dr. Liyi Xu
Postdoctoral Associate, Center for Global Change Science
Massachusetts Institute of Technology

8/1 (Thu) 11:35 am – 1:05 pm: Technical Session D1-W2-T2: Medicine, Public Health, Biomedical Science and Engineering

Chair: **Dr. Yi-Hsiang (Sean) Hsu,** Assistant Professor, School of Medicine
Harvard University
(哈佛大學醫學院許益祥教授)
Room: **32-155**

Ms. Joyce Yang
Ph.D. Candidate in Biological & Biomedical Sciences
Harvard University
(哈佛大學楊立琦)

"Identifying enhancer–promoter interactions in the human genome"
Ms. Yih-Chii Hwang
Ph.D. Candidate in Genomics and Computational Biology
Department of Pathology and Laboratory Medicine
Perelman School of Medicine, University of Pennsylvania
(賓州大學黃奕綺)

"Genetically Engineered Multi-Purpose Red Blood Cells"
Dr. Hsiang-Ying (Sherry) Lee

Postdoctoral Associate, Whitehead Institute for Biomedical Research
Massachusetts Institute of Technology
(麻省理工學院李湘盈博士)

"Mortality and hospital utilization patterns in the Old Order Amish"
Dr. Woei-jyh (Adam) Lee
Scientist, National Institutes of Health
(美國國家衛生研究院李偉智博士)

8/1 (Thu) 11:35 am – 1:05 pm: Technical Session D1-W3-T2: New Materials Science and Engineering, Nanotechnology and New Green Energy

Chair: **Dr. Jung-Tsung Shen,** Assistant Professor, Department of Electrical & Systems Engineering, Washington University in St. Louis
(聖路易華盛頓大學電機暨系統工程學系沈榮聰教授)
Room: **32-144**

"Towards Sustainable Energy: Carbon Capture, Utilization and Storage (CCUS)"
Dr. Ah-Hyung (Alissa) Park
Lenfest Junior Professor in Applied Climate Science
Associate Director of Lenfest Center for Sustainable Energy
Department of Earth and Environmental Engineering
Department of Chemical Engineering
Columbia University

"Scalable 3-D Nanostructure Array Integration and Manufacturing: A Nanomaterials Roadmap toward Ultrahigh Efficiency, Robustness, and Multi-functionality"
Dr. Pu-Xian Gao
Associate Professor, Department of Chemical, Materials and Biomolecular
& Institute of Materials Science
University of Connecticut, Storrs

"Synthesis and Applications of Two-Dimensional Materials beyond Graphene"
Dr. Albert Yi-Hsien Lee
Assistant Professor, Department of Material Science and Engineering
National Tsing Hua University
(清華大學材料科學工程學系李奕賢教授)

"Multifunctional polymer nanofibers with high thermal conductivity and Young's modulus"
Dr. Sheng Shen
Assistant Professor, Department of Mechanical Engineering
Carnegie Mellon University

8/1 (Thu) 1:05 pm - 2:35 pm: Lunch

Parallel Sessions:

8/1 (Thu) 2:35 pm – 4:05 pm: Technical Session D1-W1-T3: Earth and Atmospheric Sciences, Aerospace and Ocean Engineering

Chair: **Dr. Hsin-Haou Huang,** Assistant Professor, Department of Engineering Science and Ocean Engineering, National Taiwan University
Room: **32-124**

"Impact of aging mechanism on model simulated carbonaceous aerosols"
Dr. Shiliang Wu
Assistant Professor, Department of Geological and Mining Engineering and Sciences
Assistant Professor, Department of Civil and Environmental Engineering
Michigan Technological University

"Uncertainty in regional climate projections"
Dr. Erwan Monier
Research Scientist, Joint Program on the Science and Policy of Global Change
Center for Global Change Science
Massachusetts Institute of Technology

"Asymmetry of the Convection in the Madden-Julian Oscillation"
Dr. Wen-wen Tung
Associate Professor, Department of Earth, Atmospheric, and Planetary Sciences
Purdue University
(普渡大學地球與大氣科學系董文文教授)

8/1 (Thu) 2:35 pm – 4:05 pm: Technical Session D1-W2-T3: Medicine, Public Health, Biomedical Science and Engineering

Chair: **Dr. Aichi Chien,** Assistant Professor, Biomedical Physics IDP, Division of Interventional Neuroradiology, Department of Radiological Sciences, Ronald Reagan UCLA Medical Center, David Geffen School of Medicine at UCLA
(加州大學洛杉磯分校大衛格芬醫學院簡艾琪教授)
Room: **32-155**

"Selfassembled Polymeric Particles for Drug Delivery"
Dr. Ying Liu
Assistant Professor, Department of Chemical Engineering
The University of Illinois at Chicago

"Neural Differentiation of Pluripotent Stem Cells and the Cell Labeling with Magnetic Superparamagnetic Iron Oxides"
Dr. Yan Li
Assistant Professor, Department of Chemical and Biomedical Engineering
Florida State University

"Structural Basis for Targeting Tight Control of PP2A Holoenzyme Biogenesis"
Dr. Yongna Xing
Assistant Professor, Department of Oncology
School of Medicine and Public Health
University of Wisconsin-Madison

"CoRAL: a machine learning approach to predict non-coding RNAs from small RNA-sequencing data"
Dr. Fanny Yuk Yee Leung
Postdoctoral Researcher, Department of Pathology and Laboratory Medicine
Penn Center for Bioinformatics
University of Pennsylvania
(賓州大學醫學院梁玉儀博士)

8/1 (Thu) 2:35 pm – 4:05 pm: Technical Session D1-W3-T3: New Materials Science and Engineering, Nanotechnology and New Green Energy

Chair: **Dr. Lin-wen Hu,** Associate Director & Principal Research Scientist, Nuclear Reactor Laboratory (NRL), Massachusetts Institute of Technology
(麻省理工學院核子反應爐實驗室副主任胡玲文博士)
Room: **32-144**

"Designing Nanostructured Hybrid Materials for Energy Storage Technologies"
Dr. Guihua Yu
Assistant Professor, Materials Science & Engineering and Mechanical Engineering
Texas Materials Institute, The University of Texas at Austin

"Nanomaterials for Future Green Computation"
Dr. Jie Xiang
Assistant Professor, Department of Electrical and Computer Engineering
University of California, San Diego

Dr. Yu-Lun Chueh
Associate Professor, Department of Material Science and Engineering
National Tsing Hua University
(清華大學材料科學工程學系闕郁倫教授)

Dr. Jung-Tsung Shen
Assistant Professor, Department of Electrical & Systems Engineering
Washington University in St. Louis
(聖路易華盛頓大學電機暨系統工程學系沈榮聰教授)

8/1 (Thu) 4:05 pm – 4:20 pm: Break

Parallel Sessions:

8/1 (Thu) 4:20 pm – 5:50 pm: Technical Session D1-W1-T4: Earth and Atmospheric Sciences, Aerospace and Ocean Engineering

Chair: **Dr. Wen-Wen Tung,** Associate Professor, Department of Earth and Atmospheric Sciences, Purdue University
(普渡大學地球與大氣科學系董文文教授)
Room: **32-124**

"Coupling of an advanced particle microphysics (APM) model with GEOS-Chem, WRF-Chem, and CAM5: Key features and applications"
Dr. Fangqun Yu
Senior Research Associate & Professor
Atmospheric Sciences Research Center
State University of New York at Albany

"Understand multi-scale climate processes over the Maritime Continent by analyzing observed and model simulated data"
Dr. Jian-Hua (Joshua) Qian
Associate Professor of Atmospheric and Climate Science
Department of Environmental, Earth & Atmospheric Sciences
University of Massachusetts, Lowell

"Remote and Local Forcing of Decadal Sea Level and Thermocline Depth Variability in the South Indian Ocean"
Dr. Weiqing Han
Associate Professor, Department of Atmospheric and Oceanic Sciences
University of Colorado at Boulder

8/1 (Thu) 4:20 pm – 5:50 pm: Technical Session D1-W2-T4: Medicine, Public Health, Biomedical Science and Engineering

Chair: **Dr. Woei-jyh (Adam) Lee,** Scientist, National Institutes of Health
(美國國家衛生研究院李偉智博士)
Room: **32-155**

"Investigating tissue specificity of cancer-causing germline mutations"
Dr. Jessica C. Mar
Assistant Professor, Department of Systems & Computational Biology &
Assistant Professor, Department of Epidemiology & Population Health
Albert Einstein College of Medicine

"'Filter Feeding': Principled exploratory filtering approaches for sequence data to identify variants, genes, and regions for genetic follow-up studies"
Dr. Adam Naj
Instructor, Department of Biostatistics and Epidemiology
Senior Scholar, Center for Clinical Epidemiology and Biostatistics
Perelman School of Medicine, University of Pennsylvania

"Limb Regeneration: From Amphibians to Mammals"
Dr. Chia-Ho Cheng
Statistical Programmer Analyst
Institute for Aging Research
Harvard Medical School

8/1 (Thu) 4:20 pm – 5:50 pm: Technical Session D1-W3-T4: New Materials Science and Engineering, Nanotechnology and New Green Energy

Chair: **Dr. Jung-Tsung Shen,** Assistant Professor, Department of Electrical & Systems Engineering, Washington University in St. Louis
(聖路易華盛頓大學電機暨系統工程學系沈榮聰教授)
Room: **32-144**

"High-Efficiency Nanowire Light-Emitting Diodes for Phosphor-Free Solid-State Lighting"
Dr. Zetian Mi
Associate Professor, Department of Electrical and Computer Engineering
McGill University

"Fabrication of Functionalized Graphene-based Materials and Their Applications to Electrochemical Energy Storage"
Dr. Yu Ting
Nanyang Assistant Professor Division of Physical and Applied Physics
School of Physical & Mathematical Sciences
Nanyang Technological University
(南洋理工大学于霆教授)

Dr. Junxia (Lucy) Shi

Assistant Professor, the Department of the Electrical and Computer Engineering
The University of Illinois at Chicago

"Building Three-Dimensional Surface Patterning on Nanostructures by Self-Assembly"
Dr. Jeong-Hyun Cho
Assistant Professor, Department of Electrical and Computer Engineering
University of Minnesota, Twin Cities

Day 2 (Friday, August 2, 2013)

8/2 (Fri) 8:30 am - 6:00 pm: Registration
Room: **32-155**

Parallel Sessions:
8/2 (Fri) 9:50 am - 11:20 am: Technical Session D2-W2-T1: Medicine, Public Health, Biomedical Science and Engineering
Chair: **Dr. Aichi Chien,** Assistant Professor, Biomedical Physics IDP, Division of Interventional Neuroradiology, Department of Radiological Sciences, Ronald Reagan UCLA Medical Center, David Geffen School of Medicine at UCLA

(加州大學洛杉磯分校大衛格芬醫學院簡艾琪教授)

Room: **32-155**

"Development of Pin1 inhibitors to treat aggressive cancers"
Dr. Shuo Dennis Wei
Postdoctoral Research Fellow, Department of Medicine
Beth Israel Deaconess Medical Center
Harvard Medical School

(哈佛醫學院魏碩博士)

Dr. Wen-Chi Chou
Postdoctoral Research Fellow, Hebrew SeniorLife
Harvard Medical School

"Designing Small Molecule Drugs for Staphylococcus Aureus Infection"
Dr. Fu-Yang (Albert) Lin
Postdoctoral Research Fellow, Springer Lab
Department of Biological Chemistry and Molecular Pharmacology
Harvard Medical School

"ATF3 induction and axon regeneration in DRG neurons"
Dr. Yung-Chih (Inge) Cheng
Postdoctoral Research Fellow
Clifford Woolf's Laboratory, Boston Children's Hospital
Harvard Medical School

8/2 (Fri) 9:50 am - 11:20 am: Technical Session D2-W3-T1: New Materials Science and Engineering, Nanotechnology and New Green Energy
Chair: **Dr. Lin-wen Hu,** Associate Director & Principal Research Scientist, Nuclear Reactor Laboratory (NRL), Massachusetts Institute of Technology

(麻省理工學院核子反應爐實驗室副主任胡玲文博士)

Room: **32-144**

"Catalytic Characterization of Meso-/microporous Lamellar Zeolite Catalysts"
Dr. Dongxia Liu
Assistant Professor, Department of Chemical and Biomolecular Engineering
University of Maryland, College Park

Dr. Ying-Hao Eddie Chu
Assistant Professor, Department of Materials Science and Engineering
National Chiao Tung University
(交通大學材料系朱英豪教授)

"Hierarchical Carbon Nanotube Architectures for Water Treatment"
Dr. Chongzheng Na
Assistant Professor, Department of Civil & Environmental Engineering & Earth Sciences
Assistant Professor, College of Engineering
University of Notre Dame

"Nanowire-based Lead-Free Nanosolders for Nanoelectronics Assembly and Interconnection"
Dr. Zhiyong Gu
Associate Professor, Department of Chemical Engineering
University of Massachusetts Lowell
(麻州大學洛爾分校化學工程系谷志勇教授)

8/2 (Fri) 9:50 am - 11:20 am: Technical Session D2-W4-T1: Broadband and Wireless Computing, Web, Cloud Computing, Cyber Security, and Machine Learning

Chair: **Dr. Chen-Hsiang (Jones) Yu,** Zappix, Inc. and PetPace, LTD
Room: **32-124**

"Mobile-to-Mobile Cooperation in Uplink Cellular Communication"
Dr. Mai Vu
Associate Professor, Department of Electrical and Computer Engineering
Tufts University

"User Cooperation in Media-Sharing Social Networks"
Dr. H. Vicky Zhao
Associate Professor, Department of Electrical & Computer Engineering
University of Alberta

Dr. Tian Lan
Assistant Professor, Department of Electrical and Computer Engineering
George Washington University

"Understanding the Robustness of SSDs under Power Fault"
Dr. Feng Qin
Assistant Professor, Department of Computer Science and Engineering
The Ohio State University

8/2 (Fri) 11:20 am - 11:35 am: Break

Parallel Sessions:

8/2 (Fri) 11:35 am – 1:05 pm: Technical Session D2-W2-T2: Medicine, Public Health, Biomedical Science and Engineering

Chair: **Dr. Li-San Wang,** Assistant Professor, Department of Pathology and Laboratory Medicine, University of Pennsylvania Perelman School of Medicine
(賓州大學醫學院王立三教授)
Room: **32-155**

"Prevention of Hemorrhagic Stroke—the Role of Science and Engineering"
Dr. Aichi Chien
Assistant Professor, Biomedical Physics IDP, Division of Interventional Neuroradiology, Department of Radiological Sciences, Ronald Reagan UCLA Medical Center, David Geffen School of Medicine at UCLA
(加州大學洛杉磯分校大衛格芬醫學院簡艾琪教授)

"Magnetic Resonance guided Focused Ultrasound Treatment (MRgFUS)"
Dr. Chang-Sheng Mei
Assistant Professor, Department of Physics
Soochow University
(東吳大學物理系梅長生教授)

"Lipid-based nanoparticles for Intracellular Delivery of Proteins for Cancer Therapy"
Dr. Qiaobing Xu
Assistant Professor, Department of Biomedical Engineering and
Assistant Professor, Department of Chemical and Biological Engineering
Tufts University

Dr. Yi-Hsiang (Sean) Hsu
Assistant Professor, School of Medicine
Harvard University
(哈佛大學醫學院許益祥教授)

8/2 (Fri) 11:35 am – 1:05 pm: Technical Session D2-W3-T2: New Materials Science and Engineering, Nanotechnology and New Green Energy

Chair: **Dr. Jung-Tsung Shen,** Assistant Professor, Department of Electrical & Systems Engineering, Washington University in St. Louis
(聖路易華盛頓大學電機暨系統工程學系沈榮聰教授)
Room: **32-144**

"Development of Schottky Structure Radiation Sensor on Freestanding Gallium Nitride"
Dr. Lei Raymond Cao
Assistant Professor and Director, Nuclear Analysis and Radiation Sensor Lab
Department of Mechanical and Aerospace Engineering
The Ohio State University

"Advanced modeling of pebble-bed reactors: granular flow simulation and radiation transport in stochastic media"
Dr. Wei Ji
Assistant Professor, Department of Mechanical, Aerospace, and Nuclear Engineering
Rensselaer Polytechnic Institute
(伦斯勒理工學院季崴教授)

"Enhanced Ion and Molecule Transport in 2-D Nanofluidic Channels"
Dr. Chuanhua Duan
Assistant Professor, Department of Mechanical Engineering
Boston University

Dr. Lin-wen Hu
Associate Director & Principal Research Scientist

Nuclear Reactor Laboratory (NRL)
Massachusetts Institute of Technology
(麻省理工學院核子反應爐實驗室副主任胡玲文博士)

8/2 (Fri) 11:35 am - 1:05 pm: Technical Session D2-W4-T2: Broadband and Wireless Computing, Web, Cloud Computing, Cyber Security, and Machine Learning

Chair: **Dr. Chen-Hsiang (Jones) Yu,** Zappix, Inc. and PetPace, LTD
Room: **32-124**

"Continuous Gesture Recognition for Natural Interaction"
Ms. Ying Yin
Ph.D. Candidate, Computer Science and Artificial Intelligence Laboratory
Department of Electrical Engineering and Computer Science
Massachusetts Institute of Technology

"Exploiting Network Effects for Fraud and Malware Detection"
Dr. Duen Horng "Polo" Chau
Assistant Professor, School of Computational Science & Engineering
Georgia Institute of Technology

Dr. Jing Gao
Assistant Professor, Department of Computer Science and Engineering
The State University of New York at Buffalo

8/2 (Fri) 1:05 pm - 2:35 pm: Lunch

Parallel Sessions:

8/2 (Fri) 2:35 pm – 4:05 pm: Technical Session D2-W2-T3: Medicine, Public Health, Biomedical Science and Engineering

Chair: **Dr. Li-San Wang,** Assistant Professor, Department of Pathology and Laboratory Medicine, University of Pennsylvania Perelman School of Medicine
(賓州大學醫學院王立三教授)
Room: **32-155**

"Innate immune activation modulates HIV infection"
Dr. Theresa Li-Yun Chang
Associate Professor, Rutgers, The State University of New Jersey
(羅格斯新澤西州立大學張璨云教授)

Dr. Abel Po-Hao Huang
Neurosurgeon, National Taiwan University Hospital, Yun-Lin branch
Clinical lecturer, College of Medicine, National Taiwan University Hospital
(台大醫院神經外科黃博浩醫師)

"Integrated Genomic Analysis of Prostate Cancer Disparities between Caucasian and African American Populations"
Dr. Bi-Dar Wang
Assistant Research Professor, Department of Pharmacology and Physiology
The George Washington University Medical Center

(喬治華盛頓大學醫學院王必達教授)

"GUCY2C at the intersection of obesity and colorectal cancer"
Dr. Jieru Egeria Lin
Research Fellow, Thomas Jefferson University

8/2 (Fri) 2:35 pm – 4:05 pm: Technical Session D2-W3-T3: New Materials Science and Engineering, Nanotechnology and New Green Energy

Chair: **Dr. Jung-Tsung Shen,** Assistant Professor, Department of Electrical & Systems Engineering, Washington University in St. Louis
(聖路易華盛頓大學電機暨系統工程學系沈榮聰教授)
Room: **32-144**

"Atmospheric-Pressure-Plasma-Jet Rapid Sintering Process for TiO2 Photoanodes of Dye-Sensitized Solar Cells"
Dr. I-Chun Cheng
Associate Professor, Graduate Institute of Photonics and Optoelectronics
Department of Electrical Engineering
National Taiwan University
(台灣大學電機工程學系陳奕君教授)

"Light up the Way of Energy Sustainability: from Green IT to Solar Energy"
Dr. Jifeng Liu
Assistant Professor, Thayer School of Engineering
Dartmouth College

"Design and Fabrication of Multifunctional Three-Dimensional Nanostructured Materials"
Dr. Chih-Hao Chang
Assistant Professor, Department of Mechanical & Aerospace Engineering
North Carolina State University

"Mechanics and Energy Transfer in Scalable Plasmonic Nanomanufacturing"
Dr. Liang Pan
Assistant Professor, School of Mechanical Engineering
Purdue University
(普渡大学机械工程学院潘亮教授)

8/2 (Fri) 2:35 pm - 4:05 pm: Technical Session D2-W4-T3: Broadband and Wireless Computing, Web, Cloud Computing, Cyber Security, and Machine Learning

Chair: **Dr. Chen-Hsiang (Jones) Yu,** Zappix, Inc. and PetPace, LTD
Room: **32-124**

Ms. Oshani Seneviratne
PhD Candidate, Computer Science and Artificial Intelligence Laboratory
Department of Electrical Engineering and Computer Science
Massachusetts Institute of Technology

"Adapting User Interfaces to Cultural Differences in Perception and Preferences"
Dr. Katharina Reinecke
Postdoctoral Fellow, Intelligent and Interactive Systems Group

School of Engineering and Applied Sciences
Harvard University

"Cyber-Physical Systems: From Learning, Optimization to Security"
Dr. Haibo He
Associate Professor, Department of Electrical, Computer, and Biomedical Engineering
Director, Computational Intelligence and Self-Adaptive Systems (CISA) Laboratory
University of Rhode Island

8/2 (Fri) 4:05 pm – 4:20 pm: Break

Parallel Sessions:

8/2 (Fri) 4:20 pm – 5:50 pm: Technical Session D2-W2-T4: Medicine, Public Health, Biomedical Science and Engineering

Chair: **Dr. Yi-Hsiang (Sean) Hsu,** Assistant Professor, School of Medicine, Harvard University
(哈佛大學醫學院許益祥教授)
Room: **32-155**

"One-to-Many and Many-to-One Binding Mechanisms in Intrinsically Disordered Proteins"
Ms. Wei-Lun Hsu
Ph.D. Student, Center for Computational Biology and Bioinformatics
Department of Biochemistry and Molecular Biology
Indiana University School of Medicine

"Comparing and Intercoverting Expression Profiles from Microarrays to RNASeq"
Dr. Yaoyu E. Wang
Associate Director, Center for Cancer Computational Biology
Dana-Farber Cancer Institute
(波士頓達納法伯癌症研究所王耀煜博士)

"Vitamin D and Type 2 Diabetes: From Observation to Intervention"
Dr. Yiqing Song
Assistant Professor of Medicine, Division of Preventive Medicine
Brigham and Women's Hospital/Harvard Medical School
(哈佛医学院布莱根妇女医院宋一青教授)

"Alzheimer's Disease: A Genomics Approach"
Dr. Li-San Wang
Assistant Professor, Department of Pathology and Laboratory Medicine
University of Pennsylvania Perelman School of Medicine
(賓州大學醫學院王立三教授)

8/2 (Fri) 4:20 pm – 5:50 pm: Technical Session D2-W3-T4: New Materials Science and Engineering, Nanotechnology and New Green Energy

Chair: **Dr. Lin-wen Hu,** Associate Director & Principal Research Scientist, Nuclear Reactor Laboratory (NRL), Massachusetts Institute of Technology
(麻省理工學院核子反應爐實驗室副主任胡玲文博士)
Room: **32-144**

"Silicon Photonics and Photonics Crystals"
Dr. Wei Jiang

Associate Professor, Department of Electrical and Computer Engineering &
Institute for Advanced Materials, Devices and Nanotechnology
Rutgers, The State University of New Jersey

"Nano Plasmonic Devices based on Metasurfaces"
Dr. Yongmin Liu
Assistant Professor, Department of Mechanical and Industrial Engineering &
Department of Electrical and Computer Engineering
Northeastern University
(东北大学电子与计算机工程系刘咏民教授)

Dr. Juejun Hu
Assistant Professor, Department of Materials Science and Engineering
University of Delaware
(特拉华州立大学材料科学与工程系胡崛隽教授)

Dr. Chien-Wen Hsieh
Assistant Professor, Institute of Lighting and Energy Photonics
National Chiao Tung University
(交通大學光電學院謝建文教授)

8/2 (Fri) 4:20 pm - 5:50 pm: Technical Session D2-W4-T4: Broadband and Wireless Computing, Web, Cloud Computing, Cyber Security, and Machine Learning

Chair: **Dr. Chen-Hsiang (Jones) Yu,** Zappix, Inc. and PetPace, LTD
Room: **32-124**

"A Measurement-based Study of MultiPath TCP Performance over Wireless Networks"
Mr. Yung-Chih Chen
Ph.D. Candidate, School of Computer Science
University of Massachusetts at Amherst
(麻州大學安默斯特分校陳勇志)

"Digital Humanities and its Challenges to Information Technologists"
Dr. Shih-Pei (Gail) Chen
Postdoctoral researcher, Fairbank Center for Chinese Studies
Harvard University

"Web Page Enhancement on Desktop and Mobile Browsers"
Dr. Chen-Hsiang (Jones) Yu
Director of Mobile Engineering and User Experience,
Zappix, Inc. and PetPace, LTD

Dr. Ping-Cheng Yeh
Associate Professor, Department of Electrical Engineering
National Taiwan University
(台灣大學電機工程學系葉丙成教授)

Abstracts and Biographies

Day 1 (August 1st[h], 2013)

Opening Session

Opening Speech and Conference Co-Chair

Lin-wen Hu

Associate Director & Principal Research Scientist
Nuclear Reactor Laboratory (NRL), Massachusetts Institute of Technology
(麻省理工學院核子反應爐實驗室副主任胡玲文博士)

BIOGRAPHY

Opening Session

Opening Speech and Conference Co-Chair

Yi-Hsiang (Sean) Hsu

Assistant Professor, School of Medicine
Harvard University
(哈佛大學醫學院許益祥教授)

BIOGRAPHY

Opening Session

Welcome Remarks

Ms. Anne Hung

Director General, Taipei Economic and Cultural Office in Boston
(駐波士頓台北經濟文化辦事處洪慧珠處長)

BIOGRAPHY

Workshop Co-Chair

Shu-Hua Chen

Professor, University of California, Davis
One Shields Avenue, Davis, CA 95616
Tel: +1-530-752-1822, Fax: +1-530-752-1793
Email: shachen@ucdavis.edu
(加州大學戴維斯分校陳淑華教授)

BIOGRAPHY

Professor Shu-Hua Chen was born in Nantou, Taiwan. She received her B.S. degree in Atmospheric Science in 1993 from National Taiwan University in Taipei, Taiwan, and her M.S. (1995) and Ph.D. (1999) degrees in Atmospheric Science from Purdue University, West Lafayette, IN.

Shu-Hua was a postdoctoral researcher at National Center for Atmospheric Research in Boulder, CO for 2 years. She was there to help develop the Weather Research and Forecasting model, a current community mesoscale model. Shu-Hua taught one year in the Department of Atmospheric Science at National Central University, Taiwan in 2006-2007. She is now a Full Professor in the Department of Land Air and Water Resources at University of California, Davis. Her major research interests are in regional climate change, cloud physics, orographic rainfall, data assimilation, and hurricanes using numerical modeling tools. Below are her recent publications:

Silverman, N. L., M. P. Maneta, S.-H. Chen, J. T. Harper, 2013: Dynamically downscaled winter precipitation over complex terrain of the Central Rockies of Western Montana, USA, Water Resources Research, 49, 458-470.

Chen, S.-H., J.-Y. Chen, W.-Y. Chang, P.-L. Lin, P.-H. Lin, and W.-Y. Sun,2011: Observing System Simulation Experiment: Development of the system and preliminary results, J. Geophys. Res., 116, D13202, doi:10.1029/2010JD015103.

Chen, S.-H, S.-H. Wang, and M. Waylonis, 2010: Modification of Saharan air layer and environmental shear over the eastern Atlantic Ocean by dust-radiation effects, J. Geophys. Res., 115, D21202, doi:10.1029/2010JD014158.

Chen, S.-H. and Y.-C. Siao, 2010: Evaluation of an explicit one-dimensional time dependent tilting cloud model: sensitivity to relative humidity. J. Meteor. Soc. Japan, DOI:10.2151/jmsj.2010-201, 88, 95-121.

Dr. Chen. NASA Group Achievement Award to Genesis and Rapid Intensification Processes (GRIP), member of American Meteorological Society, member of American Geophysical Union, member of Hurricane Intensity Research Working Group, NOAA in 2006.

Technical Session D1-W1-T1: Earth and Atmospheric Sciences, Aerospace and Ocean Engineering

Session Chair

Erwan Monier

Research Scientist, Center for Global Change Science
Massachusetts Institute of Technology
77 Massachusetts Ave, E19-439GA
Cambridge, MA, 02139 USA
Tel: +1-617-715-5429, Fax: +1-617-253-9845
Email: emonier@mit.edu

BIOGRAPHY

Dr. Erwan Monier holds a Ph.D. in atmospheric science from the University of California, Davis and a M.Eng. in hydraulics and fluid mechanics from the National Polytechnic Institute of Toulouse, ENSEEIHT, a French top engineering school. He joined the Massachusetts Institute of Technology as a Postdoctoral Associate at the Center for Global Change Science and at the Joint Program on the Science and Policy of Global change in 2009 and has been a Research Scientist since 2011. Dr. Monier's research interests include climate modeling, uncertainty in climate change projections, climate change impacts, as well as climate variability including El Nino-Southern Ocean and the Madden-Julian Oscillation. He is a lead researcher in the development of a 3-dimensional climate modeling framework at MIT to investigate uncertainty in regional climate change and he participated in the intercomparison project with Earth System Models of Intermediate Complexity (EMICs) undertaken in support of the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5). Dr. Monier is a lifetime member of the American Geophysical Union (AGU) and the European Geosciences Union (EGU) and a member of the American Meteorological Society (AMS). He has published articles in peer-reviewed international journals such as Atmospheric Chemistry and Physics, Journal of Climate, Climate Dynamics, Climatic Change, Climate of the Past, and Geophysical Research Letters.

Technical Session D1-W1-T1: Earth and Atmospheric Sciences, Aerospace and Ocean Engineering

Modeling Land Surface Processes in Earth System Models

Zong-Liang Yang

Professor and Jackson Chair
Director, Center for Integrated Earth System Science
Jackson School of Geosciences
University of Texas at Austin
Austin, Texas 78712-0254, USA
Tel: +1-512-471-3824, Fax: +1-512-471-9425
Email: liang@jsg.utexas.edu

ABSTRACT

The rapid development of land surface models (LSMs) over the past three decades has reached a point that these LSMs can adequately represent the surface energy, water, and carbon balances spanning a wide range of space and time scales, as judged by comparison with a wealth of surface and remote sensing datasets. LSMs have been used in various weather, climate, and earth system studies, such as assessing the coupling strength between the land surface and the atmosphere, understanding climate and carbon interaction and feedbacks, and quantifying the impacts of land use and land cover change on climate change. Recently, LSMs are being merged with other types of models including surface hydrology (river flows with implications for flooding and drought, soil chemistry, nutrient transport, and freshwater inflow to coastal zones), groundwater (aquifers, irrigation, and human withdrawals), ecology (vegetation growth and health, crop yield, wetlands, and riverine ecosystems), and air quality (biogenic emissions, dust emissions, aerosols, urban canopy layer, and dry/wet deposition). New data assimilation methods are being explored to take advantage of remote sensing products, surface flux network measurements, and aircraft datasets to improve LSMs' predictive skills. Multi-physics (or multi-parameterization) frameworks have been incorporated in LSMs to allow for multi-hypothesis testing and uncertainty quantification. Hyperresolution modeling at scales of O(100 m) is being proposed to take advantage of the emerging petascale computational resources. Therefore, next-generation LSMs are becoming more complex as we are facing unprecedented challenges to understand variability and change on all time and space scales, and to quantify the climatic impacts on energy and water resources, agriculture, ecosystems, and environmental conditions for decision-making. As a result, the new development of these LSMs demands much more coordinated and integrated efforts from multi-disciplinary groups.

BIOGRAPHY

Professor Zong-Liang Yang obtained his BS in meteorology from Nanjing Institute of Meteorology, China in 1984, MSc in Meteorology from University of Melbourne, Australia (under Ian Simmonds) in 1989, and Ph.D. in atmospheric sciences from Macquarie University, Australia (under Ann Henderson-Sellers) in 1992. He spent one year as a postdoc with Ann Henderson-Sellers to be the first coordinator of the PILPS (Project for Intercomparison of Land-surface Parameterization Schemes) before working with Bob Dickinson as a postdoc in 1993. He spent eight years at the University of Arizona, working with Bob Dickinson, Jim Shuttleworth and Soroosh Sorooshian, moving from a postdoc to a research associate professor. He then started

as a tenure-track teaching faculty member at the University of Texas at Austin (UT-Austin) in 2001, and became a tenured associate professor in 2005, a tenured full professor in 2008, and an endowed Jackson Chair in earth system science in 2011. He is the founding director of the Center for Integrated Earth System Science.

What he has done at UT-Austin in the past 12 years is to build a new climate science program in the Department of Geological Sciences that quantitatively addresses the impacts of climate variability and climate change on environmental issues of societal importance, such as the conditions of freshwater resources, ecosystems, and air quality.

Prof. Yang's publications include more than 100 peer-reviewed articles (well over 60 in the past 12 years at UT-Austin), in addition to about 100 conference proceedings papers, research reports and presentations abstracts, with a total citation of more than 4500 and a current "Hirsch Index" of 35. He has won just over $7 million total as the Principal Investigator in external funding. His graduate students have received prestigious federal fellowships from the National Science Foundation, NASA, NOAA, Department of Homeland Security, and the AGU Hydrology Section's Horton Research Grant. He has received the Joseph C. Walter Jr. Excellence Award, the most prestigious award at the Jackson School of Geosciences. He was a Co-Chair of the National Center for Atmospheric Research (NCAR) Community Earth System Model (CESM) Land Modeling Working Group from 2008 to 2013. He shared NCAR's Community Climate System Model (CCSM) Distinguished Achievement Award in 2008. He has been elected as a member of China's "1000-Talents" Program. He serves in the editorial board of the Environmental Modeling & Software journal, and is the guest editor of Climatic Change.

His research group has developed the parameterizations of terrestrial hydrology used in the cutting-edge versions of one leading US climate model, the National Center for Atmospheric Research Community Earth System Model (CESM). His group has also developed the next-generation land surface model (Noah-MP) for the Weather Research and Forecast (WRF) regional modeling system.

At UT-Austin, he founded in 2011 the Center for Integrated Earth System Science (CIESS; http://www.jsg.utexas.edu/ciess), a cooperative effort between the Jackson School of Geosciences and the Cockrell School of Engineering. He has collaborated with Jackson School of Geosciences colleagues in the Department of Geological Sciences (DGS), the Bureau of Economic Geology (BEG) and the Institute for Geophysics (UTIG), as well with scientists in other academic units and institutions in the US and worldwide.

Chien Wang

Senior Research Scientist of Atmospheric Chemistry
Center for Global Change Science
Massachusetts Institute of Technology
(麻省理工学院全球变化科学中心大气化学实验室王謙博士)

ABSTRACT

BIOGRAPHY

Technical Session D1-W1-T1: Earth and Atmospheric Sciences, Aerospace and Ocean Engineering

Water Vapor Isotope Analyzer: a New Tool for Atmospheric Research

Xiahong Feng

Frederick Hall Professor of Earth Sciences
Dartmouth College
6015 Fairchild
Hanover NH 03755
Tel: +1-603-646-1712, Fax: +1-603-646-3922
Email: Xiahong.feng@dartmouth.edu

ABSTRACT

Stable oxygen and hydrogen isotopic compositions of precipitation have been a power tool for studying the hydrological cycles of the earth and for reconstructions of paleoclimate. What we learned from ice cores about the history glaciation during the past a few hundred thousand years is an outstanding example. Similar studies are being conducted today for understanding atmospheric dynamics and change. In climatology and meteorology research, it is often desirable or necessary to know the isotopic compositions of the water vapor component of the atmosphere. Until recently, making such a measurement, even with limited temporal resolution (e.g., 30-60 minute integrated average), required significant effort.

Development and use of spectral based water vapor analyzers is revolutionizing the way we investigate the atmosphere using stable isotope tracers. The water vapor isotope analyzer (WVIA) quantifies the differential absorption of infrared light by different water isotopologues in vapor. It is capable of high frequency measurements of up to once every 10 seconds (in contrast to every 30-60 minutes), and mobile deployment. This ability opens up a range of new possibilities, such as identifying moisture sources and temporal variations of vapor isotopes in the atmosphere, and partitioning evaporation and transpiration. Two examples will be used to demonstrate its use and power. In the first example, we investigated how marine and glacial air masses interact to affect local wind and moisture conditions. And in the second example, we used a WVIA over a lake to quantify lake evaporation.

Similar spectral technologies are increasingly used in ground- and satellite-based observations of the entire atmospheric column, and global coverage of vapor isotopic observations may become available for utilization in weather and climate forecasts of the future.

BIOGRAPHY

Xiahong Feng received her B.S. (1982) and M.S. (1985) in Geochemistry from Peking University, Beijing, China. She received her Ph.D. (1991) from the Case Western Reserve University in Geochemistry, and was postdoctoral fellow at California Institute of Technology from 1991 to 1994. Currently, Feng is a Professor of Earth Science and Frederick Hall Professor of Mineralogy and Petrology at Dartmouth College. Her research takes an interdisciplinary approach to global and local environmental problems. She uses isotopic tracers of oxygen, hydrogen, carbon and nitrogen in natural materials to study the function and dynamics of natural systems, to trace the history of

climatic and environmental changes, and to understand the mechanisms for such changes.

Her current NSF-supported research concerns how sea ice affects sea surface evaporation and land precipitation in the Arctic, and how this effect interacts with the global climate system.

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

Workshop Co-Chair

Jiashing Yu

Assistant Professor, Department of Chemical Engineering
National Taiwan University
(臺灣大學化學工程學系游佳欣教授)

BIOGRAPHY

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

Session Chair

Woei-jyh (Adam) Lee

Scientist, National Institutes of Health
Bethesda, Maryland 20892, USA
E-mail: adamlee@mail.nih.gov
(美國國家衛生研究院李偉智博士)

BIOGRAPHY

Dr. Woei-jyh (Adam) Lee received his BSE degree from the National Taiwan University, his MS degree from the Courant Institute at the New York University, and his PhD degree from the University of Maryland at College Park (UMD). He worked on distributed objects and fault tolerance at AT&T Labs - Research in 1997. He focused on network software and management at Bell Laboratories Research, Lucent Technologies, from 1998 till 2000. He visited the University of Southern California specializing in continuous media streaming and multimedia networking from 2002 to 2003.

Dr. Lee worked on distributed objects and fault tolerance at the AT&T Labs - Research in 1997. He focused on network software and management at the Bell Laboratories Research, Lucent Technologies, from 1998 till 2000. He visited the University of Southern California specializing in continuous media streaming and multimedia networking from 2002 to 2003. He contributed in protein domain parsing and boundary prediction at the National Cancer Institute (NCI), National Institutes of Health (NIH) from 2004 to 2005. He was a fellow focusing on human genetics and genomics at the National Center for Biotechnology Information, National Library of Medicine, NIH from 2009 to 2012. He became a special volunteer working on computational modeling for cancer progression and metastatic at the NCI, NIH since 2012. He was also affiliated with the Center for Bioinformatics and Computational Biology and the Institute for Advanced Computer Studies at the UMD.

Dr. Lee is currently a faculty of Information Systems at the Robert H. Smith School of Business at the UMD since 2012. His research interests include bioinformatics, computational biology, cancer biology, genomics and genetics, information integration, data management and mining, and literature-based discovery. He has two US Patents and is a member of the ISCB and the ISENG.

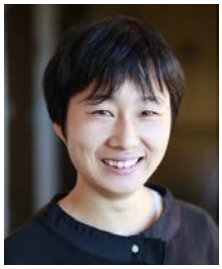
Technical Session D1-W2-T1: Medicine, Public Health, Biomedical Science and Engineering

Yun Li

Assistant Professor, Department of Genetics
The University of North Carolina at Chapel Hill

ABSTRACT

BIOGRAPHY



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

Jing Maria Zhang

Assistant Professor, Department of Statistics
Yale University

ABSTRACT

BIOGRAPHY

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

Hungyun Lin

Senior Scientist
Pfizer Inc.

ABSTRACT

BIOGRAPHY

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

Jr-Shin Li

Associate Professor, Department of Electrical and Systems Engineering
Washington University in St. Louis
(聖路易華盛頓大學電機與系統工程學系李智新教授)

ABSTRACT

BIOGRAPHY

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

Workshop Co-Chair and Session Chair

Lin-wen Hu

Associate Director & Principal Research Scientist
Nuclear Reactor Laboratory (NRL), Massachusetts Institute of Technology
(麻省理工學院核子反應爐實驗室副主任胡玲文博士)

BIOGRAPHY

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

Designer germanium quantum dots for novel nano-electronics, photonics, and energy saving devices

Pei-Wen Li

Professor, Department of Electrical Engineering, National Central University
300 ChungDa Road, ChungLi, Taiwan, ROC
Tel: +011-886-3427-9222, Fax: +011-886-342-5830
Email: pwli@ee.ncu.edu.tw
(中央大學電機工程學系李佩雯教授)

ABSTRACT

Since their inception in the early 1980s quantum dots (QDs) have found widespread applications in advanced electronics, photonics, memories, as well as in thermoelectric, metrology, and biosensing devices. For semiconductor QDs, the key challenge for the production of these mostly self-assembled nanostructures is to achieve precise control over the formation of QDs of desired sizes at specific locations and targeted depths of penetration within an embedding matrix. Our group has successfully demonstrated a unique self-assembly, complementary metal-oxide-semiconductor (CMOS) approach to deliberately locate germanium (Ge) QDs of desired sizes, locations and depths within Si-based semiconductor nanostructures using the control available through lithographic nanopatterning and selective oxidation of the nanopatterned Si1-xGex layers.

During SiGe oxidation, the Si content is preferentially oxidized, releasing Ge to be incorporated within the as-yet unoxidized SiGe regions. Thus, Ge QDs are ultimately formed by a progressive “concentration” of the Ge content within the remaining unoxidized portions of SiGe grains until the entire Si is used up, ultimately leaving Ge QDs embedded within the newly formed SiO2 layer. Accordingly controlled heterogeneous nucleation, growth, size, and location of Ge QDs are demonstrated on SiO2 substrates by means of thermally oxidizing nano-patterned SiGe layers. We also discovered unique migration phenomena for Ge QDs within Si3N4 and Si layers in close proximity with the as-formed QDs, enabling deliberate placement of Ge QDs at targeted locations on these Si-containing layers (Si3N4 and Si substrate) through lithographic patterning and selective oxidation of SiGe pillars over Si-containing buffer layers deposited over the Si substrate. We are able to precisely mold Ge QDs into a variety of forms, such a single QD, specific number of QDs, or stacked QD array on the Si platform for innovative nanoelectronic, nanophotonic, sensing, and microcooling applications.

High-performance Ge QD single-electron transistors (SETs) were demonstrated with clear Coulomb blockade characteristics at T = 77–300K, paving an effective path for resolving electronic structure of the Ge QD and for realizing single charge detection and precision thermometer. We also demonstrated well-organized stacked Ge QDs array of desired QD sizes featuring tunable luminescence/absorption over the visible to near-infrared, that is suitable for broadband photodetection and as a single receiver for optical interconnects. A low dark current density of 1.1 mA/cm2 and a high ratio of photocurrent to dark current up to 35,000 and 1,500, respectively, for 1.5 mW incident illumination at 850nm and 1200 nm were measured on our Ge QD-based MOS photodiodes (Fig. 2). In addition to innovative nano-electronic and photonic applications, the most impressive structure for the Ge QD systems is a reduction of

200X in thermal conductivity and an enhancement of 3X in thermoelectric voltage opposed to their counterpart bulk Si, suggesting Ge nanostructures should have better TE efficiency and may present advantages on enabling efficient site-specific, on-demand cooling and on-chip power management.

BIOGRAPHY

Pei-Wen Li was born in Taiwan in 1967 and received the Bachelor degree in electrophysics from National Chiao-Tung University, Taiwan in 1989, and 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 Vanguard International Semiconductor Corporation working on the process integration of 64M DRAM. Then, she joined I-Shou University as a faculty in the department of Electronic Engineering in 1996. 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 chair during 2007-2010. Currently she is the director of the Center for Nanoscience and Technology, National Central University.

Dr. Li's main research theme focuses on experimental silicon-germanium nanostructures and devices. Her present research encompasses germanium quantum dot single-electron transistors, photodetectors, nonvolatile memory, and energy saving (photovoltaic and thermoelectric) devices, making use of self-assembly nanostructures in silicon integration technology. Her research group has successfully developed a novel CMOS-compatible, self-organized approach for the generation of germanium quantum dots on Si-containing layers through thermal oxidation of silicon-germanium-on-insulator structures. Of particular, the successful demonstration of precise placement and size control of the self-assembled germanium quantum dots shed light on the practical creation of new nano-electronic, nano-photonic, and electromechanical devices. She has published more than 60 journal papers and holds 4 patents in Si device processing.

Dr. Li was awarded Distinguished Young Electrical Engineer from Chinese Electrical Engineering Society in 2005, Distinguished Professorship from National Central University in 2006-2013, Top 10 Rising Stars in Taiwan (Science and Technology) from Central News Agency in 2008. She is an IEEE senior member.

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

Photonics and plasmonics for solar energy

Jeremy Nathan Munday

Assistant Professor, Department of Electrical and Computer Engineering and
Institute for Research in Electronics and Applied Physics
University of Maryland, College Park, MD 20742

ABSTRACT

The main driving force in current photovoltaic research is the desire for cheaper and more efficient devices. We have taken two approaches to this problem by considering the photonic aspects of light absorption in thin layers and the thermodynamic requirements of such devices. We find that the use of photonic and plasmonic waveguiding and light localization can greatly improve the absorption characteristics of thin film solar cells and lead to absorption enhancements in excess of the traditional light trapping limit of 4n2, where n is the index of refraction of the absorber. Further, by considering the photonic aspects of the detailed balance formulation of solar converters, we find several interesting directions to improve solar cell efficiencies, e.g. by modifying the radiative recombination rate. In this talk, I will overview our recent results and on-going experiments aimed at next generation photovoltaics.

BIOGRAPHY

Jeremy Munday is currently an Assistant Professor of Electrical and Computer Engineering at the University of Maryland, College Park, with affiliate appointments in the Institute for Research in Electronics and Applied Physics (IREAP) and the Chemical Physics Graduate Program. He received his PhD in Physics from Harvard in 2008, under the supervision of Federico Capasso, and his BS in Physics Middle Tennessee State University in 2003. He was a postdoctoral scholar in the group of Harry Atwater at Caltech until 2011 when he came to the University of Maryland. His research endeavors range from near field optics, photonics, and plasmonics for solar energy conversion to quantum electromechanical phenomena (such as the Casimir effect) for actuating micro- and nano-mechanical devices. He has received a number of recognitions, including the NASA Early Career Faculty Space Technology Research Award.

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

Electrochemical Fabrication of Optical Transparent and Tunable Wettability Nickel Hydroxide for 2D Microfluidic Channels

Shien-Ping Feng

Assistant Professor, The University of Hong Kong
5-28A, Haking Wong Building, Pokfulam Road, Hong Kong
Tel: +852-2857-8554, Fax: +852-2858-5415
Email: hpfeng@hku.hk
(香港大學機械工程系馮憲平教授)

ABSTRACT

One of the great challenges in fabricating superhydrophobic surface is to maintain the optical transparency because the increase of the surface roughness increases the effect of Mie scattering, which thereby hinders the optical applications. In this work, we report a facile approach to fabricate multifunctional surface which possesses optical transparent and tunable wettability via stepwise anodic electrodeposition of nanostructured nickel hydroxide films and post-treatment of self-assembled octadecyltrimethoxy silane (ODS) monolayer on the F-doped tin oxide (FTO) glass. The wetting contrast between superhydrophobic (nickel hydroxide) and hydrophilic (FTO) is utilized to fabricate the transparent two-dimensional (2D) microfluid channels with a fast flow speed of 5mm/s through a cost-effective electrochemical attach-detach micropatterning technique.

BIOGRAPHY

Shien-Ping Feng (another name is Hsien-Ping Feng) is an Assistant Professor in the department of Mechanical Engineering at Hong Kong University. He received his Ph.D. in chemical engineering from National Tsing-Hua University (2003-2008), and was a postdoctoral associate at MIT (2009-2011) prior to his appointment at Hong Kong University. He was a principal engineer, section manager and technical manager at Taiwan Semiconductor Manufacturing Company (2001-2008), and a deputy director at Tripod Research Center (2008-2009). His current research is focused on electrochemical processing and interfacial characterization of nanostructured materials, and their applications on energy conversion and storage.

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

Plasma-Assisted Nanoprinting and Doping Technology for Manufacturing MoS2-Based Nanoelectronic Devices

Xiaogan Liang

Assistant Professor, Department of Mechanical Engineering
The University of Michigan, Ann Arbor

ABSTRACT

Molybdenum disulfide (MoS2), previously widely used as a lubricant material, recently attracts a great deal of attention because of its attractive electronic, optoelectronic, and mechanical properties.1-3 Especially, monolayer and few-layer MoS2 films have a large direct bandgap that is suitable for semiconductor-related applications such as thin-film transistors (TFTs)1, chemical sensors4, and light emission devices2. Such atomically layered films also exhibit a high mechanical flexibility and can be used for making flexible electronic products with high performance.3 The current methods for producing few-layer MoS2 flakes include scotch tape exfoliation,5 chemical vapor deposition (CVD),6 and laser-thinning process7 etc. These methods still suffer from specific disadvantages and cannot create ordered, pristine MoS2 device arrays over large areas that are required for large-area applications. Therefore, novel low-cost, upscalable nanofabrication methods are needed for addressing such manufacturing-related issues and enabling the future scale-up applications of MoS2 in electronics and optoelectronics. In this work, we systematically studied transfer-printing approaches for creating orderly arranged MoS2 micro- and nanostructures over large (cm2-scale) areas and demonstrated working field-effect transistors (FETs) made from printed MoS2 flakes with excellent transistor performance. This research also identified the key processing conditions affecting the printing uniformity over large areas, morphologies of printed MoS2 structures, and ultimate transport properties of MoS2-based FETs.

In our processes, the device patterns are firstly pre-structured onto a bulk MoS2 disc by using photolithography followed with plasma etching. This MoS2 disc is then used as a relief template for exfoliating prepatterned MoS2 flake arrays over large areas via various printing processes, including direct mechanical printing8, plasma-assisted printing, and electrostatic printing9. All of these printing processes can produce ordered MoS2 arrays over large areas, but different printing processes can result in different morphologies of individual MoS2 flakes, as demonstrated in Fig. 1. In addition, the MoS2 flakes created by various transfer-printing processes exhibit different transport properties. For example, Figs. 2a and 2b show IDS-VDS and IDS-VG characteristic curves, respectively, of a MoS2 FET produced by using electrostatic printing, which exhibit N-type conduction. Figure 2c shows the IDS-VG characteristic curve of another MoS2 FET made by plasma-assisted printing, which exhibits P-type conduction.

Our work demonstrated the printing of high-quality, well-defined MoS2 flakes over large areas and working MoS2-based FETs with excellent performance. The fundamental knowledge achieved in this work could also be used for optimizing the printing-based manufacturing routes for producing other atomically layered materials and devices.

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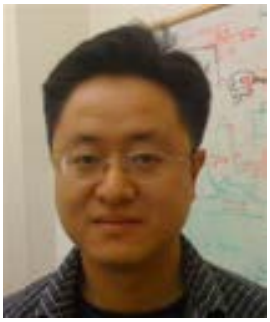
BIOGRAPHY



Dr. Xiaogan Liang is currently working as an Assistant Professor at The Mechanical Engineering Department of University of Michigan (UM). Before joining UM, Dr. Liang was a Staff Scientist (PI) working at The Molecular Foundry, Lawrence Berkeley National Laboratory. His current research interests are focused on nanoimprint/nanoprint lithography, nanoelectronics based on low-dimensional nanostructures, nanofluidics, and block copolymer self-assembly. Dr. Liang has coauthored 35 journal publications and more than 30 conference presentations, and has 3 US patents and 6 pending patents. Xiaogan Liang is the member of Sigma Xi, IEEE, and MRS. Dr. Liang obtained a BS in Physics from Peking University, a MS in Condensed Matter Physics from Chinese Academy of Sciences, and a Ph.D. in Electrical Engineering from Princeton University.

Workshop Co-Chair and Session Chair

Wen-wen Tung

Associate Professor, Department of Earth, Atmospheric, and Planetary Sciences
Purdue University
2504 Gala Drive, West Lafayette, IN 47907, USA
Tel: +1-765-494-0272, Fax: +1-765-496-1210
Email: wwtung@purdue.edu
(普渡大學地球與大氣科學系董文文教授)

BIOGRAPHY

Wen-wen Tung was born in Taiwan on October 8, 1974. She graduated from the National Taiwan University with a B.S. degree in atmospheric sciences in 1996. In 2002, she received her Ph.D. in atmospheric sciences from the Department of Atmospheric and Oceanic Sciences at the University of California, Los Angeles, USA.

She has since worked in the United States as a postdoctoral researcher in the Advanced Study Program at the National Center for Atmospheric Research (2002-2004). In 2005, she was hired as an assistant professor in the Department of Earth, Atmospheric, and Planetary Sciences at Purdue University, and became an associate professor in 2011. She has conducted teaching, research, and committee services, in random order. During 2012 to early 2013, she was on sabbatical leave, doing research at the Courant Institute of Mathematical Sciences at New York University. Her specialties are physical, dynamical, and stochastic characterizations of multiscale tropical convective systems. Her method of inquisition has resulted in collaborative multidisciplinary research.

Prof. Tung is a member of the American Meteorological Society, the American Geophysical Union, the Society for Industrial and Applied Mathematics, and the Sigma Xi. She was awarded the 2002-2004 Advanced Study Program Postdoctoral Fellowship at the National Center for Atmospheric Research and 2011 College of Science Graduate Mentor Award at Purdue University. She has authored and coauthored more than thirty referred journal publications and one textbook.

Technical Session D1-W1-T2: Earth and Atmospheric Sciences, Aerospace and Ocean Engineering

Understanding The Wake in Tidal Turbines Arrays: Experimental Investigation of Turbulence Budget Using Porous Disks

Heng Xiao

Assistant Professor, Department of Aerospace and Ocean Engineering, Virginia Tech
Blacksburg, Virginia, USA
Tel: +1-540-231-0926
Email: hengxiao@vt.edu

ABSTRACT

Recent studies suggest that the U.S. wave and tidal currents have a maximum technically recoverable energy of 1,420 terawatt-hours per year, which accounts for one third of the total electricity consumption of the US. At present tidal energy harvesting is still in its infancy, with only a few demonstration and pilot projects worldwide. Tidal turbines are usually deployed in harsh marine environments, posing stringent requirements on their constructions, deployment, and maintenance. Numerous technological challenges have to be overcome before major commercial deployment and operations can occur. To produce significant amount of energy, many units of tidal turbines will be arranged in a farm. In such an arrangement, understanding the interference among the tidal turbines is essential to ensure efficient and safe operations of the farm.

In this work, experiments were conducted with an array of aligned porous disks positioned in a recirculation water channel hosted by the Institute of Fluid Dynamics at ETH Zurich. We perform measurements of the mean flow and turbulent statistics in the wake of a porous disk by using an Acoustic Doppler Velocimeter. The wake of a single porous disk and that of a solid disk without pores are also measured for comparison purposes. Based on the measurements, the budgets of turbulent kinetic energy for the three cases are analyzed and compared. It is demonstrated that the production pattern of turbulence kinetic energy in the wake of a porous disk in an array is qualitatively different from that of a single porous disk. Comparison with the wake of a solid disk shows that the porosity of the disk plays an important in changing the wake characteristics, e.g., the size of circulation bubble and the mechanism of turbulence production. These results provide guidelines and benchmark data for the numerical modeling of tidal turbine arrays.

BIOGRAPHY

Dr. Heng Xiao (Simplified Chinese: 肖恒; Traditional Chinese: 蕭恆) was born in Hubei, China, in 1981. He obtained a bachelor's degree in civil engineering from Zhejiang University, Hangzhou, (浙江大学，杭州）China, in 2003. He then studied in The Royal Institute of Technology (KTH), Stockholm, Sweden, obtaining a master's degree in mathematics in 2005. In 2009, Xiao was awarded a Ph.D. degree in civil engineering from Princeton University, Princeton, New Jersey, USA.

Currently he holds the appointment of Assistant Professor in Ocean

Engineering at Virginia Tech, Blacksburg, Virginia. Prior to joining Virginia Tech, he was a postdoctoral researcher at the Swiss Federal Institute of Technology (ETH) Zurich, Switzerland, between 2009 and 2012. When working at ETH Zurich, he visited The University of Edinburgh, UK, twice as a Guest Researcher sponsored by European Commission. During his graduate study at Princeton, he was a visiting student at Oregon State University, where he conducted large-scale experiments to study the impact of tsunami waves on coastal slopes. His current research focuses on marine renewable energy, turbulence modeling, and particle-laden flows, all with applications and emphasis in ocean and coastal engineering applications.

Dr. Xiao was appointed as Francis-Upton fellow by the School of Engineering and Applied Sciences at Princeton University from 2005 to 2009. His professional affiliations include AGU (American Geophysical Union) and SNAME (Society of Naval Architects and Marine Engineers). In the past five years, his research has been published in Marine Geology, Journal of Computational Physics, and International Journal of Numerical and Analytical Methods in Geomechanics.

Technical Session D1-W1-T2: Earth and Atmospheric Sciences, Aerospace and Ocean Engineering

Offshore Wind Energy in Taiwan

Hsin-Haou Huang

Assistant Professor, National Taiwan University
No.1, Sec. 4, Roosevelt Rd., Da'an Dist., Taipei 106, Taiwan
Tel: +886-2-3366-5753, Fax: +886-2-2392-9885
Email: hsinhaouhuang@ntu.edu.tw
(臺灣大學工程科學及海洋工程學系黃心豪教授)

ABSTRACT

Wind power makes it possible to exploit an abundant and clean energy resource, reduce dependence on increasingly costly fossil fuels and provide large quantities of affordable electricity. Developed countries have taken great advantage of it through thousands of wind farms on land. Now they even move the constructions offshore. Offshore wind farms offer several benefits over their land-based counterparts. Strong ocean winds allow one offshore turbine to generate substantially more power than one onshore turbine. If an offshore wind farm is located near a coastal city, clean energy would be available without dedicating land to new transmission lines. For Taiwan there are good reasons to develop wind energy offshore rather than onshore. Although in its infancy, the offshore wind energy technology has started to find its market place in Taiwan. As of Today, Taiwan has launched a grant scheme to support construction of the island's first offshore wind farms. The initiative by the Bureau of Energy is designed to help the country reach its goal of installing 600MW of offshore wind capacity by 2020 and 3GW by 2030. This talk presents the recent development and progress of offshore wind energy in Taiwan.

BIOGRAPHY

Dr. Hsin-Haou Huang was born in Chiayi, Taiwan. He received B.S. and M.S. degrees in Civil Engineering, majored in structural engineering, from National Taiwan University, Taipei, Taiwan, in 1997and 1999, respectively. After earning his master's degree, Dr. Huang joined the army in Taiwan ranked second lieutenant. He received his Ph.D. majored in structures and materials and minored in aerodynamics in 2009 from Purdue University, where his research involved the study of acoustic and elastic metamaterials.

Dr. Huang continued to work at Purdue University as a postdoctoral research fellow after receiving his Ph.D. degree. He joined the faculty of the department of engineering science and ocean engineering as an Assistant Professor at National Taiwan University, Taipei, Taiwan, in 2012. Dr. Huang's research interests are in the broad area of complex and multi-functional materials, structures, and systems with tunable material, structural, and system properties: including acoustic metamaterials, micro-structural design for stress wave energy management, structural dynamics, composite materials, multi-scale mechanics of materials and structures, structural assessment and health monitoring, hazard mitigation, green energy from winds and oceans.

Dr. Huang is currently the member of ASME, the Society of Theoretical and Applied Mechanics of the Republic of China (STAM), and the Taiwan Wind Energy Association (TwnWEA).

Technical Session D1-W1-T2: Earth and Atmospheric Sciences, Aerospace and Ocean Engineering

Local air-sea feedback mechanisms over the shallow water region of the Maritime Continent

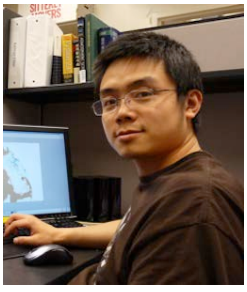
Pengfei Xue

Postdoc Associate, Dept. of Earth, Atmospheric and Planetary Sciences,
Massachusetts Institute of Technology
77 Massachusetts Avenue, Building 54-1423,
Cambridge, MA 02139
Tel: +1-617-452-2977
Email: pengfei@mit.edu

ABSTRACT

Sensitivity analysis of model coupling frequency for SST was conducted over Maritime Continent and adjacent regions with a coupled regional ocean-atmosphere model to investigate distinct model behaviors under different SST coupling frequencies and explore associated ocean-atmosphere feedback mechanisms. Experiments were carried out by alternating the coupling frequency of SST from standard 6-hour coupling (control run) to daily, weekly, bi-weekly coupling, with a focus on dynamical connections between the required coupling frequency and the ocean-atmosphere feedback process. Results of spectral analysis showed that modeling with daily or higher SST coupling frequency was able to resolve SST temporal/spatial variation, while modeling with weekly or bi-weekly SST coupling induced artificial oscillations and resulted in cold biases with coupling errors primarily arising in the shallow regions with water depth < 200m. Running coupled/uncoupled models with perturbed SST fields reveals that the coupled system is dominated by a negative feedback process, a mechanism that help restore SST from perturbations through "SST-latent heat" adjustment and "SST-convective clouds-incoming solar radiation" adjustment. The response time scale of the feedback process is ~3-5 days. Failure to resolve the coupled dynamics of this response time scale can induce artificial oscillations, particularly in the shallow regions where a large short-term variability of SST is exhibited.

BIOGRAPHY



Pengfei Xue received his B.S. (2000) in applied mathematics from the East China Normal University and Ph.D. (2012) in physical oceanography from the University of Massachusetts. He has been a postdoc associate at the department of Earth, Atmospheric and Planetary Sciences (EAPS), Massachusetts Institute of Technology (MIT) since 2012. Dr. Xue's research interests include hydrodynamic modeling, coupled physical-biological numerical modeling, dynamics of coupled ocean-atmosphere models, ocean data assimilation, estuary and coastal ocean circulation, oceanic frontal processes and the bio-physical processes in the Great Lakes. Research projects he is currently involved in include ocean-atmosphere feedbacks over Maritime Continent and its impact on climate change, modeling the circulation in Lake Michigan-Huron and the particle transport through the Straits of Mackinac, and pan-regional modeling for the Copepods in the Arctic and northwest Atlantic system. His recent researches are published in Journal of Geophysical Research and Ocean Dynamics.

Technical Session D1-W1-T2: Earth and Atmospheric Sciences, Aerospace and Ocean Engineering

Improving Regional Evapotranspiration Simulation

Liyi Xu

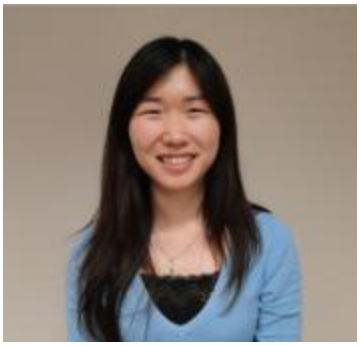
Postdoctoral Associate, Center for Global Change Science
Massachusetts Institute of Technology
77 Massachusetts Ave, E19-411, Cambridge, MA 02139-4307, USA
Tel: (+1) 617-253-7492, Fax: (+1) 617-253-9845
Email: liyixm@mit.edu

ABSTRACT

Accurate estimates of evapotranspiration (both potential and actual) are especially important for regions with limited water availability and high water demand, such as California. Water availability has been and will continue to be the most important issue facing California for years and perhaps decades to come. The terrestrial evapotranspiration are influenced by many processes and interactions in the atmosphere and the biosphere such water, carbon, and momentum exchanges. The need to improve representation within of surface-atmosphere interactions remains an urgent priority within the modeling community.

This study investigates the impact of canopy representation on regional evapotranspiration using coupled mesoscale WRF model and the complex land surface model ACASA. We couple the Weather Research and Forecasting Model (WRF) with the Advanced Canopy-Atmosphere-Soil Algorithm (ACASA), a high complexity land surface model. The WRF-ACASA model uses a multilayer structure to represent the canopy, consequently allowing micro-environmental variables such as LAI, air and canopy temperature, wind speed and humidity to also vary vertically. The improvement in canopy representation and canopy-atmosphere interactions allow more realist simulation of evapotranspiration in both regional and local scales.

BIOGRAPHY



Dr. Xu received her B.S. in Environmental and Resources Sciences and her Ph.D. in Atmospheric Science from the University of California, Davis. She joined the Massachusetts Institute of Technology as a Postdoctoral Associate at the Center for Global Change Science and at the Joint Program on the Science and Policy of Global Change in 2012. Dr. Xu's research interests include land surface modeling and regional modeling, climate change impact, carbon and hydrological cycles, as well as ecosystem and climate interactions. She is currently working on model development and numerical experimentation to investigate how various ecosystems respond to extreme weather events and how the changing natural and managed environments will alter the local and regional eco-hydro-climate. Dr. Xu is a member of the American Geophysical Union (AGU) and the American Meteorological Society (AMS).

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

Conference Co-Chair and Session Chair

Yi-Hsiang (Sean) Hsu

Assistant Professor, School of Medicine
Harvard University
(哈佛大學醫學院許益祥教授)

BIOGRAPHY

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

Joyce Yang

Ph.D. Candidate in Biological & Biomedical Sciences
Harvard University
(哈佛大學楊立琦)

ABSTRACT

BIOGRAPHY

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

Identifying enhancer–promoter interactions in the human genome

Yih-Chii Hwang

PhD Candidate, Genomics and Computational Biology Program
Perelman School of Medicine at the University of Pennsylvania
Tel: +1-215-576-5144, Fax: +1-215-573-3111
Email: yihhwang@mail.med.upenn.edu
(賓州大學黃奕綺)

ABSTRACT

In mammals, genes are not only regulated by their proximal promoters, but can also be affected by distal and orientation-independent elements such as enhancers. It is believed that enhancer elements mostly function to regulate gene expression in a tissue-specific manner, and thus affect different sets of genes in various tissues. In this way, enhancers are thought to be central regulators of gene expression during animal development. Therefore, discovering long-range regulatory elements genome-wide is necessary to fully understand gene expression regulation in animals, and during their developmental programs.

However, as enhancers can be distal from the genes they regulate, identifying possible enhancer elements is extremely laborious, and more comprehensive methods of detection are only recently being developed. In order to systematically uncover the enhancer–target gene interactions in mammalian cells, we reanalyzed published Hi-C data and applied a geometric distribution-based analysis pipeline to identify DNA interacting hotspots in the human cell lines (lymphoblastoid and erythroleukemia cell lines). By further classifying these Hi-C interaction hotspots, we then identified candidate enhancer elements as hotspots overlapping known enhancer-associated histone modifications from ENCODE and interacting with a promoter element. We found these candidate enhancer elements being conserved and tend to contact with protein-coding genes that are expressed in a cell type-specific manner. Using these comprehensive enhancer–target gene datasets will allow us to identify disease-linked polymorphisms that lie within these regulatory elements.

BIOGRAPHY

Yih-Chii Hwang received her B.S. degree in Computer Science from National Chengchi University in 2005 and her M.S. degree in Bioinformatics at National Yang-Ming University in 2007. During the summer between her first and second year in her master program, she did her research internship at Institute for Systems Biology in Seattle. In 2009, she started her PhD study at Genomics and Computational Biology program at University of Pennsylvania. Currently she is a PhD candidate under the mentorship of Dr. Li-San Wang and Dr. Brian Gregory.

Ms. Yih-Chii research interests include discovering disease-causing variations in non-coding DNA regions as well as identifying regulatory elements. She studies long-range gene regulations in particular enhancer–target gene interactions by developing algorithms and analyzing chromosome conformation capture (3C)- based data sets. She also works closely in studying genetic variations of neurodegenerative disease with large-scale exome sequencing data.

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

Genetically Engineered Multi-Purpose Red Blood Cells

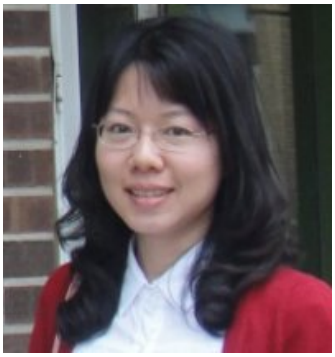
Hsiang-Ying (Sherry) Lee

Postdoctoral Associate, Whitehead Institute for Biomedical Research
Massachusetts Institute of Technology
(麻省理工學院李湘盈博士)

ABSTRACT

Red blood cells could be useful diagnostic and therapeutic tools, since they have large surface area, good biocompatibility and long life span in circulation. We have developed an ex vivo culture system to produce large numbers of enucleated human red cells using human CD34+ hematopoietic progenitors. The four-stage culture system yields 30,000-fold expansion after a 20-day culture. The cells were highly synchronized during the culture process. At the end of the culture, the cells went through enucleation efficiently, and the enucleated cells resemble normal human reticulocytes or red blood cells. We have applied "sortagging" technique, which refers to the process in which sortase catalyzes a transpeptidation reaction between a target protein and the substrates, to engineered red blood cells. Since enucleated red cells do not possess remnants of foreign DNA, we have generated genetically-modified red cells expressing glycophorin A fused with a sortagging motif. Upon sortagging reaction, we are able to equip red cells with payloads of interest. These engineered red blood cells could potentially serve as therapeutic devices, immune modulators, and imaging modalities.

BIOGRAPHY



Dr. Lee was born in Tainan, Taiwan. She received her B.S. in Medical Technology from National Cheng Kung University in Taiwan. She then came to U.S. to pursue her graduate studies. She has received her M.A. in Medical Sciences from Boston University and Ph.D. in Biomolecular Chemistry from University of Wisconsin-Madison in 2011.

She is currently a Postdoctoral Fellow in Whitehead Institute for Biomedical Research located at M.I.T.. With extensive training in biochemistry, molecular and cell biology, her research interests center around red blood cell biology. She has been conducting basic research to investigate how genetic network regulates red blood cell development, as well as translational research to develop red cell-based diagnostic and therapeutic tools.

Dr. Lee has been a member of Taiwan Society of Laboratory Medicine, American Heart Association, and American Association for the Advancement of Science. She has also been involved in organizing events and serving communities including Boston Taiwanese Biotechnology Association, Monte Jade Science and Technology Association of New England and MIT Biology IAP. She was a American Heart Association Predoctoral Fellow. Her research work was published in major bioscience journals including Molecular Cell and PNAS.

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

Mortality and hospital utilization patterns in the Old Order Amish

Woei-jyh (Adam) Lee

Scientist, National Institutes of Health
Bethesda, Maryland 20892, USA
E-mail: adamlee@mail.nih.gov
(美國國家衛生研究院李偉智博士)

ABSTRACT

Lifespan increases observed in the United States and elsewhere throughout the developed world, have been attributed in part to improvements in medical care access and technology and to healthier lifestyles. To differentiate the relative contributions of these two factors, we have compared lifespan in the Old Order Amish (OOA), a population with historically low use of medical care, with that of Caucasian participants from the Framingham Heart Study (FHS), focusing on individuals who have reached at least age 30 years. Analyses were based on 2,108 OOA individuals from the Lancaster County, PA community born between 1890 and 1921 and 5,079 FHS participants born approximately the same time. Vital status was ascertained on 96.9% of the OOA cohort through 2011 and through systematic follow-up of the FHS cohort. The lifespan part of the study included an enlargement of the Anabaptist Genealogy Database to 539,822 individuals, which will be of use in other studies of the Amish. Mortality comparisons revealed that OOA men experienced better longevity ($p<0.001$) and OOA women comparable longevity than their FHS counterparts. We further documented all OOA hospital discharges in Lancaster County, PA during 2002-2004 and compared OOA discharge rates to Caucasian national rates obtained from the National Hospital Discharge Survey for the same time period. Both OOA men and women experienced markedly lower rates of hospital discharges than their non-Amish counterparts, despite the increased lifespan. We speculate that lifestyle factors may predispose the OOA to greater longevity and perhaps to lesser hospital use. Identifying these factors, which might include behaviors such as lesser tobacco use, greater physical activity, and/or enhanced community assimilation, and assessing their transferability to non-Amish communities may produce significant gains to the public health.
Reference: Mitchell BD and et al.. PLoS One 2012;7(12):e51560. doi: 10.1371/journal.pone.0051560.

BIOGRAPHY

Dr. Woei-jyh (Adam) Lee received his BSE degree from the National Taiwan University, his MS degree from the Courant Institute at the New York University, and his PhD degree from the University of Maryland at College Park (UMD). He worked on distributed objects and fault tolerance at AT&T Labs - Research in 1997. He focused on network software and management at Bell Laboratories Research, Lucent Technologies, from 1998 till 2000. He visited the University of Southern California specializing in continuous media streaming and multimedia networking from 2002 to 2003.

Dr. Lee worked on distributed objects and fault tolerance at the AT&T Labs - Research in 1997. He focused on network software and management at the Bell Laboratories Research, Lucent Technologies, from 1998 till 2000. He visited the University of Southern California specializing

in continuous media streaming and multimedia networking from 2002 to 2003. He contributed in protein domain parsing and boundary prediction at the National Cancer Institute (NCI), National Institutes of Health (NIH) from 2004 to 2005. He was a fellow focusing on human genetics and genomics at the National Center for Biotechnology Information, National Library of Medicine, NIH from 2009 to 2012. He became a special volunteer working on computational modeling for cancer progression and metastatic at the NCI, NIH since 2012. He was also affiliated with the Center for Bioinformatics and Computational Biology and the Institute for Advanced Computer Studies at the UMD.

Dr. Lee is currently a faculty of Information Systems at the Robert H. Smith School of Business at the UMD since 2012. His research interests include bioinformatics, computational biology, cancer biology, genomics and genetics, information integration, data management and mining, and literature-based discovery. He has two US Patents and is a member of the ISCB and the ISENG.

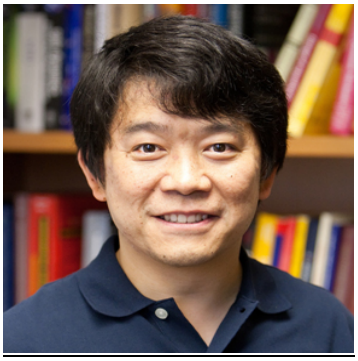
Technical Session D1-W3-T2: New Materials Science and Engineering, Nanotechnology and New Green Energy

Workshop Co-Chair and Session Chair

Jung-Tsung Shen

Assistant Professor, Department of Electrical & Systems Engineering
Washington University in St. Louis
(聖路易華盛頓大學電機暨系統工程學系沈榮聰教授)

BIOGRAPHY



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

Towards Sustainable Energy: Carbon Capture, Utilization and Storage (CCUS)

Ah-Hyung (Alissa) Park

Lenfest Junior Professor in Applied Climate Science,
Departments of Earth and Environmental Engineering & Chemical Engineering
Associate Director, Lenfest Center for Sustainable Energy,
Columbia University
918 S. W. Mudd Building, Mailcode 4711
500 West 120th Street, New York, NY 10027 USA
Tel: +1-212-854-8989, Fax: +1-212-854-7081
Email: ap2622@columbia.edu

ABSTRACT

Historically, the atmospheric concentration of CO2 fluctuated naturally on the timescales of ice ages. Concerns, however, stem from the recent dramatic increase in CO2 concentration, which coincides with global industrial development. This rise is mainly due to the high use of fossil fuels. In order to meet the ever-increasing global energy demands while stabilizing the CO2 level in the atmosphere, it is widely believed that current carbon emissions must be reduced by at least a factor of three. The containment of CO2 involves three operations: separation, transportation, and storage. Until now, these technologies have been developed independently of one another, which has resulted in complex and economically challenging large-scale designs. The future direction of carbon management technologies now focuses on the integration of CO2 capture and storage schemes as well as CO2 utilization. In this talk, two novel carbon capture, utilization and storage (CCUS) technologies will be introduced. Nanoparticle Organic Hybrid Materials (NOHMs) are a new class of organic-inorganic hybrids that consist of a hard nanoparticle core functionalized with a molecular organic (e.g., polymeric) corona that possesses a high degree of tunability. NOHMs are non-volatile and stable over a very wide temperature range, which make them interesting materials for various energy and environmental applications. The second set of CO2 capture materials is derived from Mg- and Ca-bearing minerals and industrial wastes. The main advantage of carbon mineralization is that it is the most permanent and safe method of carbon storage, since the gaseous CO2 is fixed into a solid matrix of Mg-bearing minerals (e.g., serpentine) forming a thermodynamically stable solid product. These carbon sequestration technologies can be integrated into the existing or new energy conversion systems in order to improve their overall sustainability.

BIOGRAPHY

Ah-Hyung (Alissa) Park received her B.S. (1998) and M.S. (2000) in Chemical and Biological Engineering from University of British Columbia University in Canada. She received her Ph.D. (2005) from the Ohio State University in Chemical and Biomolecular Engineering and was a Postdoctoral Fellow at the Ohio State University between 2005 and 2007. Currently, she is the Lenfest Junior Professor in Applied Climate Science of Earth and Environmental Engineering &

Chemical Engineering at Columbia University. She is also the Associate Director of the Lenfest Center for Sustainable Energy, the Earth Institute. Her research interests include carbon capture, utilization and storage (CCUS), novel nano-scale hybrid materials for energy and environmental technologies, and synthesis of hydrogen and liquid fuels from unconventional energy sources (e.g., biomass, wastes, shale gas). She has authored thirty-five peer-reviewed journal particles and book chapters on these topics and served on the program and organizing committees of various international workshops and conferences. She will also be the chair for two upcoming international conferences as well. Prof. Park received a number of professional awards and honors including the NSF CAREER Award in 2009 and the James Lee Young Investigator Award in 2010.

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

Scalable 3-D Nanostructure Array Integration and Manufacturing: A Nanomaterials Roadmap toward Ultrahigh Efficiency, Robustness, and Multi-functionality

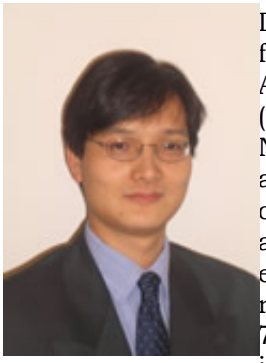
Pu-Xian Gao

Department of Materials Science and Engineering & Institute of Materials Science
University of Connecticut, Storrs, CT 06269-3136, USA
E-mail: puxian.gao@ims.uconn.edu

ABSTRACT

Three-dimensional (3-D) integration of nanostructures or nanostructure arrays into applicable platforms or devices represents the need for meeting ever-increasing demands of human beings for cost-effectiveness, structure sophistication, multi-function enabling, while simplified and efficient practical operations. Such an integration process generally involves a diverse array of nanostructured entities that include various dissimilar nanoscale building blocks such as nanoparticles, nanowires, and nanofilms made of metals, ceramics, or polymers in the nanoscale form. In this talk, I will highlight our latest research progress on the 2-D and 3-D metal oxide based nanostructure integrations toward applicable ultrahigh efficiency, robustness, and improved functionality, with an intention to draw a unique roadmap toward practically and better bridging the gap between nanoscience and nanotechnology in energy and environmental applications. Specifically, examples through design in scalable nanomanufacturing and catalytic vehicle aftertreatment will be used as the connecting dots to display the nanomaterials roadmap linking from scalable 2-D toward 3-D integration.

BIOGRAPHY



Dr. Pu-Xian Gao obtained his Ph.D. in Materials Science and Engineering from the Georgia Institute of Technology in 2005. He currently is an Associate Professor of Materials Science and Engineering, and Physics (courtesy) at the University of Connecticut. He is the founding director of Nanomaterials Science Laboratory (NSL) in the Institute of Materials Science at the University of Connecticut since 2007. NSL's mission mainly focuses on bridging nanomaterials science and engineering with practical applications in energy and environmental catalysis, sensors and related electronics, fire security and energy sources, and bioenvironment-nanomaterials interfaces. Dr. Gao has authored and co-authored more than 70 journal articles with over 4000 citations, 4 book chapters, 12 patents and invention disclosures, and a few conference proceedings, and delivered more than 100 invited and contributed professional presentations and seminars. Dr. Gao has received several awards including Honda Initiation Grant Award, ACS-PRF New Faculty Grant Award, and the Humboldt Research Fellowship. Dr. Gao is affiliated with professional societies such as ACerS, ACS, MRS, and RSC.

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

Synthesis and Applications of Two-Dimensional Materials beyond Graphene

Albert Yi-Hsien Lee

Assistant Professor, Department of Material Science and Engineering
National Tsing Hua University
Visiting Scientist, Department of Electrical Engineering and Computer Science, MIT
(清華大學材料科學工程學系李奕賢教授)

ABSTRACT

Monolayers of two-dimensional materials, including graphene, have been highlighted in the past decade regarding both scientific and industrial aspects due to novel physical phenomenon inherited from the reduced dimensionality. Recently, monolayers of layered transition metal dichalcogenides (TMDC), such as MX2 (M=Mo, W and X=S, Se), have been reported to exhibit significant spin-valley coupling and optoelectronic performances because of the unique structural symmetry and band structures. Monolayers in this class of materials offered a burgeoning field in fundamental physics, energy harvesting, electronics and optoelectronics. However, most studies to date are hindered by great challenges on the synthesis and transfer of high quality TMDC monolayers. Hence, a feasible synthetic process to overcome the challenges is essential. Here, we demonstrate the growth of high-quality TMDC monolayers using chemical vapor deposition (CVD) with the seeding of aromatic molecules. We also present a robust technique in transferring the TMDC monolayers to diverse surfaces, which may stimulate the progress on the class of materials and open a new route toward the synthesis of various novel hybrid structures with TMDC monolayer and functional materials. Furthermore, applications and large-scale 2D electronics based on TMDC monolayers were demonstrated.

BIOGRAPHY

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

Multifunctional polymer nanofibers with high thermal conductivity and Young's modulus

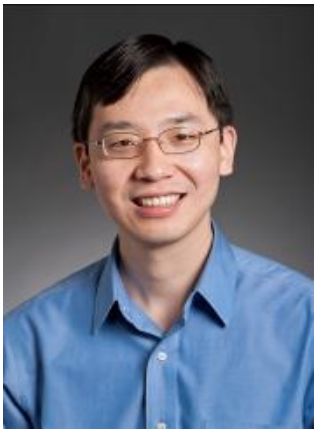
Sheng Shen

Assistant Professor, Carnegie Mellon University
5000 Forbes Avenue, Pittsburgh, PA 15217 USA
Tel: +1-412-268-3393, Fax: +1-412-268-3348
Email: sshen1@cmu.edu

ABSTRACT

Polymers play an essential and ubiquitous role in everyday life due to their extraordinary range of properties. However, bulk polymers generally have low stiffness and thermal conductivity. In this talk, I will present polyethylene nanofibers with diameters as small as 50 nm fabricated by a novel ultra-drawing technique. Using this technique, the polyethylene molecular chains are extended and aligned, resulting in highly-crystalline nanofibers with low defect concentration. Nanofibers with diameters between 50 and 500 nm are characterized using atomic force microscope (AFM) based techniques, and we find that their Young's modulus and thermal conductivity can be as high as 326 GPa and 100 W/m·K, respectively. The Young's modulus of polymer nanofibers reported is comparable with the best Young's modulus of metal alloys. Also, their thermal conductivity is higher than most of metals. But the density of the polymer nanofibers is one order of magnitude smaller than metals and metal alloys. These light weight, ultra-strong, and thermally conductive polymer nanofibers have potential applications in high-strength cords, electronic devices and biocompatible devices.

BIOGRAPHY



Sheng Shen received his bachelor and master degree from the Power Engineering Department, Huazhong University of Science and Technology, China, in 2000 and 2003, respectively. In 2005, he joined Professor Gang Chen's group at Massachusetts Institute of Technology (MIT). He obtained his PhD degree from the Mechanical Engineering Department, MIT, in 2010. After finishing his PhD, he conducted his postdoctoral research with Professor Xiang Zhang at University of California-Berkeley (UC-Berkeley), from 2010 to 2011. He joined CMU in September, 2011.

He is currently Assistant Professor at the Mechanical Engineering Department of Carnegie Mellon University (CMU). His research interests include nanoscale thermal transport and energy conversion phenomena, and their applications in solar or thermal energy conversion, thermal management, and multifunctional materials. He has authored twenty peer-reviewed book chapters and journal articles, and served on the program and organizing committees of various international workshops and conferences.

Professor Shen is a recipient of NSF CAREER Award and DARPA Young Faculty Award. He also received the Philomathia Foundation Research Fellowship in Alternative Energy Research from

UC-Berkeley, a Hewlett-Packard Best Paper Award from ASME Heat Transfer Division, and a Best Paper Award in Julius Springer Forum on Applied Physics.

Technical Session D1-W1-T3: Earth and Atmospheric Sciences, Aerospace and Ocean Engineering

Session Chair

Hsin-Haou Huang

Assistant Professor, National Taiwan University
No.1, Sec. 4, Roosevelt Rd., Da'an Dist., Taipei 106, Taiwan
Tel: +886-2-3366-5753, Fax: +886-2-2392-9885
Email: hsinhaouhuang@ntu.edu.tw
(臺灣大學工程科學及海洋工程學系黃心豪教授)

BIOGRAPHY

Dr. Hsin-Haou Huang was born in Chiayi, Taiwan. He received B.S. and M.S. degrees in Civil Engineering, majored in structural engineering, from National Taiwan University, Taipei, Taiwan, in 1997and 1999, respectively. After earning his master's degree, Dr. Huang joined the army in Taiwan ranked second lieutenant. He received his Ph.D. majored in structures and materials and minored in aerodynamics in 2009 from Purdue University, where his research involved the study of acoustic and elastic metamaterials.

Dr. Huang continued to work at Purdue University as a postdoctoral research fellow after receiving his Ph.D. degree. He joined the faculty of the department of engineering science and ocean engineering as an Assistant Professor at National Taiwan University, Taipei, Taiwan, in 2012. Dr. Huang's research interests are in the broad area of complex and multi-functional materials, structures, and systems with tunable material, structural, and system properties: including acoustic metamaterials, micro-structural design for stress wave energy management, structural dynamics, composite materials, multi-scale mechanics of materials and structures, structural assessment and health monitoring, hazard mitigation, green energy from winds and oceans.

Dr. Huang is currently the member of ASME, the Society of Theoretical and Applied Mechanics of the Republic of China (STAM), and the Taiwan Wind Energy Association (TwnWEA).

Technical Session D1-W1-T3: Earth and Atmospheric Sciences, Aerospace and Ocean Engineering

Impact of aging mechanism on model simulated carbonaceous aerosols

Shiliang Wu

Assistant Professor, Michigan Technological University
Houghton, MI 49931, USA
Tel: +1-906-487-2590, Fax: +1-906-487-3371
Email: slwu@mtu.edu

ABSTRACT

Carbonaceous aerosols including organic carbon and black carbon have significant implications for both climate and air quality. In most current global models, a fixed hydrophobic-to-hydrophilic conversion lifetime (τ) for carbonaceous aerosol is generally assumed, which is usually around one day. We have implemented a new detailed aging scheme for carbonaceous aerosols in a chemical transport model (GEOS-Chem) to account for both the chemical oxidation and the physical condensation-coagulation effects, where is affected by local atmospheric environment including atmospheric concentrations of water vapor, ozone, hydroxyl radical and sulfuric acid. The updated exhibits large spatial and temporal variations with the global average (up to 11 km altitude) calculated to be 2.6 days. The chemical aging effects are found to be strongest over the tropical regions driven by the low ozone concentrations and high humidity there. The resulted from chemical aging generally decreases with altitude due to increases in ozone concentration and decreases in humidity. The condensation-coagulation effects are found to be most important for the high-latitude areas, in particular the polar regions, where the τ values are calculated to be up to 15 days. When both the chemical aging and condensation-coagulation effects are considered, the total atmospheric burdens and global average lifetimes of BC (OC) are calculated to increase by 9% (3%) compared to the control simulation, with considerable enhancements of BC and OC concentrations in the Southern Hemisphere. Model evaluations against data from multiple ground-based observation networks worldwide datasets show that the updated aging scheme improves model simulations of carbonaceous aerosols for some regions, especially for the remote areas in the northern hemisphere. The improvement helps explaining the persistent low model bias for carbonaceous aerosols in the northern hemisphere reported in literature. Further model sensitivity simulations focusing on the continental outflow of carbonaceous aerosols demonstrate that previous studies using the old aging scheme could have significantly underestimated the inter-continental transport of carbonaceous aerosols.

BIOGRAPHY

Dr. Shiliang Wu is an Assistant Professor at Michigan Technological University in Houghton, MI. He got his PhD in atmospheric chemistry in 2007 from Harvard University where he continued as a post-doc research fellow before joining Michigan Tech in 2009. He has authored or co-authored more than 30 peer-reviewed scientific journal articles and a book related to atmospheric chemistry and air quality. He was a recipient of the Ralph E. Powe Junior Faculty Award from ORAU in 2010 and an early career award from the U.S. EPA in 2012.

Technical Session D1-W1-T3: Earth and Atmospheric Sciences, Aerospace and Ocean Engineering

Uncertainty in regional climate projections

Erwan Monier

Research Scientist, Center for Global Change Science
Massachusetts Institute of Technology
77 Massachusetts Ave, E19-439GA
Cambridge, MA, 02139 USA
Tel: +1-617-715-5429, Fax: +1-617-253-9845
Email: emonier@mit.edu

ABSTRACT

With climate change underway, mitigation and adaptation strategies are required to limit the impacts of future climate change on food, water and energy. While a large number of studies have been devoted to understanding and simulating future climate impacts, they generally rely on a small ensemble of climate simulations and do not consider all major sources of uncertainty in future projections of climate change, namely: uncertainty in the emissions projections, using different climate policies; uncertainty in the climate system response, represented by climate parameters (climate sensitivity, strength of the aerosol forcing, ocean heat uptake rate); natural variability, obtained by initial condition perturbation; and structural uncertainty associated with differences between climate models.

In this talk, I will introduce a new modeling framework that revolves around the Massachusetts Institute of Technology (MIT) Integrated Global System Model (IGSM), an integrated assessment model that couples an intermediate complexity earth system model (with a 2-D zonal-mean atmosphere) to a human activity model. Regional climate change is obtained by two downscaling methods: a dynamical downscaling, where the IGSM is linked to a three-dimensional atmospheric model; and a statistical downscaling, where a pattern scaling algorithm uses climate-change patterns from 17 climate models. Results show that the choice of climate policy and the climate parameters are the largest drivers of uncertainty. In addition, different initial conditions can result in differences in patterns of change as large as when using different climate models. Finally, this analysis reveals that uncertainty in regional climate change projections is still large and should be accounted for systematically when estimating regional climate impacts.

BIOGRAPHY

Dr. Erwan Monier holds a Ph.D. in atmospheric science from the University of California, Davis and a M.Eng. in hydraulics and fluid mechanics from the National Polytechnic Institute of Toulouse, ENSEEIHT, a French top engineering school. He joined the Massachusetts Institute of Technology as a Postdoctoral Associate at the Center for Global Change Science and at the Joint Program on the Science and Policy of Global change in 2009 and has been a Research Scientist since 2011. Dr. Monier's research interests include climate modeling, uncertainty in climate change projections, climate change impacts, as well as climate variability including El Nino-Southern Ocean and the Madden-Julian Oscillation. He is a lead researcher in the development of a 3-dimensional climate modeling framework at MIT to investigate uncertainty in regional climate change and he

participated in the intercomparison project with Earth System Models of Intermediate Complexity (EMICs) undertaken in support of the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5). Dr. Monier is a lifetime member of the American Geophysical Union (AGU) and the European Geosciences Union (EGU) and a member of the American Meteorological Society (AMS). He has published articles in peer-reviewed international journals such as Atmospheric Chemistry and Physics, Journal of Climate, Climate Dynamics, Climatic Change, Climate of the Past, and Geophysical Research Letters.

Technical Session D1-W1-T3: Earth and Atmospheric Sciences, Aerospace and Ocean Engineering

Asymmetry of the Convection in the Madden-Julian Oscillation

Wen-wen Tung

Associate Professor, Department of Earth, Atmospheric, and Planetary Sciences
Purdue University
2504 Gala Drive, West Lafayette, IN 47907, USA
Tel: +1-765-494-0272, Fax: +1-765-496-1210
Email: wwtung@purdue.edu
(普渡大學地球與大氣科學系董文文教授)

ABSTRACT

This work studies the significance of asymmetry in systems of organized convection associated with the Madden-Julian oscillation (MJO). Satellite infrared brightness temperature data for the period 1983--2006 were decomposed into subsets symmetric and antisymmetric about the equator. Using a recent nonlinear objective method called nonlinear Laplacian spectral analysis, modes of variability were extracted representing symmetric and antisymmetric features of MJO convective systems, along with a plethora of other modes of tropical convective variability. It was found that the boreal winter MJO emerges as a single pair of modes in both symmetric and antisymmetric convection signals. Phase composites of the corresponding kinematic and thermodynamic anomalous fields were constructed using reanalysis data. It was found that the predominantly symmetric convective systems are potentially short-lived due to equatorial dry air intrusion eradicating equatorial convection when the MJO crosses the Maritime Continent. The predominantly antisymmetric convective systems, however, are less affected by dry intrusion; the strength of the MJO convective systems as well as anomalous circulations can be maintained and enhanced in the West Pacific. It was also found that the off-equatorial convective systems enhanced during the MJO are mostly deep convection and stratiform anvils, unlike the typical complex of shallow-congestus-deep convection to stratiform anvils on the equator.

BIOGRAPHY

Wen-wen Tung was born in Taiwan on October 8, 1974. She graduated from the National Taiwan University with a B.S. degree in atmospheric sciences in 1996. In 2002, she received her Ph.D. in atmospheric sciences from the Department of Atmospheric and Oceanic Sciences at the University of California, Los Angeles, USA.

She has since worked in the United States as a postdoctoral researcher in the Advanced Study Program at the National Center for Atmospheric Research (2002-2004). In 2005, she was hired as an assistant professor in the Department of Earth, Atmospheric, and Planetary Sciences at Purdue University, and became an associate professor in 2011. She has conducted teaching, research, and committee services, in random order. During 2012 to early 2013, she was on sabbatical leave, doing research at the Courant Institute of Mathematical Sciences at New York University. Her specialties are physical, dynamical, and stochastic characterizations of multiscale tropical convective systems. Her method of inquisition has resulted in collaborative multidisciplinary

research.

Prof. Tung is a member of the American Meteorological Society, the American Geophysical Union, the Society for Industrial and Applied Mathematics, and the Sigma Xi. She was awarded the 2002-2004 Advanced Study Program Postdoctoral Fellowship at the National Center for Atmospheric Research and 2011 College of Science Graduate Mentor Award at Purdue University. She has authored and coauthored more than thirty referred journal publications and one textbook.

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

Session Chair

Aichi Chien

Assistant Professor, Biomedical Physics IDP, Dept. of Radiological Sciences, Division of Interventional
Neuroradiology, David Geffen School of Medicine at UCLA, Ronald Reagan UCLA Medical Center
10833 LeConte Ave, Box 951721, Los Angeles, CA 90095
Phone: (310) 794-7921, Fax: (310)206-5958
Email: aichi@ucla.edu
(加州大學洛杉磯分校大衛格芬醫學院簡艾琪教授)

BIOGRAPHY

Aichi Chien, Ph.D. is an Assistant Professor in the Department of Radiological Sciences and the Biomedical Physics IDP Graduate Program in the UCLA Medical School since 2009; a faculty member of Medical School Short Term Training Program (SSTP) and Cross-disciplinary Scholars in Science and Technology (CSST) program since 2010, and faculty in the UCLA Center for Domain Specific Computing (CDSC) since 2011.

Dr. Chien received her Bachelor's Degree from National Taiwan University, Dept. of Agricultural Machinery Engineering in 1999, Taipei, Taiwan. She then completed her Master's Degree on the subject of Micro/Nano Resonators in the Dept. of Mechanical and Aerospace Engineering, Cornell University, Ithaca, NY; and her PhD Degree in Biomedical Engineering at the University of California, Los Angeles, CA on the topic of MEMS/NEMS implantable devices for cardiovascular disease. She went on to complete Postdoctoral Fellowship training in endovascular treatment in the Division of Interventional Neuroradiology in the UCLA David Geffen School of Medicine.

Dr. Chien's research interests encompass cardiovascular and stroke disease analysis with the integration of science and engineering to assist clinical decision making for individualized medicine. She has published more than 50 peer-review journal publications of original research, including 17 first author papers in high impact factor medical journals such as Stroke, Neurosurgery, Journal of Neurosurgery, and American Journal of Neuroradiology. She has received numerous awards, including the American Heart Association Outreach Award (2004), Heart Failure Society of America (2004), American Society for Laser Medicine and Surgery (2006), and Young Investigator Award from Cardiovascular System Dynamics Society (2006). She is the lead inventor on multiple US Patents and International Patents; Principle Investigator in a Philips Healthcare research grant and Radiology Exploratory grant. She is currently a Co-Investigator on two NIH R01 projects and one NSF (CCF) multi-disciplinary program. She has regularly given lectures in universities/ medical centers around the world and in US and international scientific meetings.

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

Selfassembled Polymeric Particles for Drug Delivery

Ying Liu

Tenure-track Assistant Professor, University of Illinois at Chicago
810 S. Clinton Street, RM 211, Chicago, IL 60607, USA
Tel: +1-312-996-8249, Fax: +1-312-996-0808
Email: liuying@uic.edu
(伊利诺大学芝加哥校区刘颖教授)

ABSTRACT

The Liu research group is interested in the interface among microfluidics, nanotechnologies, cellular biology, and drug delivery. Specifically, we focus on the competitive kinetics of self-assembling processes to synthesize nano- and micro-particles with designed structures and functionalities in a scalable manner. Both numerical and experimental endeavor are implemented to elucidate the fundamental mechanisms and to provide heuristic parameters for these physical and chemical processes.

In this presentation, the self-assembly processes to make polymeric nanoparticles (PNP) and Toroidal-Spiral particles (TSP) will be demonstrated. PNPs encapsulating hydrophobic drugs and imaging agents present unique opportunities to treat complex diseases, to enhance bioavailability and efficacy of the compounds, to conveniently deliver drugs by aerosol or oral administration. However, many processes to make PNPs suffer from low drug loading, broad particle-size distribution, and low stability. We have developed a continuous and scalable process, flash precipitation and dry (FPaD), to generate PNPs at various scales (milligram to 100 grams) with high drug loading (~50%) and long-term stability. The key is to control the kinetics of micromixing, polymer micellization, particle nucleation and growth, and spray dry. Enhanced bioavailability and functionality of the hydrophobic SR13668 and curcumin were demonstrated in mouse and dog models.

TSPs have well-defined internal channels. Multiple compounds could be encapsulated without considering compound compatibility. Moreover, the release schedule of each compound could be designed separately to reach best drug synergy. TSPs were generated under the competitive kinetics of viscous sedimentation flow, diffusion, and polymer cross-linking. TSPs were formed and loaded with proteins entirely within the aqueous phase under benign conditions to preserve delicate macromolecular conformations of the proteins and thereby maximize their bioactivity and bioavailability. The application of TSPs was demonstrated by encapsulating and releasing irinotecan and an anti-VEGF antibody for the treatment of glioblastoma multiforme.

BIOGRAPHY

EDUCATION AND PROFESSIONAL PREPARATION

2001	B.Sc., Engineering Mechanics, Tsinghua University, Beijing, China
2004	M.A., Mechanical and Aerospace Engineering, Princeton University, Princeton, NJ
2007	Ph.D., Mechanical and Aerospace Engineering, Princeton University, Princeton, NJ

2007-2008 Postdoc, Department of Chemistry and Institute for Biophysical Dynamics, University of Chicago, Chicago, IL

APPOINTMENT

2008-present Assistant professor (tenure track), Department of Chemical Engineering, University of Illinois at Chicago, Chicago, IL
2008-present Adjunct professor, Department of Biopharmaceutical Sciences, University of Illinois at Chicago, Chicago, IL
2007-2008 Adjunct professor, Department of Chemical Engineering, University of Illinois at Chicago, Chicago, IL

MEMBERSHIP

NSF panel reviewers for DMR, CBET, and CMMI
Members for APS, BMES, AAPS, ACS, and AIChE

AWARDS AND HONORS

College of Engineering Research Award, UIC, IL, 2013
Chancellor Discovery Award, UIC, IL, 2012
Technology for Developing Regions Grant, Princeton University, NJ, 2006
Howard Crathorne Phillips Graduate Fellowship, Princeton University, NJ, 2003
Engineering Fellowship, Princeton University, NJ, 2002
Graduation with Honor, Tsinghua University, Beijing, China 2001
Rong Hong National Fellowship, Tsinghua University, Beijing, China, 2000
Best Academic Performance, Tsinghua University, Beijing, China 1999

JOURNAL PUBLICATIONS

1. A. Banerjee†, H. Shen†, M. Hautman, J. Anwer, S. Hong, I. Kapetanovic, Y. Liu*, and A. Lyubimov*, Polymeric nanoparticles enhance oral bioavailability of the hydrophobic chemopreventive agent (SR13668) in beagle dogs, Current Pharmaceutical Biotechnology, 14, 464-469, 2013. (†Equivalent first authors; *Corresponding author).
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12. F. Shen, C. Kastrup, Y. Liu, and R. Ismagilov, "Threshold Response of Initiation of Blood Coagulation by Tissue Factor in Patterned Microfluidic Capillaries is Controlled by Shear Rate", Arteriosclerosis Thrombosis and Vascular Biology, 28 (11) 2035-2041, 2008.
13. D. Chen†, W. Du†, Y. Liu†, W. Liu†, A. Kuznetsov, F. Mendez, L. Philipson, and R. Ismagilov, "The Chemistrode: a Droplet-based Microfluidic Device for Stimulation and Recording with High Temporal, Spatial and Chemical Resolution", Proceedings of the National Academy of Sciences, 105 (44) 16843-16848, 2008. (†Equivalent first authors)
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Technical Session D1-W2-T3: Medicine, Public Health, Biomedical Science and Engineering

Neural differentiation of pluripotent stem cells and the cell labeling with magnetic superparamagnetic iron oxides

Yan Li

Assistant Professor, Department of Chemical and Biomedical Engineering
FAMU-FSU College of Engineering, Florida State University
2525 Pottsdamer St, Tallahassee, FL, 32310, USA
Tel: +1-850-410-6320, Fax: +1-850-410-6150
Email: yli@eng.fsu.edu

ABSTRACT

Pluripotent stem cells (PSC) have great potentials for cell therapy, drug discovery, and disease modeling due to their extensive proliferative capacity and unique ability to differentiate into derivatives of all three-germ layers. In this presentation, several key technologies will be discussed for the safe, consistent, and scalable production of neural cells differentiated from PSCs. First, a defined human PSC culture system is established with synthetic peptide acrylate surface. This system supported long-term culture of human PSC with high expression of the pluripotent markers. Second, oligodendrocyte progenitor cells (OPCs) were differentiated with high purity for the treatment of spinal cord injury. The process was successfully scaled up for production under the compliance of current good manufacturing practices (cGMP). The cells were used for the first-ever FDA approved clinical trial based on human PSC-derived cell therapy. Finally, for the potential clinical use, neural progenitors were labeled with magnetic superparamagnetic iron oxides for MRI imaging. The labeling efficiency, the effects on cell proliferation and neural differentiation, and the magnetic resonance contrast were investigated. Taken together, defined culture system, scalable differentiation of high purity cells, and bio-imaging enable the successful use of PSC-derived medicines in clinics.

BIOGRAPHY

Dr. Yan Li was born in Shangdong, China. She received her B.S. degree in Chemical Engineering and graduated with honors from Tsinghua University (Beijing, China) in 1995. She received her Ph.D. in Chemical Engineering from The Ohio State University (Columbus, Ohio, USA) in 2002. At The Ohio State University, Dr. Yan Li received numerous awards including Presidential Fellowship and Graduate Student Alumni Research Award.

From Jan 2002 to Aug 2011, she worked at Geron Corporation, the world leader in pluripotent stem cell technology, on human embryonic stem cell (hESC) derived therapies as Development Scientist (2002-2003), Scientist II (2003-2006), Senior Scientist (2006-2009), and Principal Scientist (2009-2011). During this period, Dr. Yan Li received several awards from Geron including Geronosity Award and Award of Achievement, and was recognized as the company's leading expert for hESC-derived cell production and engineering.

Dr. Yan Li is currently an Assistant Professor in the Department of Chemical and Biomedical Engineering, FAMU-FSU College of Engineering, at Florida State University, Tallahassee,

Florida. She has more than 12 years of experiences in industry and academy on pluripotent stem cell engineering. Her major research focuses on Pluripotent Stem Cell (PSC)-based systems and biomaterials for drug screening and cell therapy. Specifically, Dr. Li's group is studying the cell-cell and cell-matrix interactions to regulate the fate of PSCs in order to understand the effects of stem cell niche factors and the microenvironment for self-renewal and lineage commitment. The lineages in her expertise include the neural progenitors, cardiomyocytes, and dendritic cells. Dr. Li is a member of American Institute of Chemical Engineers (AIChE) and American Chemical Society (ACS). She has more than 80 publications/presentations and more than 30 technical reports.

Representative Publications:

1. Yan Li, Archna Gautam, Jiwei Yang, Liqun Qiu, Zara Melkoumian, Jennifer Weber, Lavanya Telukuntla, Rashi Srivastava, Erik Whiteley, Ralph Brandenberger. Oligodendrocyte progenitor cell differentiation from human embryonic stem cells on vitronectin-derived synthetic peptide acrylate surface. Stem Cells and Development. 2013, 22, 1497-1505.

2. Sebastien Sart, Teng Ma, Yan Li. Cryopreservation of pluripotent stem cell aggregates in defined protein-free formulation. Biotechnology Progress. 2013; 29: 143-153.

3. Bridget M. Mooney, Nurazhani Abdul Raof, Yan Li, Yubing Xie. Convergent mechanisms in pluripotent stem cells and cancer: Implications for stem cell engineering. Biotechnology Journal. 2013, 8, 408-419.

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

Structural basis for targeting tight control of PP2A holoenzyme biogenesis

Yongna Xing

Assistant Professor, Department of Oncology
University of Wisconsin-Madison, School of Medicine and Public Health
1400 University Avenue, Madison, WI 53706
Tel: +1-608-262-8376, Fax: +1-608-262-2824
Email: xing@oncology.wisc.edu

ABSTRACT

Protein phosphatase 2A (PP2A) is a major serine/threonine phosphatase in eukaryotic cells with complex composition and regulation. Deregulation of PP2A function has been linked to devastating human diseases, including cancer, neurodegenerative disease, and heart failure. Our recent advance in understanding the structural basis of PP2A regulation underlies a linear pathway that strictly controls the molecular events en route to the biogenesis of PP2A holoenzymes, including stable PP2A latency, activation, methylation, and assembly of diverse trimeric holoenzymes. Our study also provides key structural basis for targeting this pathway for developing therapeutics.

We showed that free PP2A catalytic subunit is stabilized in a partially folded form by α4, which is critical for cellular PP2A latency and stability, and underlies a mechanism for recycling of PP2A catalytic subunit (Nat. Commun. 4:1699 doi: 10.1038/ncomms2663 (2013)). PP2A phosphatase activator (PTPA) is a unique activation chaperone that stabilizes a meta-stable PP2A fold, and orients ATP to directly enhance chelation of catalytic metal ions. PP2A-specific methyltransferase, LCMT-1, binds directly to the PP2A active site, which relies on an active conformation of PP2A and is required for methylation of PP2A tail. Methylation in turn facilitates holoenzyme assembly. Consistent with our structural observations, PTPA stimulates both PP2A phosphatase activity and LCMT-1-mediated PP2A methylation (Molecular Cell 41, 331–342 (2011)). These strictly controlled molecular events ensure that the free PP2A catalytic subunit is stabilized in an inactive form, and the activated PP2A is selectively methylated and enhanced to form substrate-specific holoenzymes. α4, PTPA, and LCMT-1 are all important for cell survival, cell cycle progression, and resistance to DNA damaging reagents, suggesting that blocking the function of these regulatory proteins might specifically hinder the biogenesis of responsive PP2A holoenzymes, which likely represents a novel therapeutic strategy.

BIOGRAPHY

Yongna Xing received her B.S. in Biochemistry (1995) and M.S. in Genetics (1997) from Fudan University, and received her Ph.D. in Molecular Genetics and Microbiology from Rutgers University/UMDNJ (2002). She pursued her postdoctoral training at UMDNJ (2002-2004) and at Princeton University (2004 -2008). Currently she is an Assistant Professor at McArdle Institute for Cancer Research in the School of Medicine and Public Health, University of Wisconsin-Madison, and serves as a trainer for multiple graduate programs, including Cancer biology, Cell and Molecular Biology, Biophysics, and Molecular and Environmental Toxicology Center (METC). Dr. Xing's research focuses on elucidating cellular signaling related to cancer using structural,

biochemical, biophysics, and cell biology approaches. She has authored up to thirty peer-reviewed publications, and more than 10 high profile publications are related to PP2A regulation. She is also an affiliated member of Morgridge Institute for Discovery at UW-Madison focusing on computational drug discovery.

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

CoRAL: a machine learning approach to predict non-coding RNAs from small RNA-sequencing data

Fanny Yuk Yee Leung

Postdoctoral Researcher, Department of Pathology and Laboratory Medicine
Penn Center for Bioinformatics
Room 1404, Blockley Hall,
423 Guardian Drive, Philadelphia, PA19104
Tel: 1-215-573-3729
Email: yyee@mail.med.upenn.edu
(賓州大學梁玉儀博士)

ABSTRACT

Background:
The surprising observation that virtually the entire human genome is transcribed means we know little about the function of many emerging classes of RNAs, except their astounding diversities. Traditional RNA function prediction methods rely on sequence or alignment information, which are limited in their abilities to classify the various collections of non-coding RNAs (ncRNAs).

Method and Results:
To address this, we developed Classification of RNAs by Analysis of Length (CoRAL), a machine learning-based approach for classification of RNA molecules. CoRAL uses biologically interpretable features including fragment length and cleavage specificity to distinguish between different ncRNA populations. We evaluated CoRAL using genome-wide small RNA sequencing data sets from four human tissue types and were able to classify six different types of RNAs with ~80% cross-validation accuracy.

Conclusions:
Analysis by CoRAL revealed that microRNAs, small nucleolar and transposon-derived RNAs are highly discernible and consistent across all human tissue types assessed, whereas long intergenic ncRNAs, small cytoplasmic RNAs and small nuclear RNAs show less consistent patterns. The ability to reliably annotate loci across tissue types demonstrates the potential of CoRAL to characterize ncRNAs using small RNA sequencing data in less well-characterized organisms.

BIOGRAPHY

Fanny Yuk Yee Leung received the BEng degree in Medical Engineering from the University of Hong Kong in 2005. She obtained her PhD degree in the Department of Electrical and Electronic Engineering at the same university in 2009, under the supervision of Prof Y.S. Hung. In 2010, she started her postdoctoral research in Li-San Wang's lab in the Department of Pathology and Laboratory Medicine, Penn Center for Bioinformatics at the University of Pennsylvania.

Dr. Leung completed all her studies in Hong Kong. During her undergraduate study, she finished her final year project on unsupervised clustering in microarray data. Besides, she spent her summers as an intern in two different labs. In 2004, in Bio-cancer Treatment International Limited, a biotech company developing an anti-liver cancer drug, she helped to study drugs' effects on nude mice models, both in vitro and in vivo. In 2005, in the Department of Surgery at The University of Hong Kong Li Ka Shing Faculty of Medicine, she helped to run proteomics experiments on rats affected by liver cancers. There are places where she developed most of her wet laboratory skills.

Dr. Leung then pursued her PhD study focusing on different aspects of microarray data analyses. Her thesis entitled 'An Integrated Framework for Feature Selection and Classification in Microarray Data Analysis' is a three-in-one algorithm for outlier detection, feature selection and classification in high-dimensional data. She was a student member of the IEEE Engineering in Medicine and Biology Society (EMBS).

Dr. Leung is currently a postdoctoral researcher at the University of Pennsylvania. Her research focuses on developing statistical, machine learning and data mining algorithms for data obtained from clinical population and RNA-seq experiments. She is involved in developing tools to better understand the biology of small RNAs, a rising type of non-coding RNA. She also works closely with clinicians on different biomarker discovery projects, including a biomarker discovery project in collaboration with the Jansen entity. She is particularly interested in identifying potential targets for diagnosis and prognosis of different neurodegenerative diseases, such as Alzheimer's disease and depression, a psychological disease.

Technical Session D1-W3-T3: New Materials Science and Engineering, Nanotechnology and New Green Energy

Workshop Co-Chair and Session Chair

Lin-wen Hu

Associate Director & Principal Research Scientist
Nuclear Reactor Laboratory (NRL), Massachusetts Institute of Technology
(麻省理工學院核子反應爐實驗室副主任胡玲文博士)

BIOGRAPHY

Technical Session D1-W3-T3: New Materials Science and Engineering, Nanotechnology and New Green Energy

Designing Nanostructured Hybrid Materials for Energy Storage Technologies

Guihua Yu

Assistant Professor, Materials Science & Engineering and Mechanical Engineering
Texas Materials Institute, The University of Texas at Austin
Austin, Texas 78712
Tel: 512-232-5276, Fax: 512-474-8482
Email: ghyu@austin.utexas.edu

ABSTRACT

Rational design and controlled synthesis of functional nanomaterials with well-tailored properties are essential for realizing their exciting applications in energy technologies. This talk will discuss: how various nanoscale building blocks can be rationally designed and integrated into desired architectures to optimize the fundamental energy transformation processes for high-performance energy storage devices including electrochemical supercapacitors and lithium-ion batteries.

Firstly, a general design of three-dimensional (3D) hierarchical nanostructured supercapacitor electrodes will be presented that chemically integrate carbon nanomaterials with functional metal oxides to allow efficient charge carrier transport and ion diffusion. The resulting devices fabricated with low-cost materials through scalable processes exhibit the promising characteristics with high power and energy densities and remarkable cycling stability, offering the potential for large-scale energy storage systems. Secondly, hybrid inorganic-organic nanostructured electrode systems will be introduced for next-generation lithium-ion batteries, which can offer over 5 times higher charge storage capacity than that is possible with current technology. In this part, it will be discussed how the unique functions of conducting polymers can be utilized to overcome several fundamental material challenges faced by those ultrahigh capacity but insulating electrode materials such as sulfur (as a cathode material) and silicon (as an anode material).

BIOGRAPHY

Guihua Yu received his B.S. degree with the highest honor in chemistry from University of Science and Technology of China (USTC) in 2003. He earned his A.M. (2006) and Ph.D. (2009) degrees in chemistry at Harvard University, and did three years postdoctoral research in Chemical Engineering at Stanford University from 2009-2012. Currently he is an Assistant Professor in the Department of Mechanical Engineering and Texas Materials Institute at The University of Texas at Austin. Dr. Yu's research has been focused on rational design, synthesis, and fundamental investigation of nanostructured material systems for advanced energy and environmental technologies. He has published over 30 research papers on top scientific journals, and received Ralph E. Powe Junior Faculty Award (2013), IUPAC Prize for Young Chemists (2010) and MRS Graduate Student Silver Award (2007).

Technical Session D1-W3-T3: New Materials Science and Engineering, Nanotechnology and New Green Energy

Nanomaterials for Future Green Computation

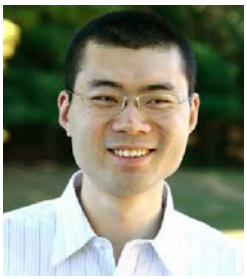
Jie Xiang

Assistant Professor, Department of Electrical and Computer Engineering
University of California, San Diego

ABSTRACT

For over a decade, nanotechnology has allowed rational synthesis of nanodot, nanowire and nanotube materials with different structure, composition, and with size control at the atomic precision. These nanoscale building blocks make it possible to explore electronic devices with completely new operating principles. Faster silicon is typically associated with burning more power, which is the top design constraint in today's computer chips. In this talk I will first use Ge/Si nanowire heterostructures as an example to illustrate how we can harness the mechanical degree of freedom in such tiny nanodevices to lower transistor power dissipations beyond the fundamental thermodynamic limit in traditional MOSFETs. In the second part I will discuss a new era of phononic engineering in nanowires to turn waste heat into power and to explore the greener side of silicon.

BIOGRAPHY



Dr. Jie Xiang joined the Department of Electrical and Computer Engineering and the Materials Science Engineering program at University of California, San Diego as an Assistant Professor in 2009. Prior to his appointment he was a KNI Prize postdoctoral fellow in the Kavli Nanoscience Institute at California Institute of Technology. He received the B.S. degree in physics from Peking University in China (2002), the A.M. degree in physics (2006) and the Ph.D. degree in chemical physics from Harvard University in 2007. His research interests include electron and phonon transport phenomena in nanostructured materials and the development of novel nanodevices for logic, sensing and energy harvesting applications. He is a recipient of the Materials Research Society Graduate Student Gold Award, the KNI Prize Postdoctoral Fellowship and NSF CAREER Award.

Technical Session D1-W3-T3: New Materials Science and Engineering, Nanotechnology and New Green Energy

Yu-Lun Chueh

Associate Professor, Department of Material Science and Engineering
National Tsing Hua University
(清華大學材料科學工程學系闕郁倫教授)

ABSTRACT

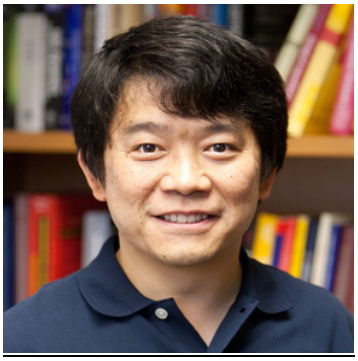
BIOGRAPHY

Technical Session D1-W3-T3: New Materials Science and Engineering, Nanotechnology and New Green Energy

Jung-Tsung Shen

Assistant Professor, Department of Electrical & Systems Engineering
Washington University in St. Louis
(聖路易華盛頓大學電機暨系統工程學系沈榮聰教授)

BIOGRAPHY



Workshop Co-Chair and Session Chair

Wen-wen Tung

Associate Professor, Department of Earth, Atmospheric, and Planetary Sciences
Purdue University
2504 Gala Drive, West Lafayette, IN 47907, USA
Tel: +1-765-494-0272, Fax: +1-765-496-1210
Email: wwtung@purdue.edu
(普渡大學地球與大氣科學系董文文教授)

BIOGRAPHY

Wen-wen Tung was born in Taiwan on October 8, 1974. She graduated from the National Taiwan University with a B.S. degree in atmospheric sciences in 1996. In 2002, she received her Ph.D. in atmospheric sciences from the Department of Atmospheric and Oceanic Sciences at the University of California, Los Angeles, USA.

She has since worked in the United States as a postdoctoral researcher in the Advanced Study Program at the National Center for Atmospheric Research (2002-2004). In 2005, she was hired as an assistant professor in the Department of Earth, Atmospheric, and Planetary Sciences at Purdue University, and became an associate professor in 2011. She has conducted teaching, research, and committee services, in random order. During 2012 to early 2013, she was on sabbatical leave, doing research at the Courant Institute of Mathematical Sciences at New York University. Her specialties are physical, dynamical, and stochastic characterizations of multiscale tropical convective systems. Her method of inquisition has resulted in collaborative multidisciplinary research.

Prof. Tung is a member of the American Meteorological Society, the American Geophysical Union, the Society for Industrial and Applied Mathematics, and the Sigma Xi. She was awarded the 2002-2004 Advanced Study Program Postdoctoral Fellowship at the National Center for Atmospheric Research and 2011 College of Science Graduate Mentor Award at Purdue University. She has authored and coauthored more than thirty referred journal publications and one textbook.

Technical Session D1-W1-T4: Earth and Atmospheric Sciences, Aerospace and Ocean Engineering

Coupling of an advanced particle microphysics (APM) model with GEOS-Chem, WRF-Chem, and CAM5: Key features and applications

Fangqun Yu

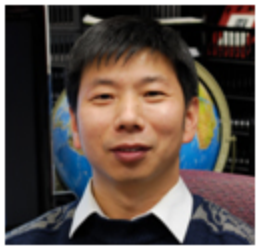
Senior Research Associate & Professor
Atmospheric Sciences Research Center
State University of New York at Albany
251 Fuller Road
Albany, New York 12203-3649
Tel: 518-437-8767; Fax: 518-437-8758
E-mail: fyu@albany.edu

ABSTRACT

Atmospheric particles, as part of the principal components of the atmosphere, impact air quality, tropospheric oxidation capacity, and Earth's climate. They degrade air quality (smog and haze formation, visibility reduction, etc.) and can cause adverse health effects. They influence atmospheric oxidation capacity and chemistry through the scattering and absorption of ultraviolet radiation. They also provide sites for heterogeneous chemistry, affecting the NOx and O3 budgets. Lastly, aerosols affect the Earth's radiation balance both directly, by scattering and absorbing radiation, and indirectly, by serving as cloud condensation nuclei and ice nuclei and thus influencing cloud properties and precipitation.

To better understand and assess the environmental and climatic impacts of atmospheric particles which depend strongly on their concentrations, sizes, compositions, and mixing states, we have developed a computationally efficient size-resolved (sectional) advanced particle microphysics (APM) model and incorporated it into a global chemical transport model GEOS-Chem, the Weather Research and Forecasting (WRF) model coupled with chemistry WRF-Chem, the Community Atmosphere Model (CAM) v5.2 within the recently released Community Earth System Model (CESM). In this talk, I will discuss the key features of the APM model in these three widely used community models (i.e, GEOS-Chem, WRF-Chem, and CESM-CAM), recent scientific findings based on the coupled models, and possible future applications.

BIOGRAPHY



Fangqun Yu was born in Zhejiang Province, China. He has earned a BS degree in atmospheric sciences from Peking University in 1991, a MS degree atmospheric physics from the Chinese Academy of Sciences in 1994, and a Ph.D. in atmospheric sciences at University of California at Los Angeles (UCLA) in 1998.

He is currently a faculty member at the State University of New York at Albany. His research focuses on the fundamental theory of nucleation mechanisms, the development and application of nucleation theories and an advanced particle microphysics (APM) model, 3-dimensional modeling of size-resolved aerosol processes, the analysis of field and laboratory measurements related to particle formation, and the global implications of aerosol nucleation and transformation for climate change, air quality, and health impacts.

Prof. Yu has served as an Editor for Atmospheric Chemistry and Physics (ACP) sine 2011. He Reviewed many proposals for major funding agencies and manuscripts for journals including Science, Nature, Phys. Rev. Lett., Environ. Sci. Tech., etc. He received Global Change Consortium Fellowship in 1994-1997, Dissertation Year Fellowship in 1998, and Jacob A. Bjerknes Memorial Award for Outstanding Research in 1998. He has published about 90 peer reviewed scientific journal papers.

Technical Session D1-W1-T4: Earth and Atmospheric Sciences, Aerospace and Ocean Engineering

Understand multi-scale climate processes over the Maritime Continent by analyzing observed and model simulated data

Jian-Hua Qian

Associate Professor, University of Massachusetts Lowell
One University Ave, Lowell, MA 01854, USA
Tel: +0-978-934-4861, Fax: +0-978-934-3069
Email: JianHua_Qian@uml.edu

ABSTRACT

Two mechanisms associated with multi-scale climate processes of ENSO, monsoon and diurnal cycle are found important for rainfall variability over the Maritime Continent: 1) Monsoonal damping effect over narrow islands such as Java and North Borneo - an inverse relationship between the monsoonal wind speed and the intensity of diurnal cycle of land-sea and mountain-valley winds; 2) Wake effect over wide islands such as South Borneo - the diurnal cycle is stronger on the wake- or lee-side than the windward side of the island or mountain ranges in respect to the low-level monsoonal winds.

The mechanisms for the spatial heterogeneity of climate variability over Java Island have been studied. Besides the well-known anomalous dry conditions that characterize the dry and transition seasons during an El Niño year, analysis of regional model output reveals a wet mountainous south versus dry northern plains in precipitation anomalies associated with El Niño over Java during the peak rainy season. Modeling experiments indicate that this mountains/plains contrast is caused by the interaction of the El Niño– induced monsoonal wind anomalies and the island/mountain-induced local diurnal cycle of winds and precipitation. During the wet season of El Niño years, anomalous southeasterly winds over the Indonesian region oppose the climatological northwesterly monsoon, thus reducing the strength of the monsoon winds over Java. This weakening is found to amplify the local diurnal cycle of land–sea breezes and mountain–valley winds, producing more rainfall over the mountains, which are located closer to the southern coast than to the northern coast.

The interannual variability of precipitation over Borneo Island in association with ENSO has been studied by using the satellite and reanalysis data. Analysis of the GPCC precipitation shows a dipolar structure of wet southwest versus dry central and northeast in precipitation anomalies associated with El Niño over Borneo Island during the austral summer. The spatial distribution of rainfall over Borneo depends on the direction of monsoonal winds. Weather typing analysis indicates that the dipolar structure of rainfall anomalies associated with ENSO is caused by the variability in the frequency of occurrence of different weather types. Rainfall is enhanced in the coastal region where sea breezes head against off-shore synopticscale low-level winds, i.e., in the lee side or wake area of the island, which is referred to here as the "wake effect." In the December-February of El Niño years, the northwesterly austral summer monsoon in South Borneo is weaker than normal over the Maritime Continent and easterly winds are more frequent than normal over Borneo, acting to enhance rainfall over the southwest coast of the island. This coastal rainfall generation mechanism in different weather types explains the dipole pattern of a wet southwest versus dry northeast in the rainfall anomalies over Borneo Island in the El Niño years.

BIOGRAPHY

Dr. Jian-Hua Qian was born in Nantong, Jiangsu Province, China in 1963. He graduated from Nanjing University, Jiangsu, China with Bachelor's and Master's degree in atmospheric science in 1983 and 1986, respectively, and got his Ph.D. in atmospheric science from the North Carolina State University at Raleigh, North Carolina USA in 1996. He did his postdoc research in the Climate and Global Dynamics Division at the National Center for Atmospheric Research in Boulder Colorado 1n 1996-2008. Then he spent a year at the NASA Goddard Space Flight Center in Greenbelt Maryland. From 2000 to 2011, he was an Associate Research Scientist and then a Research Scientist in the International Research Institute for Climate and Society at Columbia University in the City of New York. Since 2011, he has been an Associate Professor in atmospheric and climate science at the University of Massachusetts Lowell. He has research experience and interests in a wide spectrum of atmospheric and climate sciences. Specific areas of his research are listed below: (1) Multi-scale climate process studies; (2) Regional climate downscaling and prediction; (3) Regional climate modeling methodology; (4) Global and regional climate model development; (5) Mesoscale atmospheric modeling of moisture ransport, precipitation recycling, and land-atmosphere interaction; (6) Global non-hydrostatic semi-implicit semi-Lagrangian atmospheric model development; (7) Theoretical studies of atmospheric dynamics in non-hydrostatic normal modes; and (8) Applications of climate science in real-world problems such as forest fire and rice production.

Prof. Qian is a member of American Meteorological Society and American Geophysical Union. Selected publications are:

1. Qian, J.-H., A.W. Robertson and V. Moron (2013) Diurnal cycle in different weather regimes and
rainfall variability over Borneo associated with ENSO. J. Climate, 26, 1772-1790.
2. Qian, J.-H., A.W. Robertson, V. Moron (2010) Interactions between ENSO, monsoon and diurnal
cycle in rainfall variability over Java, Indonesia. J. Atmos. Sci., 67, 3509-3524.
3. Qian, J.-H., L. Zubair (2010) The effects of grid spacing and domain size on the quality of ensemble
regional climate downscaling over South Asia during the northeasterly monsoon season. Mon. Wea.
Rev., 138, 2780-2802.
4. Qian, J.-H. (2008) Why precipitation is mostly concentrated over islands in the Maritime Continent.
J. Atmos. Sci. 65, 1428-1441.
5. Qian, J.-H., W.-K. Tao, K.-M. Lau (2004) Mechanisms for torrential rain associated with the Meiyu
development during SCSMEX-1998. Mon. Wea. Rev., 132, 3-27.
6. Qian, J.-H., A. Kasahara (2003) Nonhydrostatic normal modes on the beta-planes. Pure and Applied
Geophysics, 160, 1315-1358.
7. Qian, J.-H, A. Seth, S.E. Zebiak (2003) Reinitialized versus continuous simulations for regional
climate downscaling. Mon. Wea. Rev., 131, 2857-2874.
8. Qian, J.-H., F. Giorgi, M. Fox-Rabinovitz (1999) Regional stretched grid generation and its application to the NCAR RegCM. J. Geophy. Res., 104, 6501-6513.
9. Qian, J.-H., F.H.M. Semazzi, J.S. Scroggs (1998) A global nonhydrostatic semi-Lagrangian atmospheric model with orography. Mon. Wea. Rev., 126, 747-771.

Technical Session D1-W1-T4: Earth and Atmospheric Sciences, Aerospace and Ocean Engineering

Remote and local forcing of decadal sea level and thermocline depth variability in the south Indian Ocean

Weiqing Han

Associate Professor, Department of Atmospheric and Oceanic Sciences
University of Colorado, UCB 311, Boulder, Co 80309, USA
Tel: 303-735-3079, Fax: +303-492-3524
Email: whan@colorado.edu

ABSTRACT

Analysis is performed on a set of diagnostic numerical experiments designed to isolate local Indian Ocean forcing versus remote forcing from the Pacific via the Indonesian Throughflow on decadal variability of subsurface temperature, sea level and thermocline depth of the south Indian Ocean. It is found that the vertical structure of decadal temperature variability varies from decade-to-decade, with maximum variability peaking in the vicinity of the thermocline. The decadal scale temperature variations in the tropical southwestern Indian Ocean between 5oS-17oS are primarily associated with the vertical displacements of the thermocline. Prior to the early 1990s, decadal variations in sea level and thermocline depth can be described in terms of a baroclinic Sverdrup balance, forced by Ekman pumping velocity associated with windstress curl acting on the Indian Ocean. Beginning in the early 90's, decadal variability of the equatorial Pacific trades forces thermocline variations that modify the sea level and thermocline depth across the tropical south Indian Ocean basin. Farther south, between 20oS-30oS, oceanic instabilities make significant contributions to decadal variability of the thermocline. The anomalies along the western coast of Australia are primarily driven by regional forcing acting on the Indian Ocean prior to the 1990s, and signals originating from the equatorial Pacific make a greater contribution thereafter.

[From: Trneary L., and W. Han, 2013: J. of Geophys. Res. - Oceans, in press]

BIOGRAPHY

Weiqing Han
Born: Linxi, P.R. China
B.S. 1986 Atmospheric Dynamics, Nanjing Institute of Meteorology, Nanjing, P.R. China
M.S. 1989 Meteorology, Chinese Academy of Meteorological Sciences, Beijing, P.R. China
PhD. 1999 Physical Oceanography, Nova Southeastern University, Dania, Florida, USA

She has been an Associate Professor since 2009 and had been an assistant Professor from 2002-2009 at Department of Atmospheric and Oceanic Sciences, the University of Colorado. She had been a Postdoc at the University of Colorado from 1999-2002. Her research directs toward tropical ocean circulation, dynamics, process studies, air-sea interaction, and decadal climate variability and change.

Prof. Han
American Meteorological Society
American Geophysical Union
National Science Foundation Faculty Early CAREER award (2009)
NCAR Faculty Fellowship Award (2005)
Distinguished Student Achievement Awards, Nova SE University (1998)
National Research Council/NAS Committee on sea level rise in California, Oregon and Washington
(2011-2012)
World Climate Research Program/Climate variability and predictability Indian Ocean Panel (2011-pres)
Associate Editor, JGR-Oceans. 2004-2010
NSF panel, NASA Panels

Duncan B., and **W. Han**, 2012: Influence of atmospheric intraseasonal oscillations on seasonal and interannual variability in the upper Indian Ocean. JGR-Oceans, 117, DOI: 10.1029/2012JC008190.
Wang J.-W., **W. Han**, and R. Sriver, 2012b: Impact of tropical cyclones on the ocean heat budget in the Bay of Bengl during 1999. Part II: processes and interpretations. JGROceans, 117, C09021, doi:10.1029/2012JC008373.
Han W., J.P. McCreary, Y. Masumoto, J. Vialard, B. Duncan, 2011: Basin Resonances in the Equatorial Indian Ocean. J. Phys. Oceanogr., 41, 1252-1270.
Han W., Gerald A. Meehl, Balaji Rajagopalan, John T. Fasullo, Aixue Hu, Jialin Lin, William Large, Jih-wang Wang, Xiaowei Quan, Laurie L. Trenary, Alan Wallcraft, Stephen Yeager, 2010: Patterns of Indian Ocean Sea Level Change in a Warming Climate. Nature Geoscience,DOI:10.1038/NGEO901.

Technical Session D1-W2-T4: Medicine, Public Health, Biomedical Science and Engineering

Session Chair

Woei-jyh (Adam) Lee

Scientist, National Institutes of Health
Bethesda, Maryland 20892, USA
E-mail: adamlee@mail.nih.gov
(美國國家衛生研究院李偉智博士)

BIOGRAPHY

Dr. Woei-jyh (Adam) Lee received his BSE degree from the National Taiwan University, his MS degree from the Courant Institute at the New York University, and his PhD degree from the University of Maryland at College Park (UMD). He worked on distributed objects and fault tolerance at AT&T Labs - Research in 1997. He focused on network software and management at Bell Laboratories Research, Lucent Technologies, from 1998 till 2000. He visited the University of Southern California specializing in continuous media streaming and multimedia networking from 2002 to 2003.

Dr. Lee worked on distributed objects and fault tolerance at the AT&T Labs - Research in 1997. He focused on network software and management at the Bell Laboratories Research, Lucent Technologies, from 1998 till 2000. He visited the University of Southern California specializing in continuous media streaming and multimedia networking from 2002 to 2003. He contributed in protein domain parsing and boundary prediction at the National Cancer Institute (NCI), National Institutes of Health (NIH) from 2004 to 2005. He was a fellow focusing on human genetics and genomics at the National Center for Biotechnology Information, National Library of Medicine, NIH from 2009 to 2012. He became a special volunteer working on computational modeling for cancer progression and metastatic at the NCI, NIH since 2012. He was also affiliated with the Center for Bioinformatics and Computational Biology and the Institute for Advanced Computer Studies at the UMD.

Dr. Lee is currently a faculty of Information Systems at the Robert H. Smith School of Business at the UMD since 2012. His research interests include bioinformatics, computational biology, cancer biology, genomics and genetics, information integration, data management and mining, and literature-based discovery. He has two US Patents and is a member of the ISCB and the ISENG.

Technical Session D1-W2-T4: Medicine, Public Health, Biomedical Science and Engineering

Investigating tissue specificity of cancer-causing germline mutations

Jessica C. Mar

Assistant Professor, Albert Einstein College of Medicine of Yeshiva University
1300 Morris Park Avenue, Bronx NY 10461, USA
Tel: +1-718-678-1251
Email: Jessica.Mar@einstein.yu.edu

ABSTRACT

The remarkable diversity we see between different cell types in the human body is governed by the specificity attained through transcriptional and epigenetic regulatory programs. Cancer is a disease that targets specific tissues, and in the case of cancer-causing germline mutations, it is perplexing that primary tumors arise in a restricted subset of tissues only. Understanding why a mutation can be suppressed in one tissue but not others stands to unlock insights into tissue-specific transcriptional regulation and how these programs promote fragility or resistance of cancer-causing mutations.

We have been studying cancer-causing germline mutations in the context of cell type-specific gene regulatory networks. Using a comprehensive tissue expression atlas from the FANTOM5 consortium, we have access to CAGE sequencing data that captures promoter usage and gene expression in over 1000 human samples, including primary cells, tissues and cell lines. Levering information from COSMIC, the Cancer Gene Census, and FANTOM5, two classes of genes that have tissues-specific, cancer-causing mutations have been identified – (1) genes that are expressed in the cell type where the cancer occurs, (2) genes that are expressed ubiquitously across many different cell types. For this second class, we have begun comparing regulatory networks associated with these genes in susceptible versus resistant cell types to identify changes in network topology that may change a cell type's oncogenic potential.

BIOGRAPHY

Jessica Mar received her Bachelor of Science degree in mathematics at the University of Queensland in Brisbane, Australia and First Class Honors in statistics in 2002. She received her PhD in biostatistics from Harvard University in 2008.

She currently runs a computational biology lab as an Assistant Professor at the Albert Einstein College of Medicine in the Department of Systems and Computational Biology in the Bronx, New York. Previously she was a postdoctoral research fellow at the Dana-Farber Cancer Institute in Boston, and a visiting scientist at the European Bioinformatics Institute in the United Kingdom. The focus of the Mar lab is to understand how variability of biological signals is involved in cellular regulation and its role in human disease.

Prof. Mar is a member of the International Society of Computational Biology, the Australian Society for Biochemistry and Molecular Biology and the Australasian Microarray and Associated Technologies Association. She is a recipient of a University of Queensland medal and an American-Australian Fulbright award. She is currently an Associate Editor of Genomics.

Technical Session D1-W2-T4: Medicine, Public Health, Biomedical Science and Engineering

'Filter Feeding': Principled exploratory filtering approaches for sequence data to identify variants, genes, and regions for genetic follow-up studies

Adam Naj

Instructor, Department of Biostatistics and Epidemiology
Senior Scholar, Center for Clinical Epidemiology and Biostatistics
University of Pennsylvania Perelman School of Medicine
229 Blockley Hall, 423 Guardian Drive
Philadelphia, PA 19104, USA
Tel: +1-215-746-4180, Fax: +1-215-573-1050
Email: adamnaj@mail.med.upenn.edu

ABSTRACT

Large scale sequencing projects using many cases and controls to identify both rare and common variants contributing to complex disease risk remain cost-prohibitive for most studies. Among the feasible approaches being implemented widely are targeted resequencing, whole exome sequencing, and whole genome sequencing of small numbers of samples (tens or hundreds of cases and sometimes controls) and the use of filtering strategies on the resulting data to identify follow-up genotyping of candidate variants or limited fine-mapping sequencing of candidate genes or regions for association analyses in larger datasets. Principled filtering strategies are thus critical in addressing potential type I and type II errors in identifying variants/genes/regions for follow-up. In this talk, we will review filtering approaches for examining small-scale sequencing data in both family-based and unrelated case-control data, as well as sample selection strategies for both primary sequencing and follow-up genotyping or sequencing projects. We will discuss the application of data from multiple annotation sources in filtering, as well as preliminarily highlight the value and potential applications of new data on functional genetic elements arising from the ENCODE Project. We will explore the application of these approaches to several on-going genetic studies of late-onset Alzheimer's disease.

BIOGRAPHY

Originally from Chicago, Illinois, Adam Naj earned a bachelor's degree (B.A.) in biology with a specialization in genetics and in psychology from the University of Chicago (Chicago, IL) in 2000. Choosing to extend his study of genetics to that of genetic risk factors in populations, he pursued his doctorate in the field of human genetic epidemiology, earning his Ph.D. in epidemiology from the Johns Hopkins University Bloomberg School of Public Health (Baltimore, MD) in 2008.

While his pre-doctoral work focused mainly on the genetics of cardiometabolic traits (cardiovascular disease, type 2 diabetes, and obesity), his postdoctoral work from 2008 to 2012 at the University of Miami John P. Hussman Institute of Human Genomics (Miami, FL) explored primarily the genetics of neurodegenerative diseases- more specifically, genetic risk factors of late-onset Alzhimer's disease. His work there included leading in the analysis of and first authorship of the largest population-based genetic study of Alzheimer's disease, published in the May 2011 issue of Nature Genetics, and his subsequent work has included considerable analysis work on

both family-based and population-based studies of high-density genotyping and next-generation sequencing data to identify rare variants contributing to late-onset Alzheimer's disease risk, from which several manuscripts have been generated and are currently under review. Presently, he is a Senior Scholar in the Center for Clinical Epidemiology and Biostatistics and Lecturer in the Department of Biostatistcs and Epidemiology at the University of Pennsylvania Perelman School of Medicine (Philadelphia, PA), where he is continuing his work on next-generation sequencing and rare variant analysis in late-onset Alzheimer's disease.

Dr. Naj is a member of the American Society of Human Genetics, International Genetic Epidemiology Society, and Alzheimer's Association, is a member of the organizing committee for the Mid-Atlantic Genetic Epidemiology and Statistics (MAGES) conference, and serves in an advisory capacity on the Data Deposition and Analysis Committees of the National Human Genome Research Institute (NHGRI) Alzheimer's Disease Sequencing Project.

Technical Session D1-W2-T4: Medicine, Public Health, Biomedical Science and Engineering

Limb Regeneration: From Amphibians to Mammals

Chia-Ho Cheng

Statistical Programmer Analyst, Institute for Aging Research
Hebrew SeniorLife
1200 Centre St. Boston, MA, 02131 USA
Tel: +1-617-971-5312, Fax: +1-617-971-5339
Email: chia-hocheng@hsl.harvard.edu

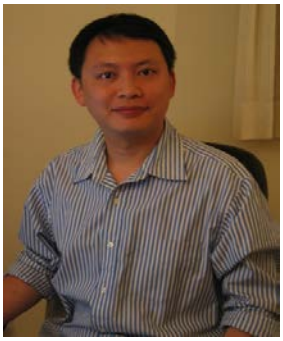
ABSTRACT

Today, nearly two million Americans live without a limb and it is estimated that there are over 185,000 amputations performed each year, largely due to diabetes, vascular diseases or accidents. The long-range goal of studying mechanisms underlying limb regeneration is to find ways to harness the body's natural regenerative abilities to heal wounds that involve bone, muscle, nerves, and soft tissue.

The morphological evidence for certain amphibians to regenerate total limbs has been known for many decades and this amazing ability can occur repeatedly on the same limb within a single individual. Traditional wound healing in mammals is a long repair process that can only partially recover the original tissue organization and is nearly always accompanied by scar formation. The pathway(s) for regulating fast wound healing in mammals are not yet known due to our incomplete understanding of what critical molecular control factors initiate and contribute to tissue regeneration at the cellular and organ level.

Despite the fact that full-limb regeneration is never observed in mammals, the complete closure of ear punch holes without scar formation has been reported in a single mouse strain, the 'superhealer' MRL. Moreover, the digit tip has been shown to regrow in both mouse and human, though amputation below the first proximal joint leads to scarring and no growth. Studies of digit amputation in the second phalange in the MRL mouse has indicated that blastema formation does occur but is followed after 2 weeks by an apoptotic response eliminating new tissue. This is then followed by a second attempt at blastema formation. However, full regrowth and replacement of lost tissue is not seen. This is in contrast to the response seen in C57BL/6 (B6) and Swiss Webster (SW) tissue in which blastema formation is never seen.

BIOGRAPHY



Chia-Ho Cheng received his B.S. (2000) in Bioengineering from Tatung University and M.S. (2004) in Computer Science from University of Detroit, Mercy. He earned his Ph.D. (2012) from University of Massachusetts Lowell in Chemistry with the concentration on Bioinformatics. Currently he is a Statistical Programmer Analyst of Institute for Aging Research in Hebrew SeniorLife, the research affiliate of Harvard Medical School. Dr. Cheng is interested in the fields of statistics, bioinformatics, bone genetic epidemiology and big data analysis. His current research work is applying novel statistical and bioinformatic methods to study the relationship between genetics and bone mineral density, fracture and foot disorder. He is the member of

American Statistical Association (ASA) and the Boston Area SAS Users Group (BASUG) and also a certified SAS programmer.

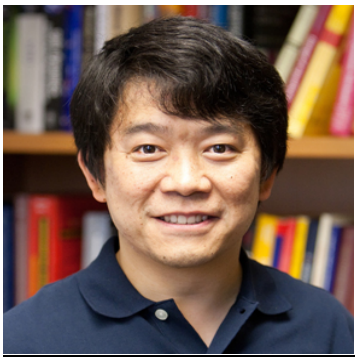
Technical Session D1-W3-T4: New Materials Science and Engineering, Nanotechnology and New Green Energy

Workshop Co-Chair and Session Chair

Jung-Tsung Shen

Assistant Professor, Department of Electrical & Systems Engineering
Washington University in St. Louis
(聖路易華盛頓大學電機暨系統工程學系沈榮聰教授)

BIOGRAPHY



Technical Session D1-W3-T4: New Materials Science and Engineering, Nanotechnology and New Green Energy

High-Efficiency Nanowire Light-Emitting Diodes for Phosphor-Free Solid-State Lighting

Zetian Mi

Associate Professor, Department of Electrical and Computer Engineering, McGill University
3480 University Street, Montreal, QC H3A 2A7, Canada
Tel: +1 514 398 7114
Email: Zetian.mi@mcgill.ca

ABSTRACT

One of the grand challenges for future solid state lighting is the development of high efficiency, phosphorfree white light emitting diodes (LEDs). In this context, we have investigated the molecular beam epitaxial growth and characterization of nanowire LEDs on Si, wherein intrinsic white-light emission is achieved by incorporating self-organized InGaN quantum dots in defect-free GaN nanowires on a single chip. We have further demonstrated that, with the incorporation of p-type modulation doping and AlGaN electron blocking layer, InGaN/GaN dot-in-a-wire white LEDs can exhibit nearly zero efficiency droop and significantly enhanced internal quantum efficiency (up to ~60%) at room-temperature. In this presentation, we will discuss the growth mechanisms of InGaN/GaN dot-in-a-wire nanoscale heterostructures on Si, the fabrication of large area nanowire devices, and their unique performance characteristics. Their emerging applications in solid state lighting, full color display, and imaging will also be discussed.

BIOGRAPHY

Zetian Mi received the B.S. degree in physics from Beijing University in 1997, the M.S. degree in Physics from the University of Iowa in 2001, and the Ph.D. degree in Applied Physics from the University of Michigan in 2006. He is an Associate Professor in the Department of Electrical and Computer Engineering at McGill University. He is also an associate member in the Department of Physics at McGill. He had been a research engineer in Picometrix Inc. (Ann Arbor, MI) from 2001 to 2003 and a postdoctoral researcher in the Department of Electrical and Computer Engineering at the University of Michigan from 2006 to 2007. Prof. Mi's teaching and research interests are in the areas of III-nitride semiconductors, low dimensional nanostructures, molecular beam epitaxy, nanophotonics, and nanoelectronics. He is currently working on phosphor-free white LEDs, solar fuels, and high-speed nanophotonic circuits on Si using nanoscale nitride semiconductors. He has published 6 book chapters, 70 refereed journal papers, and more than 100 refereed conference papers. He has received the Hydro-Quebec Nano-Engineering Scholar Award in 2009, the William Dawson Scholar Award in 2011, and the Christophe Pierre Award for Research Excellence (Early Career) in 2012 at McGill University. He has also received the Young Investigator Award from the 27th North American Molecular Beam Epitaxy Conference, which recognizes individuals who have made significant contributions to the science and technology of MBE or enabled by MBE by the age of 35 and show promise of future leadership in the field. Prof. Mi currently serves as the Associate Editor of IEEE Journal of Lightwave Technology.

Technical Session D1-W3-T4: New Materials Science and Engineering, Nanotechnology and New Green Energy

Fabrication of Functionalized Graphene-based Materials and Their Applications to Electrochemical Energy Storage

Ting YU（于霆）*1,2,3

Nanyang Assistant Professor,
1 Division of Physics and Applied Physics, School of Physical and Mathematical Sciences, Nanyang Technological University, 637371, Singapore
2 Department of Physics, Faculty of Science, National University of Singapore, 117542, Singapore
3 Graphene Research Centre, National University of Singapore, 117542, Singapore
Tel: +65 6316 7899, Fax: +65-6795 7981
Email: yuting@ntu.edu.sg

ABSTRACT

Graphene-based materials have attracted great research interest in view of their promising applications in energy conversion and storage devices due to their special two-dimensional geometrical structure and prominent intrinsic chemical and physical features, such as high electrical and thermal conductivity, large surface area as well as strong mechanical strength. However, it is very rare for a graphene-based bulk material to hold these fascinating properties and also possess the surface characteristics required for energy-related applications. Therefore, functionalization is considered to be an exciting way for making graphene-based bulk materials with exceptional properties as demanded for efficient energy conversion and storage.1

Our previous works are always focused on the fabrication of functionalized graphene-based materials and their applications to electrochemical energy storage.2, 3 Herein, we report a simple and efficient approach for fabrication of nanostructured graphene-polysulfide (GPS) materials, which consists of conducting graphene network and homogeneously distributed polysulfide in between and chemically bonded with graphene sheets. The formation of polysulfide bonds attached to the basal plane of graphene involves the nucleophilic addition reactions between carbonyl and epoxy groups on GO with the polysulfide ions. Such unique architecture not only possesses fast electron transport channels, shortens the Li-ion diffusion length but also provides very efficient Li-ion reservoirs (graphene and polysulfide bonds). The resultant GPS materials are demonstrated to be an anode material for high performance LIBs in terms of ultrahigh reversible capacity, excellent rate capability and superior long-term cycling performance (1600 mAh g-1 after 600 cycles at a current density of 1 A g-1 and 380 mAh g-1 after 1900 cycles at 10 A g-1). More practically meaningful, this simple and efficient strategy can be broadly applied to other carbon-based materials, such as carbon nanotubes, carbon fibers, carbon spheres and porous carbon, which may open up the possibility of large-scale production of functionalized carbon-based anode materials for high performance LIBs.

BIOGRAPHY

Dr. Ting YU was born in 1975 in Heilongjiang Province of China and current he is a Nanyang Assistant Professor in the Division of Physics and Applied Physics, School of Physical and Mathematical Sciences at Nanyang Technological University (NTU); a joint assistant professor of Department of Physics, Faculty of Science, National University of Singapore (NUS) and a National Research Foundation (NRF) fellow. He obtained his B.Sc. from Jilin University (1999, P. R. China), PhD degree from National University of Singapore (2003, NUS) and completed a

post-doctoral study in NUS under the Singapore Millennium Foundation (SMF) Postdoctoral Fellowship.

His research group focuses on Nanophotonics, nanoelectronics, graphene and its derivatives, nanocarbon-metal oxide hybridnanostructures for sustainable energy.

Dr. YU has received many prestigious awards including Nanyang Excellence Award for Research and Innovation (2008), National Young Scientist Award, National Research Foundation Fellowship Award (2009), Outstanding Young Scientist for the 3rd Inter Academy Panel/World Economic Forum (Summer Davos Forum) ((IAP/WEF, Representative of Singapore, 2010) and Institute of Physics Singapore, Nanotechnology award (2011).

Technical Session D1-W3-T4: New Materials Science and Engineering, Nanotechnology and New Green Energy

Junxia (Lucy) Shi

Assistant Professor, the Department of the Electrical and Computer Engineering
The University of Illinois at Chicago

ABSTRACT

BIOGRAPHY

Technical Session D1-W3-T4: New Materials Science and Engineering, Nanotechnology and New Green Energy

Building Three-Dimensional Surface Patterning on Nanostructures by Self-Assembly

Jeong-Hyun Cho

Assistant Professor, Department of Electrical and Computer Engineering
University of Minnesota, Twin Cities
Minneapolis, MN 55455
Tel: +1-612- 625-9016, Fax: +1-612-625-4583
Email: jcho@umn.edu

ABSTRACT

It is possible to alter physical and chemical proprieties of nanostructures by surface patterning on their three-dimensional (3D) surface. Recently, there is a great interest in utilizing the new physical and chemical properties which will reveal hidden state-of-the-art applications in diverse fields. For example, we can achieve superior resolution with metamaterials (artificial materials), being able to capture objects smaller than one wavelength of light. However there has been no way to realize three-dimensional surface patterning especially on nanostructures because conventional nanoscale lithographic technologies such as electron beam (e-beam) lithography and nanoimprint lithography are a two-dimensional (2D) manner which allow patterning only on a planar substrate. In order to overcome the limitation of the conventional layer-by-layer lithographic processes and realize patterning on the surface of 3D nanostructures, origami-inspired and self-assembly approaches were employed. This combination of the processes allows the building of 3D micro and nanostructures with desired patterns on their surface. As a proof-of-concept, this presentation will show the self-assembly process, building 3D micro- and nanodevices such as 3D sensors and 3D isotropic and anisotropic metamaterials which were realized with nanoscale surface patterns on the 3D structures.

BIOGRAPHY

Jeong-Hyun Cho received a B.S. degree in control and instrument engineering from Hoseo University, South Korea, in 2001. He received his M.S. degree in engineering and his Ph.D. in engineering science from Washington State University, Pullman, in 2004 and 2007, respectively. As a postdoctoral researcher in the Department of Chemical and Biomolecular Engineering at The Johns Hopkins University from 2008 to 2010, he devised a nanoscale self-assembly process and developed three-dimensional (3D) surface-patterned nanoparticles that self-assembled from 2D nanoparticles with precise, lithographically-defined features. He also worked as a postdoctoral fellow in The Center for Integrated Nanotechnologies at the Los Alamos National Laboratory from 2010 to 2013 January.

He is currently an assistant professor in Electrical Engineering at University of Minnesota, Twin Cities, where he has been working on the development of 3D multifunctional micro and nanostructures for devices, sensors, and electrical energy storages (Li-ion batteries) using a self-assembly strategy. He has published 28 journal articles relating to Micro/Nanotechnology,

Self-Assembled 3D Devices, and Energy Storages and Conversion Systems. He has also received several awards including the “Achievement Award” at the Los Alamos National Laboratory in 2011.

Day 2 (August 2nd, 2013)

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

Session Chair

Aichi Chien

Assistant Professor, Biomedical Physics IDP, Dept. of Radiological Sciences, Division of Interventional
Neuroradiology, David Geffen School of Medicine at UCLA, Ronald Reagan UCLA Medical Center
10833 LeConte Ave, Box 951721, Los Angeles, CA 90095
Phone: (310) 794-7921, Fax: (310)206-5958
Email: aichi@ucla.edu
(加州大學洛杉磯分校大衛格芬醫學院簡艾琪教授)

BIOGRAPHY

Aichi Chien, Ph.D. is an Assistant Professor in the Department of Radiological Sciences and the Biomedical Physics IDP Graduate Program in the UCLA Medical School since 2009; a faculty member of Medical School Short Term Training Program (SSTP) and Cross-disciplinary Scholars in Science and Technology (CSST) program since 2010, and faculty in the UCLA Center for Domain Specific Computing (CDSC) since 2011.

Dr. Chien received her Bachelor's Degree from National Taiwan University, Dept. of Agricultural Machinery Engineering in 1999, Taipei, Taiwan. She then completed her Master's Degree on the subject of Micro/Nano Resonators in the Dept. of Mechanical and Aerospace Engineering, Cornell University, Ithaca, NY; and her PhD Degree in Biomedical Engineering at the University of California, Los Angeles, CA on the topic of MEMS/NEMS implantable devices for cardiovascular disease. She went on to complete Postdoctoral Fellowship training in endovascular treatment in the Division of Interventional Neuroradiology in the UCLA David Geffen School of Medicine.

Dr. Chien's research interests encompass cardiovascular and stroke disease analysis with the integration of science and engineering to assist clinical decision making for individualized medicine. She has published more than 50 peer-review journal publications of original research, including 17 first author papers in high impact factor medical journals such as Stroke, Neurosurgery, Journal of Neurosurgery, and American Journal of Neuroradiology. She has received numerous awards, including the American Heart Association Outreach Award (2004), Heart Failure Society of America (2004), American Society for Laser Medicine and Surgery (2006), and Young Investigator Award from Cardiovascular System Dynamics Society (2006). She is the lead inventor on multiple US Patents and International Patents; Principle Investigator in a Philips Healthcare research grant and Radiology Exploratory grant. She is currently a Co-Investigator on two NIH R01 projects and one NSF (CCF) multi-disciplinary program. She has regularly given lectures in universities/ medical centers around the world and in US and international scientific meetings.

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

Development of Pin1 inhibitors to treat aggressive cancers

Shuo Dennis Wei

Postdoctoral Research Fellow, Beth Israel Deaconess Medical Center and
Harvard Medical School
3 Blackfan Circle, Boston, MA 02115
Tel: +1-617-735-2051, Fax: +1-617-735-2050
Email: swei2@bidmc.harvard.edu

ABSTRACT

A common and central signaling mechanism in the control of cell proliferation and transformation is Pro-directed phosphorylation on certain Ser/Thr-Pro (phospho-Ser/Thr-Pro) controlled by a large family of kinases, and phosphatases. The unique chemical properties of Pro allow for the adoption of two completely distinct amide bond conformations (cis and trans) and thereby provide a backbone switch that is controlled by prolyl cis/trans isomerization catalyzed by enzymes called peptidyl prolyl cis/trans isomerases (PPIases). A major advance in appreciating the conformational importance of Pro-directed phosphorylation motifs was the recent identification of the unique PPIase Pin1. Pin1 binds a subset of phospho-Ser/Thr-Pro-containing proteins using its protein-targeting WW domain and isomerizes only specific phospho-Ser/Thr-Pro bonds, which cannot be effectively catalyzed by other known PPIases. Importantly, Pin1 is tightly regulated at multiple levels and its deregulation plays a pivotal role in pathogenesis of some diseases, providing a potentially new therapeutic option, most notably for cancers.

Pin1 is widely overexpressed in variety of human cancers, and high Pin1 levels correlate with earlier recurrence of prostate cancer after radical prostatectomy. Moreover, Pin1 knockout in mice completely suppresses lymphoma development in p53 knockout mice as well as effectively blocks tumorigenesis induced by oncogenes such as MMTV-Ras or -HER2/Neu. Thus, Pin1 plays a major role in cancer development. Moreover, with a few exceptions, Pin1 activates 16 oncogenes/growth enhancers, including HER2/Neu, Raf-1, cyclin D1, b-catenin, c-fos, c-Jun, NF-kB, AKT, Mcl-1, Stat3, c-Rel, v-Rel, Notch, Tax, AIB1, Hbx, and also inactivates many tumor suppressors/growth inhibitors, including SMRT, p53, PML, RARa, FOXOs, Smad and TRF1, many of which have well established function in the cancer development. Pin1 amplifies oncogenic pathways by acting on multiple targets via the positive and negative feedback mechanisms such as the HER2/Ras/Raf/JNK/AP-1/cyclin D1 pathway. Thus, Pin1 is a pivotal catalyst for tumorigenesis by turning on or off numerous oncogenes or tumor suppressors at the same time, respectively, which makes development of Pin1 inhibitors a promising strategy against cancers.

BIOGRAPHY

Shuo Wei was born in Taipei, Taiwan. He obtained his pharmacy Ph.D from The Ohio State University, Columbus OH, at 2009 in Dr. Ching-Shih Chen's laboratory.

He worked as a POSTDOCTORAL RESEARCH FELLOW in Kun Ping Lu's laboratory at Beth Israel Deaconess Medical Center and Department of Medicine of Harvard Medical School, Boston MA, from 2010 until present.

Dr. Wei has been a member in the American Association for Cancer Research. He received Albert H. Soloway OSU Graduate Student Award at Ohio State University sequentially at 2008 and 2009. During his postdoctoral period, he has been awarded the Postdoctoral Fellowship from Susan G. Komen for the Cure, the breast cancer foundation. Dr. Wei has a total 16 publications with 6 papers with him as the first author published in prestige journals.

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

Wen-Chi Chou

Postdoctoral Research Fellow, Hebrew SeniorLife
Harvard Medical School

ABSTRACT

BIOGRAPHY

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

Designing Small Molecule Drugs for Staphylococcus aureus Infection

Fu-Yang (Albert) Lin

Research Fellow, Boston Children's Hospital, Harvard Medical School
3 Blackfan Circle, Boston 02115
Tel: +1-617-713-8217
Email: Fu-Yang.Lin@childrens.harvard.edu

ABSTRACT

Methicillin-Resistant Staphylococcus aureus (MRSA) is a major threat to public health worldwide. Despite of the severity of drug resistance, very few new antibiotics with novel mode actions are currently in the pipeline. One approach to combat antibiotics resistance is to target the bacterial virulence factors. Staphyloxanthin (STX) is golden-colored pigment produced by S. aureus, and is an essential virulence factor the bacterium uses to escape from host innate immunity. Knocking down STX therefore makes the pathogen much more vulnerable to immune clearance and will possibly synergize with some existing antibiotics. I present here the development of small molecule inhibitors that potently block the biosynthesis of staphyloxanthin via structure-based design. These compounds represent a novel class of therapeutics for treating MRSA infection.

BIOGRAPHY

Dr. Fu-Yang Lin was born and educated in Taiwan. He received his undergraduate and Master's degrees in Life Science from National Central University in 2003 and 2005. He went on to pursuit his career in basic research and obtained his PhD degree in Biophysics and Computational Biology from University of Illinois at Urbana-Champaign in 2011. Dr. Lin is currently a research fellow in Professor Timothy Springer's lab at Boston Children's Hospital, studying the structural basis for receptor-ligand interactions, and developing antagonists for integrins.

Dr. Lin is a member of the Biophysical Society, the American Association for the Advancement of Science (AAAS), the American Heart Association, and serves frequently as a reviewer for the American Chemical Society journals. He has published his work in highly influential journals, including the Proceedings of the National Academy of Science (PNAS), Journal of Medicinal Chemistry, and Angewandte Chemie.

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

ATF3 induction and axon regeneration in DRG neurons

Yung-Chih (Inge) Cheng

Postdoctoral Research Fellow
F. M. Kirby Neurobiology Center, Boston Children's Hospital
Department of Neurology, Harvard Medical School
3 Blackfan Circle, Boston, MA, 02115, USA
Tel: +1-857-998-1945, Fax: +1-617-919-2332
Email: Yung-Chih.Cheng@childrens.harvard.edu

ABSTRACT

Activating transcriptional factor 3 (ATF3) is highly up-regulated in all injured adult primary sensory neurons. Over-expression of ATF3 in adult cultured DRG neurons enhances neurite outgrowth and increases neuronal survival in neonatal cultured neurons after NGF withdrawal. Furthermore, forced ATF3 expression in transgenic mice enhances peripheral nerve regeneration by increasing the intrinsic growth state of injured sensory neurons. To find compounds that can enhance ATF3 expression and thereby promote sensory neuron regeneration after nerve injury, we generated hATF3-pro/GLuc stable clones in B104 neuroblastoma cells and mATF3-pro/RmGFP reporter mice for high throughput drug screening. We applied compounds reported in the literature to induce ATF3 expression to the stable clones, measuring Gaussia luciferase intensity in a 384 well format using Hamamatsu FFS7000 dynamic plate reader and found several compounds that increase ATF3 reporter activity. To confirm if these induce ATF3 in primary neuron cells, we applied the compounds to pre-conditiontioned and naive mATF3-pro/RmGFP DRG cells, then measured GFP intensity. After 24 hours, we found the GFP intensity was indeed enhanced by those compounds that made active the hATF3-pro/GLuc stable clone. To examine if the compounds has the potential to promote regeneration in neuron cells, wild-type DRG cells were stimulated with those compounds by different doses for 24 hours. After fixing, immunostaining with GFP-III tubulin, calculation of neurite length by ImagExpressmicro high content screening system, we found these compounds induced a 25% increase in neurite length in wild-type DRG neurons. Taken together, we developed a screening strategy suitable for identifying compounds that be able to induce ATF3 and promote neurite ourgrowth in peripheral DRG neuron cells. We will now survey chemical libraries for ATF3-inducing compounds using the B104 hATF3-pro/GLuc stable clone as primary screen, and then identify and confirm these using mATF3-pro/RmGFP reporter DRG cells as a secondary screen followed by a tertiary screen in an injured peripheral nerve mouse model.

BIOGRAPHY

Dr. Yung-Chih Cheng (鄭永志) graduated from National Sun Yat-Sen University in 2001. He earned the Master degree in Biochemistry and Molecular Biology from National Cheng-Kung University in 2003. Then, he joined in Academia Sinica as a research assistant to be his military serve for 4 years. Dr. Cheng received his Ph.D. degree in Biochemical Sciences from National Taiwan University in 2011. Now, he is a postdoctoral research fellow in F.M. Kirby Neurobiology Center at Boston Children's Hospital and Department of Neurology of Harvard Medical School. Dr. Cheng is a member in Society for Neuroscience (SfN). He was

selected among the top 5 of Annual Poster Competition in Academia Sinica from 2007 to 2009 for three consecutive years. He also received Travel Bursary Award of Young Scientist of 14th International Congress of Immunology (ICI 2010) in Japan. His research interest is studying molecular mechanism in neurological disorder and neuron regeneration. He has already published related papers in Journal of Neurochemistry (2009), Cellular Immunology (2010) and Molecular Neurobiology (2012). Now, he is a leader of project in setting up a high-throughput screening system in primary neuron cells for identification potential compounds to enhance neuron regeneration for therapeutic direction in neurological disorders. Moreover, he is trying to use TALEN and CRISPR/Cas genome editing technique to create neurological disorder related mouse disease model.

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

Workshop Co-Chair and Session Chair

Lin-wen Hu

Associate Director & Principal Research Scientist
Nuclear Reactor Laboratory (NRL), Massachusetts Institute of Technology
(麻省理工學院核子反應爐實驗室副主任胡玲文博士)

BIOGRAPHY

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

Catalytic Characterization of Meso-/microporous Lamellar Zeolite Catalysts

Dongxia Liu

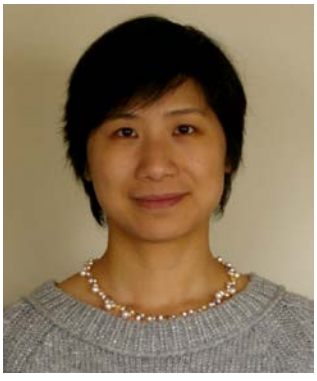
Assistant Professor, Department of Chemical and Biomolecular Engineering
University of Maryland, College Park, MD, 20742 USA
Tel: +1-301-405-3522, Fax: +1-301-405-0523
Email: liud@umd.edu

ABSTRACT

The meso/micro-zeolites couple the catalytic features of micropores and the improved access and transport consequence of mesopores in a single material, possessing the capacity of processing large molecules. The synthesis and catalytic behavior investigation of meso/micro-zeolites has become the subject of intense research.

This talk highlights the synthesis and catalytic characterizations of three emerging acidic meso-/micro-porous lamellar zeolite materials, with a focus on their catalytic behavior investigations using ethanol dehydration, monomolecular conversion of propane, and alkylation of mesitylene with benzyl alcohol as probe reactions. The rate and apparent activation energy of the catalytic ethanol and small alkane probe reactions in zeolites possessing dual micro- and meso-porosity was comparable to conventional microporous MFI materials, implying that the catalytic behavior of Brønsted acid sites in materials with dual meso-/micro-porosity is preferentially dominated by the microporous environment possibly because it provides a better fit for adsorption of small alkane or alcohol reactant molecules. The apparent rate constant of the catalytic alkylation of mesitylene with benzyl alcohol in meso/micro-porous zeolites was higher than that of their microporous analogues, revealing the role of the mesoporosity in space-demanding catalytic reactions. A mathematical model accounts for the external reaction, internal reaction, and diffusion developed to understand the catalytic behaviors of these catalysts.

BIOGRAPHY



Dongxia Liu received her B.S. (2000) and M.S. (2003) in Chemistry from Shandong University and Institute of Chemistry, Chinese Academy of Sciences, respectively. She received her Ph.D. (2009) from the University of Rochester in Chemical Engineering, and was a postdoctoral fellow in Chemical Engineering at the University of Minnesota between 2009 and 2011. Currently she is an Assistant Professor of Chemical and Biomolecular Engineering at the University of Maryland, a faculty member of University of Maryland Energy Research Center, and a faculty member of University of Maryland Nanocenter. Dr. Liu's research lies in the synthesis, characterization and evaluation of novel hierarchical meso-/microporous materials, which are used as efficient catalysts in diffusion constrained reactions and as selective membranes for water purification applications. She has authored twenty peer-reviewed journal articles and patent on these topics and served on the program and organizing committees of various international

workshops and conferences. She is the member of the American Institute of Chemical Engineers (AIChE), Catalysis Club of Philadelphia (CCP), North American Catalysis Society (NACS), American Chemical Society (ACS), and American Ceramic Society.

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

Ying-Hao Eddie Chu

Assistant Professor, Department of Materials Science and Engineering
National Chiao Tung University
(交通大學材料系朱英豪教授)

ABSTRACT

BIOGRAPHY

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

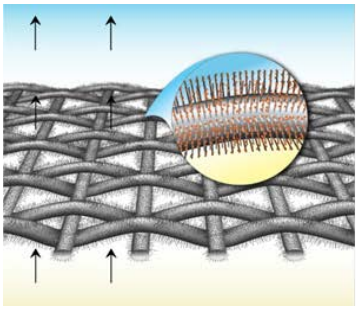
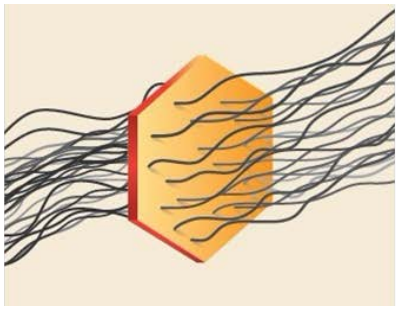
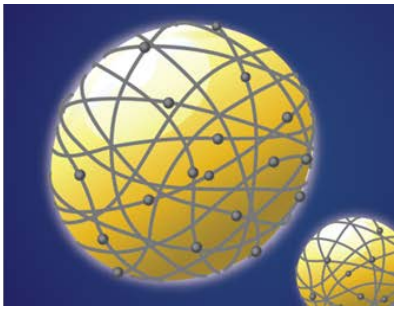
Hierarchical Carbon Nanotube Architectures for Water Treatment

Chongzheng Na

Assistant Professor, Department of Civil and Environmental Engineering and Earth Sciences, University of Notre Dame, 156 Fitzpatrick Hall, Notre Dame, IN 46556
Tel: +1-574-631-5164, Fax: +1-574-631-9236
Email: chongzheng.na@gmail.com

ABSTRACT

Developing transformative water treatment technology is essential for sustained development of society. Treatment processes using nanomaterials such as carbon nanotubes are promising candidates. Direct use of nanomaterials in water treatment, however, faces a prohibitive challenge. Because nanomaterials are small, they cannot be easily separated from treated water by sedimentation or filtration. Release of potentially toxic nanomaterials in treated water poses threats to human health and ecosystems. To meet this challenge, carbon nanotubes have been integrated on engineering supports, synthesized into colloidal particles, and decorated with magnetism. The resulting 3-D hierarchical carbon nanotube architectures are effective in adsorption, catalysis, and disinfection with little effort required for post-treatment separation.

BIOGRAPHY

Chongzheng Na obtained his bachelor's degree, master's degree, and Ph.D. – all in Environmental Engineering – from Tsinghua University, China, Pennsylvania State University, and the University of Michigan, respectively. He was further trained in environmental chemistry at Harvard University as a postdoc fellow before joining the University of Notre Dame as an assistant professor in 2009. His primary interest in research and teaching is designing new nanomaterials for environmental remediation and clean energy production. He is also interested in understanding nanoscale processes in the natural environment.

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

Nanowire-based Lead-Free Nanosolders for Nanoelectronics Assembly and Interconnection

Zhiyong Gu

Associate Professor, Department of Chemical Engineering
University of Massachusetts Lowell, One University Ave., Lowell, MA, USA
Tel: +1-978-934-3540, Fax: +1-978-934-3047
Email: Zhiyong_Gu@uml.edu
(麻州大學洛爾分校化學工程系谷志勇教授)

ABSTRACT

Nanosolders (nano-sized solder materials) have shown great promise in next generation micro/nano-electronics interconnects. Although lead-free (Pb-free) nanoparticles have been studied for several years, nano-sized solder joints were difficult to form by solder paste composed of solder nanoparticles, the main approach in this emerging area. In this presentation, we show a novel approach that utilizes nanowires as a model system to innovate nanoscale interconnection. We show that nanowire-based Pb-free nanosolders can be synthesized and developed not only for nanoscale assembly, but also for nanoscale joints formation. The nano-soldering techniques are approached by utilizing Pb-free nanosolders on multisegmented and multifunctional nanowires. Fundamentally, the interactions between the nanosolders and base materials (such as Cu or Au), including atomic diffusion, void formation, phase transformation and wetting property, were investigated. Finally, we show a case study of large scale magnetic assembly and interconnect formation of these nanosolder-based nanowires. The knowledge from these investigations is critical for the construction of next generation nanoelectronics and interconnects.

BIOGRAPHY

Dr. Zhiyong Gu is currently an Associate Professor and Graduate Coordinator in the Department of Chemical Engineering at the University of Massachusetts Lowell. He received his Ph.D. from the State University of New York at Buffalo in 2004 in the Department of Chemical and Biological Engineering. From 2004 to 2006, he worked as a Postdoctoral Fellow in the Department of Chemical and Biomolecular Engineering at the Johns Hopkins University. In September 2006, he joined the University of Massachusetts Lowell as an Assistant Professor, where he is also affiliated with the Nanomanufacturing Center. In September 2012, he was promoted to Associate Professor with Tenure. His research interests include synthesis of nanoparticles and nanowires, self-assembly, amphiphilic block copolymers, nanocomposite materials, and nanoscale integration for electronics, sensors and biomedical applications. He has published 4 book chapters and over 50 peer-reviewed papers, and contributed to over 120 presentations in national and international conferences. He has given over 30 invited talks and seminars in universities, R&D centers, and conferences. He received the 3M Non-Tenured Faculty Award in 2010 and Teaching Excellence Award in 2011. He has been a reviewer for over 40 different journals and various government funding agencies including NSF, NIH, ACS-PRF, NSERC, and Louisiana Board of Regents. He is currently an Associate Editor for Journal of Nanoparticle

Research and serves on the Editorial Board of several other journals, including Chemical Sensors, ISRN Electronics, and Frontiers in Green and Environmental Chemistry.

Technical Session D2-W4-T1: Broadband and Wireless Computing, Web, Cloud Computing, Cyber Security, and Machine Learning

Workshop Co-Chair and Session Chair

Chen-Hsiang (Jones) Yu

Director of Mobile Engineering and User Experience, Zappix and PetPace
25 Burlington Mall Road, Burlington, MA 01803, USA
Tel: +1 781.214.8124
Email: chyu@csail.mit.edu

BIOGRAPHY

Jones Yu is known as a computer scientist and a team lead in mobile industry. He earned B.E. and M.S. in Computer Science and Information Engineering (CSIE) from Tamkang University in 1998 and from National Taiwan University in 2000, respectively, and Ph.D. in Computer Science from MIT in 2012. His Ph.D. research focused on enhancing web pages on desktop and mobile browsers for two populations: non-native English readers and mobile users. Before coming to MIT, he worked as a team lead in the wireless industry for a few years. During his study at MIT, he continued his leadership and led teams winning several entrepreneurship and mobile application development competitions. Currently, he is Director of Mobile Engineering and User Experience at Zappix and PetPace.

Technical Session D2-W4-T1: Broadband and Wireless Computing, Web, Cloud Computing, Cyber Security, and Machine Learning

Workshop Co-Chair

Ping-Cheng Yeh

Associate Professor, Department of Electrical Engineering
National Taiwan University
(台灣大學電機工程學系葉丙成教授)

BIOGRAPHY

Technical Session D2-W4-T1: Broadband and Wireless Computing, Web, Cloud Computing, Cyber Security, and Machine Learning

Mobile-to-Mobile Cooperation in Uplink Cellular Communication

Mai Vu

Associate Professor, Department of Electrical and Computer Engineering
Tufts University
Medford, MA, USA
Tel: 617-627-6412 / Fax: 617-627-3220
Email: maivu@ece.tufts.edu

ABSTRACT

In this talk, I will describe our recent work on a new cooperative communication scheme for uplink mobile-to-mobile cooperation in a cellular system. Using time division of three phases in each transmission block, the mobiles partially exchange their information in the first two phases then cooperatively transmit information to the base station in the third phase. This proposed scheme has simple signal structure and short decoding delay that are suitable for practice. The scheme is near capacity-achieving when the inter-mobile links are much stronger than the mobile-to-base-station links. When performing in a fading environment, even though cooperation may induce outage at each mobile, the scheme reduces overall probabilities of outage. Our results thus show that uplink mobile-to-mobile cooperation can improve both average transmission rates and outage performance.

BIOGRAPHY

Mai Vu received a PhD degree in Electrical Engineering from Stanford University after having an MSE degree in Electrical Engineering from the University of Melbourne and a bachelor degree in Computer Systems Engineering from RMIT, Australia. During 2006-2008, she worked as a lecturer and researcher at the School of Engineering and Applied Sciences, Harvard University. During 2009-2012, she was an assistant professor in Electrical and Computer Engineering at McGill University. Since January 2013, she has been an associate professor in the department of Electrical and Computer Engineering at Tufts University.

Dr. Vu conducts research in the general areas of wireless communications, signal processing for communications, network communications and information theory. Examples include cooperative and cognitive communications, relay networks, MIMO systems. Dr. Vu has served on the technical program committee of numerous IEEE conferences and is currently an editor for the IEEE Transactions on Wireless Communications.

Technical Session D2-W4-T1: Broadband and Wireless Computing, Web, Cloud Computing, Cyber Security, and Machine Learning

User Cooperation in Media-Sharing Social Networks

H. Vicky Zhao

Associate Professor, Department of Electrical and Computer Engineering, University of Alberta
9107 116 Street, Edmonton, AB T6G 2V4 Canada
Tel: +1-780-492-9484, Fax: +1-780-492-1811
Email: vzhao@ece.ualberta.ca

ABSTRACT

In the past decade, we witness the emergence of large-scale media-sharing social network communities such as Napster, Facebook and YouTube, where millions of users form a dynamically changing infrastructure to share multimedia content. This proliferation of multimedia data creates a technological revolution to the entertainment and media industries, brings new experience to users, and introduces the new concept of web-based social networking communities. In large-scale media-sharing social networks, millions of users actively interact with each other, and such user dynamics not only influence each individual user but also affect the system performance. To provide a predictable and satisfactory level of service, it is of ample importance to analyze the impact of human factors on media-sharing social networks, and to provide important guidelines to better design of multimedia systems. The area of human and social dynamics has recently been identified by US NSF as one of its five priority areas, which also demonstrates the importance of this emerging interdisciplinary research area.

Media-sharing social networks rely on voluntary contribution of resources from individual users to achieve high system scalability and robustness. Cooperation also enables users to access extra resources from others and thus benefits each individual user. However, the voluntary participation nature and the distributed structure of social networks also pose new challenges. It has been shown that users' full cooperation cannot be guaranteed and free riding is prevalent in media-sharing networks. This talk introduces our recent works on user cooperation in media-sharing social networks. Different game-theoretic models will be proposed to analyze user dynamics and to stimulate user cooperation. Then, we will discuss the impact of user dynamics on media-sharing systems, and the design of behavior-aware media-sharing networks to maximize the network performance.

BIOGRAPHY

H. Vicky Zhao received the B.S. and M.S. degree from Tsinghua University, China, in 1997 and 1999, respectively, and the Ph. D degree from University of Maryland, College Park, in 2004, all in electrical engineering.

She was a Research Associate with the Department of Electrical and Computer Engineering and the Institute for Systems Research, University of Maryland, College Park from Jan. 2005 to July 2006. From Aug. 2006 to June 2012, she was an Assistant Professor with the Department of Electrical and Computer Engineering, University of Alberta. Since July 2012, she has been an Associate Professor with the Department of Electrical and Computer Engineering, University of Alberta, Edmonton, Canada. She is a co-author of "Multimedia Fingerprinting Forensics for Traitor Tracing" (Hindawi,

2005) and "Behavior Dynamics in Media-Sharing Social Networks" (Cambridge University Press, 2011). Her research interests include media-sharing social networks, information security and forensics, digital communications and signal processing.

Dr. Zhao received the IEEE Signal Processing Society (SPS) 2008 Young Author Best Paper Award. She is the Associate Editor for IEEE Information Forensics and Security and Elsevier Journal of Visual Communication and Image Representation, and a guest editor of special issue on Signal and Information Processing for Social Learning and Networking of IEEE Signal Processing Magazine. She was a member of IEEE Signal Processing Society Information Forensics and Security Technical Committee (2010-2012) and Multimedia Signal Processing Technical Committee (2011-2013). Dr. Zhao is the technical program co-chair of 2012 IEEE International Workshop on Multimedia Signal Processing (MMSP), the publication co-chair of 2013 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), and the finance co-chair of 2013 IEEE International Conference on Multimedia & Expo (ICME).

Technical Session D2-W4-T1: Broadband and Wireless Computing, Web, Cloud Computing, Cyber Security, and Machine Learning

Tian Lan

Assistant Professor, Department of Electrical and Computer Engineering
George Washington University

ABSTRACT

BIOGRAPHY

Technical Session D2-W4-T1: Broadband and Wireless Computing, Web, Cloud Computing, Cyber Security, and Machine Learning

Understanding the Robustness of SSDs under Power Fault

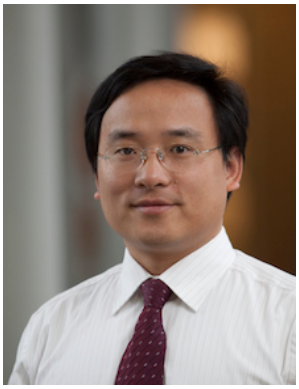
Feng Qin

Assistant Professor, Department of Computer Science and Engineering
The Ohio State University

ABSTRACT

Feng Qin received his Ph.D. degree from the University of Illinois at Urbana-Champaign. He joined the Department of Computer Science and Engineering at Ohio State as an Assistant Professor in 2006. He was promoted to Associate Professor in 2013. His research interests include Software Reliability, Operating Systems, High Performance Computing, and Security. He is particularly interested in developing system mechanisms to improve software availability and reliability at different software development stages. He has published papers in top system conferences in recent years. One of his papers was awarded as best papers in SOSP'05. Two of his papers won IEEE Micro Top Picks in 2004 and 2007, respectively. Three of his papers were nominated as best papers in HPCA'05, SC'07, and SC'10, respectively. He has received NSF CAREER Award in 2010.

BIOGRAPHY



Modern storage technology (SSDs, No-SQL databases, commoditized RAID hardware, etc.) bring new reliability challenges to the already complicated storage rack. Among other things, the behavior of these new components during power faults - which happen relatively frequently in data centers - is an important yet mostly ignored issue in this dependability-critical area. In this talk, I will mainly present our recent work on exposing reliability issues in block devices under power faults. Our framework includes specially-designed hardware to inject power faults directly to devices, workloads to stress storage components, and techniques to detect various types of failures. By applying our testing framework to fifteen commodity SSDs, we have surprisingly found that thirteen out of the fifteen devices exhibit failure behavior contrary to our expectations.

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

Workshop Co-Chair and Session Chair

Li-San Wang

Assistant Professor of Pathology and Laboratory Medicine
Institute on Aging / Institute for Biomedical Informatics
University of Pennsylvania Perelman School of Medicine
1424 Blockley Hall, 423 Guardian Drive
University of Pennsylvania, Philadelphia, PA 19104 USA
Tel: +1-215-746-7015
Email: lswang@mail.med.upenn.edu
(賓州大學醫學院王立三教授)

BIOGRAPHY

Li-San Wang received his B.S. (1994) and M.S. (1996) in Electrical Engineering from the National Taiwan University. He received his M.S. (2000) and Ph.D. (2003) from the University of Texas at Austin, both in Computer Sciences, and was a postdoctoral fellow at the University of Pennsylvania between 2003 and 2006. Currently he is an Assistant Professor of Pathology and Laboratory Medicine, a faculty member of Penn Institute for Biomedical Informatics (IBI), and a fellow of Institute on Aging (IOA) and Penn Genome Frontiers Institute (PGFI) at University of Pennsylvania. Dr. Wang's research uses genetics, genomics, bioinformatics, and next-generation sequencing technology to study Alzheimer's disease and other neurodegenerative disorders. He has published more than seventy peer-reviewed book chapters and journals. He is the PI of NIA Genetics of Alzheimer's Disease Data Storage Site (NIAGADS) and organizes working groups for Alzheimer's Disease Genetic Consortium (ADGC), the International Genome of Alzheimer's Project (IGAP), and the NIH Alzheimer's Disease Sequencing Project (ADSP).

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

Prevention of Hemorrhagic Stroke—the Role of Science and Engineering

Aichi Chien

Assistant Professor, Biomedical Physics IDP, Dept. of Radiological Sciences, Division of Interventional
Neuroradiology, David Geffen School of Medicine at UCLA, Ronald Reagan UCLA Medical Center
10833 LeConte Ave, Box 951721, Los Angeles, CA 90095
Phone: (310) 794-7921, Fax: (310)206-5958
Email: aichi@ucla.edu
(加州大學洛杉磯分校大衛格芬醫學院簡艾琪教授)

ABSTRACT

Brain aneurysm rupture causes a life-threatening type of stroke. One third of patients die before arriving at the hospital and an additional third of those who are hospitalized die as a result of the stroke. Only 20% of these patients will be able to recover to normal. As medical imaging technology has advanced, in clinical practice more and more aneurysms are found before rupture. Deciding whether to treat an unruptured aneurysm is a challenge because the risk of treatment procedures needs to be carefully evaluated against the risk of aneurysm rupture. Therefore, understanding the natural history of brain aneurysm and the mechanisms underlying aneurysm rupture become essential to assist treatment decision-making. Recently, many international studies have found important factors related to aneurysm growth and rupture based on aneurysm morphology and cerebral vascular hemodynamics factors. This talk will cover our research of clinical aneurysms, including aneurysm growth, morphology and hemodynamic risks and how this information and technology helps medical decisions to provide individualized treatment plans to prevent stroke.

BIOGRAPHY

Aichi Chien, Ph.D. is an Assistant Professor in the Department of Radiological Sciences and the Biomedical Physics IDP Graduate Program in the UCLA Medical School since 2009; a faculty member of Medical School Short Term Training Program (SSTP) and Cross-disciplinary Scholars in Science and Technology (CSST) program since 2010, and faculty in the UCLA Center for Domain Specific Computing (CDSC) since 2011.

Dr. Chien received her Bachelor's Degree from National Taiwan University, Dept. of Agricultural Machinery Engineering in 1999, Taipei, Taiwan. She then completed her Master's Degree on the subject of Micro/Nano Resonators in the Dept. of Mechanical and Aerospace Engineering, Cornell University, Ithaca, NY; and her PhD Degree in Biomedical Engineering at the University of California, Los Angeles, CA on the topic of MEMS/NEMS implantable devices for cardiovascular disease. She went on to complete Postdoctoral Fellowship training in endovascular treatment in the Division of Interventional Neuroradiology in the UCLA David Geffen School of Medicine.

Dr. Chien's research interests encompass cardiovascular and stroke disease analysis with the integration of science and engineering to assist clinical decision making for individualized medicine. She has published more than 50 peer-review journal publications of original research, including 17 first author papers in high impact factor medical journals such as Stroke, Neurosurgery, Journal of Neurosurgery, and American Journal of Neuroradiology. She has received numerous awards, including the American Heart Association Outreach Award (2004), Heart Failure Society of America (2004), American Society for Laser Medicine and Surgery (2006), and Young Investigator Award from Cardiovascular System Dynamics Society (2006). She is the lead inventor on multiple US Patents and International Patents; Principle Investigator in a Philips Healthcare research grant and Radiology Exploratory grant. She is currently a Co-Investigator on two NIH R01 projects and one NSF (CCF) multi-disciplinary program. She has regularly given lectures in universities/ medical centers around the world and in US and international scientific meetings.

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

Magnetic Resonance guided Focused Ultrasound Treatment (MRgFUS)

Chang-Sheng Mei

Assistant Professor, Department of Physics
Soochow University
70 Linhsi Road, Shihlin ,Taipei ,Taiwan 111, R.O.C.
Tel: +886-2-28819471 ext 6732, Fax: +886-2-28834634
Email: meic@bwh.harvard.edu
(東吳大學物理系梅長生教授)

ABSTRACT

Focus ultrasound (FUS) is an attractive alternative to surgical resection due to its noninvasive character. FUS treatments have been successfully conducted in several clinical applications and FDA-approved for treatment in uterine fibroid. MRI and MR thermometry is a natural choice for the guidance of FUS surgeries, given its ability to visualize, monitor, and evaluate the success of treatments. MR thermometry, however, can be a very challenging application, as good resolution is often needed along spatial, temporal as well as temperature axes. These three quantities are strictly related to each other, and normally it is theoretically impossible to simultaneously achieve high resolutions for all axes. In this talk, techniques were discussed to achieve this at cost of some reduction in spatial coverage. Different MR thermometry techniques with their drawbacks and benefits will also be discussed.

BIOGRAPHY

Chang-Sheng Mei received his diploma in Electrical Engineering at the National Taipei Institute of Technology (國立台北工專) in 1993, B.S. in Physics at the National Central University (國立中央大學) in 1995, M.S. in Physics at the National Tsing Hua University (國立清華大學) in 1998, and Ph.D. in Physics at the Boston College in 2011. He conducted his Ph.D. thesis projects at Harvard Medical School and continued on his work at Harvard as a postdoctoral research fellow since 2011. He has taken a faculty position at the Physics Department of Soochow University as an Assistant Professor. Dr. Mei's research interest is magnetic resonance thermometry, a temperature mapping technique using clinical MRI, which is the key component in MRgFUS surgeries. He has authored seven peer-reviewed journal articles, presented twenty conference abstracts, and reviewed two leading journals on the field.

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

Lipid-based nanoparticles for Intracellular Delivery of Proteins for Cancer Therapy

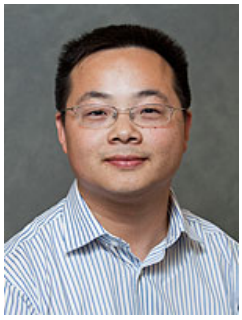
Qiaobing Xu

Assistant Professor, Department of Biomedical Engineering,
Tufts University, Medford, MA 02155, USA
Tel: 1-617-627-4322
E-mail: qiaobing.xu@tufts.edu

ABSTRACT

Although protein-based drugs have shown success, they have been limited mostly to cytokines, growth factors, enzymes and monoclonal antibodies, all of which function primarily extracellularly. There are a number of diseases, including genetic diseases and cancers, that have the potential to be treated through proteins with an intracellular target. However, proteins alone are not usually able to cross the cell membrane in order to reach their intracellular targets. Hence it is desirable to develop efficient and effective tools as well as strategies that will enable us to deliver therapeutic proteins in their active forms to tumor cells or tissues. Here I will present a combinatorial approach for the creation of cationic lipid-like nanoparticles (termed "lipidoids") to facilitate intracellular cytotoxic protein delivery for the inhibition of tumor cell proliferation both in vitro and in vivo.

BIOGRAPHY



Dr. Qiaobing Xu was born in Nanjing, Jiangsu, China in 1977. He obtained his B.S. in 1999, and M.Sc. in 2002, both from Department of Chemistry, Jilin University, Changchun, China. From 2002-2007, he pursued his PhD degree in chemistry under the guidance of Prof. George Whitesides at Harvard University where he invented "Nanoskiving", a novel technology to fabricate functional nanomaterials. From 2007-2010, he was a Cancer Center for Nanotechnology Excellence postdoctoral fellow with Prof. Robert Langer at MIT, where he worked on developing novel nanomaterials for drug delivery applications.

He joined Tufts in September, 2010. He is currently an assistant professor in Department of Biomedical Engineering at Tufts University. He also holds adjunction assistant professor position in Department of Chemical and Biological Engineering and School of Medicine at Tufts University. He is also a member of Program in Cell, Molecular and Developmental Biology, Sackler School of graduate biomedical science, Tufts University. His current research interests lie at the intersection of material science engineering, specifically micro/nanoscience, and biomedical application.

His work involves using combinatorial method to develop novel materials for the delivery of therapeutic biomacromolecules and using nanotechnology to develop novel biomaterials for tissue engineering. He has published about 40 peer reviewed scientific paper and 7 patents either filed or pending.

Dr. Xu is a member of Society for Biomaterials, Biomedical Engineering Society. He received

Charlton Award from Tufts University School of Medicine in 2012 and named the Pew Scholar for Biomedical Sciences from Pew Charitable Trusts in 2013.

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

Yi-Hsiang (Sean) Hsu

Assistant Professor, School of Medicine
Harvard University
(哈佛大學醫學院許益祥教授)

ABSTRACT

BIOGRAPHY

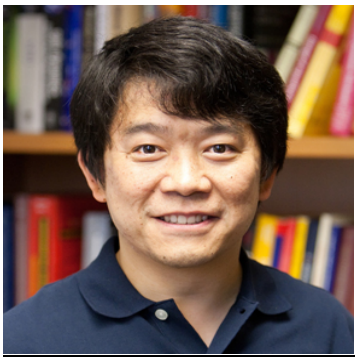
Technical Session D2-W3-T2: New Materials Science and Engineering, Nanotechnology and New Green Energy

Workshop Co-Chair and Session Chair

Jung-Tsung Shen

Assistant Professor, Department of Electrical & Systems Engineering
Washington University in St. Louis
(聖路易華盛頓大學電機暨系統工程學系沈榮聰教授)

BIOGRAPHY



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

Development of Schottky Structure Radiation Sensor on Freestanding Gallium Nitride

Lei Raymond Cao

Assistant Professor, The Ohio State University
201 W 19th Ave. columbus, Ohio USA
Tel: +1-614-247-8701, Fax: +1-614-292-3163
Email: cao.152@osu.edu

ABSTRACT

Gallium Nitride (GaN) is intrinsically suited for use as an ionizing radiation detector in high temperature, high radiation field spectroscopy applications. The rapid advancement of materials growth technology over last two decades has laid foundation for its use as light-emitting diode, optoelectronic, and high power devices etc. However, structural defects caused by lattice constant mismatch in the substrate during epitaxial growth have limited the maximum thickness of GaN films, and thus its utilization in α-particle spectroscopy. For example, while GaN grown by Metalorganic Chemical Vapor Deposition (MOCVD) and Molecular Beam Epitaxy (MBE) can achieve thicknesses of several microns, the 5.48 MeV 241Am α-particle has a substantially longer range of 14.3 μm in GaN. GaN samples created via Hydride Vapor Phase Epitaxy (HVPE) can achieve thicknesses of several millimeters with high crystalline quality, but unfortunately suffer from a higher carrier concentration. This research seeks to understand GaN at a fundamental level, and facilitate the development of a GaN radiation detector on an HVPE grown freestanding wafer for the potential applications in nuclear industry and homeland security.

BIOGRAPHY

Cao received his BS degree in Nuclear Physics from Lanzhou University in 1994, MS degree in Nuclear & Particle Physics from China Institute of Atomic Energy in 2002, and his PhD degree from the Nuclear and Radiation Engineering Program in the Mechanical Engineering Department at the University of Texas at Austin in 2007.

Prior to joining Ohio State, Dr. Cao was a Research Associate at the Center for Neutron Research at the U.S. National Institute of Standards and Technology (NIST) for 2.5 years and also received a 6-month training at the Positron Emission Tomography Laboratory at Massachusetts General Hospital, affiliated with Harvard Medical School. At OSU, Cao has founded the Nuclear Analysis and Radiation Sensor (NARS) laboratory and has published over 50 papers.

Dr. Cao serves as an executive committee member at Isotope and Radiation Division at the American Nuclear Society. He was the recipient of a DOD young investigator award in 2011 and the OSU Lumley multidisciplinary research award in 2012.

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

Advanced modeling of pebble-bed reactors: granular flow simulation and radiation transport in stochastic media

Wei Ji

Assistant Professor, Department of Mechanical, Aerospace, and Nuclear Engineering
Rensselaer Polytechnic Institute (RPI)
110 8th street, JEC5040 MANE, Troy, NY 12180, USA
Tel: +1-518-276-6602, Fax: +1-518-276-6025
Email: jiw2@rpi.edu

ABSTRACT

High temperature pebble-bed reactor (PBR) designs, one of the next generation nuclear energy systems, have been demonstrated to be the only meltdown-proof reactors to date. The meltdown-proof feature is rooted in their unique fuel designs and fuel management operations. PBR uses microsphere fuel particles (~1mm diameter) as the basic fuel element, with the uranium in the fuel kernel surrounded by four protective coating layers. About 15,000 fuel particles are embedded in a fuel pebble (6cm diameter) and about 450,000 to one million fuel pebbles are loaded in the reactor core. Helium gas or liquid salt passes through the pebbles to take the fission heat out for the electricity generation. Such a design presents substantial challenges to the reactor modeling and simulation. Pebbles are moving constantly under pebble-pebble, wall-pebble and coolant-pebble interactions. It is a computational challenge in tracking the motion of each pebble. Moreover, pebble flow and coolant flow are tightly coupled by strong drag/buoyancy force interaction. This fully coupled interaction can be further complicated by changes in the power and temperature distributions, which affect forces among pebbles, coolant, and walls. A coupled simulation accounting for mechanical-neutronic-thermal fluid interactions is needed to accurately predict the behavior of the reactor.

This presentation will review the research performed at RPI in multi-physics modeling and simulation for the pebble bed reactors. The emphasis is on the pebble flow and coolant flow coupling and their impacts on the distributions of pebble packing, coolant pressure and velocity. In addition, an advanced Monte Carlo methodology in speeding up the neutronic analysis of random distribution of fuel particles or fuel pebbles will also be discussed. This work is part of a general research topic “radiation transport computation in stochastic media” currently pursued at RPI.

BIOGRAPHY

Wei Ji received his B.S. (1999) and M.S.E. (2002) in Engineering Physics from Tsinghua University at Beijing, China. He received his Ph.D. (2007) from the University of Michigan at Ann Arbor in Nuclear Engineering. Currently, he is an Assistant Professor of Nuclear Engineering Program at RPI, leading the Rensselaer Nuclear Engineering Advanced Modeling and Simulation Laboratory (R-NEAMS). Dr. Ji’s research focuses on the development of advanced computation methodologies applied to the areas of nuclear energy, medical physics, and nuclear safeguards. These methods include Monte Carlo modeling of radiation transport in stochastic media, multi-physics models for

coupled granular flow and fluid flow simulations in pebble-bed reactors, and algorithms on hybrid parallel CPU-GPU architectures to accelerate simulations. Dr. Ji has been leading or participating in several NRC, DOE and NIH funded research projects in the past five years. He has authored over fifty peer-reviewed publications and served on the program and organizing committees of various national and international workshops and conferences.

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

Enhanced Ion and Molecule Transport in 2-D Nanofluidic Channels

Chuanhua Duan

Assistant Professor, Department of Mechanical Engineering, Boston University
110 Cummington Mall, Boston, MA 02215, U.S.A
Tel: +1-617-353-3270, Fax: +1-617-353-5866
Email: duan@bu.edu

ABSTRACT

Nanofluidics refers to the study and application of fluid transport in and around nanometer-sized objects, including nanopores, nanotubes, nanochannels and porous membranes. Among the four nanofluidic platforms above, 2-D nanochannels are the only one that provides well-defined nanoscale confinement, yet can be fabricated by conventional MEMS fabrication techniques and is amenable for integration and observation. Such nanofluidic devices have recently attracted great attention because of many interesting ion/molecule transport phenomena recently discovered in them and their corresponding novel applications in bio- and energy-related fields. Most of these discoveries result from nanoscale surface-liquid interactions (e.g. electrostatic interaction, van der Waals force and hydration/steric force). In this talk, I will first introduce surface-charge-governed ion transport due to electrostatic force in 2-D nanochannels. Several new applications of this enhanced transport, including power generation, flow control and enzyme sensing will be demonstrated. I will then present some recent discoveries on enhanced ion transport in 2-nm nanochannels due to electrostatic and hydration forces, and fast evaporation due to cavitation under negative pressure. Potential applications of such enhanced transport in energy storage and conversion will also be discussed.

BIOGRAPHY

Chuanhua Duan was born in Yueyang, Hunan Province, China in 1979. He received his B.S. and M.S. degrees in engineering thermophysics from Tsinghua University (Beijing, China) in 2002 and 2004. He obtained his Ph.D. degree in mechanical engineering from the University of California, Berkeley in 2009.

After staying in Berkeley for two more years as a postdoctoral research fellow at the Lawrence Berkeley National Laboratory, Dr. Duan joined the department of Mechanical Engineering at Boston University as an Assistant Professor in January 2012. His current research interests include energy conversion and storage, micro/nanofluidics and phase change heat transfer.

Dr. Duan is a member of ASME and MRS.

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

Lin-wen Hu

Associate Director & Principal Research Scientist
Nuclear Reactor Laboratory (NRL), Massachusetts Institute of Technology
(麻省理工學院核子反應爐實驗室副主任胡玲文博士)

BIOGRAPHY

Technical Session D2-W4-T2: Broadband and Wireless Computing, Web, Cloud Computing, Cyber Security, and Machine Learning

Workshop Co-Chair and Session Chair

Chen-Hsiang (Jones) Yu

Director of Mobile Engineering and User Experience, Zappix and PetPace
25 Burlington Mall Road, Burlington, MA 01803, USA
Tel: +1 781.214.8124
Email: chyu@csail.mit.edu

BIOGRAPHY

Jones Yu is known as a computer scientist and a team lead in mobile industry. He earned B.E. and M.S. in Computer Science and Information Engineering (CSIE) from Tamkang University in 1998 and from National Taiwan University in 2000, respectively, and Ph.D. in Computer Science from MIT in 2012. His Ph.D. research focused on enhancing web pages on desktop and mobile browsers for two populations: non-native English readers and mobile users. Before coming to MIT, he worked as a team lead in the wireless industry for a few years. During his study at MIT, he continued his leadership and led teams winning several entrepreneurship and mobile application development competitions. Currently, he is Director of Mobile Engineering and User Experience at Zappix and PetPace.

Technical Session D2-W4-T2: Broadband and Wireless Computing, Web, Cloud Computing, Cyber Security, and Machine Learning

Continuous Gesture Recognition for Natural Interaction

Ying Yin

Ph.D. Candidate, Department of Electrical Engineering and Computer Science
Massachusetts Institute of Technology
Cambridge, MA, USA
Tel: +1-707-742-3696
Email: yingyin@mit.edu

ABSTRACT

Recent trends in user interfaces have brought on a new wave of interaction techniques that depart from the traditional mouse and keyboard. These include multi-touch interfaces such as the iPhone, the iPad and the Microsoft Surface® as well as camera-based systems such as the Microsoft Kinect and the Google Glass. Most of these devices gained instant popularity among consumers because they make interacting with computation more natural and effortless. Users feel more natural to directly manipulate the virtual objects by hands and/or body gestures, as this is how we interact with our environment in everyday life.

Our goal is to take this aspiration to the next level by developing an intelligent multi-modal interface for natural interaction. We are developing computer interfaces that understand what the user is saying and doing, and the user can simply behave.

Gesture plays an important part in multi-modal interaction, especially for conveying spatial information. The focus of my doctoral research is developing a continuous gesture recognition method that can be easily applied in different domains and applications. I am developing a gesture-based interface that allows users to perform manipulative and communicative gestures continuously with no arbitrary restrictions. The key element of the approach is the hierarchical framework based on abstract hidden Markov models (AHMMs).

BIOGRAPHY

Ying Yin received her B.A.Sc. (2008) in computer engineering from the University of British Columbia in Vancouver, Canada and M.S. (2010) in computer science from Massachusetts Institute of Technology (MIT) in Cambridge, USA.

Currently she is a Ph.D. candidate and a Research Assistant at the Computer Science and Artificial Intelligence Laboratory of MIT. Her research has been focusing on applying machine learning and computer vision methods to multi-modal human computer interaction. She has published in major conferences such as the Conference on Human Factors in Computing Systems (CHI) and the International Conference on Multimodal Interaction (ICMI). She also worked as a Software Engineering Intern at both Google and Microsoft.

Ms. Yin is also interested in web and mobile application development. She has won awards in both web and mobile programming competitions at MIT. She is also a recipient of the

Governor-General's Silver Medal in Science, which is given to the top undergraduate student in a Canadian university every year.

Technical Session D2-W4-T2: Broadband and Wireless Computing, Web, Cloud Computing, Cyber Security, and Machine Learning

Exploiting Network Effects for Fraud and Malware Detection

Duen Horng (Polo) Chau

Assistant Professor, School of Computational Science and Engineering
College of Computing
Georgia Tech
266 Ferst Drive, Atlanta, GA, 30332-0765, USA
Tel: +1-404-385-7682, Fax: +1-404-385-7682
Email: polo@gatech.edu

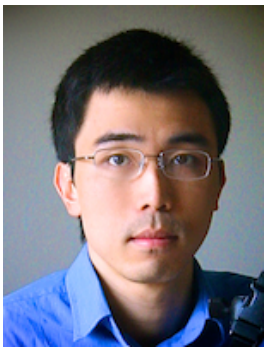
ABSTRACT

Graph mining is one of my primary research areas. I work with large graphs with billions of nodes and edges, to spot patterns and anomalies to help people gain insights into such huge datasets. In this talk, I will describe two major pieces of research that make impact to society. They share the common theme that both exploit network effects to combat and detect malicious behaviors.

1) The Polonium malware detection technology uses machine learning to unearth malware from 37 billion machine-file relationships. It is now patented and deployed by Symantec to protect more than 120 million machines worldwide.

2) The NetProbe system detects auction fraud on eBay and fingers bad guys by identifying their networks of suspicious transactions. This work appeared in Wall Street Journal, USA Today, and more.

BIOGRAPHY



Duen Horng (Polo) Chau is an Assistant Professor at Georgia Tech's School of Computational Science and Engineering of the College of Computing, and an Adjunct Assistant Professor at the College's School of Interactive Computing. Polo received his Ph.D. from the Machine Learning Department at Carnegie Mellon University. He also received a Masters in Human-Computer Interaction (HCI) from Carnegie Mellon.

Polo is working to bridge the fields of Data Mining and HCI. He develops tools that combine the best of both worlds to help people make sense of large graphs with billions of nodes and edges. His research interests span data mining, machine learning, information visualization and HCI.

Polo solves large-scale, real world problems that make impact to society. His NetProbe auction fraud detection system appeared on The Wall Street Journal, CNN, TV and radio. His Polonium malware detection technology (with Symantec, patent-pending) protects 120 million people worldwide.

Polo received Carnegie Mellon's School of Computer Science Distinguished Dissertation Award, Honorable Mention. Polo is the only two-time Symantec fellow. He received a Yahoo! Key Scientific Challenges Award. He contributes to the PEGASUS peta-scale graph mining that won

an Open Source Software World Challenge Silver Award. Polo is also an award-winning designer. He designed Carnegie Mellon's ID card.

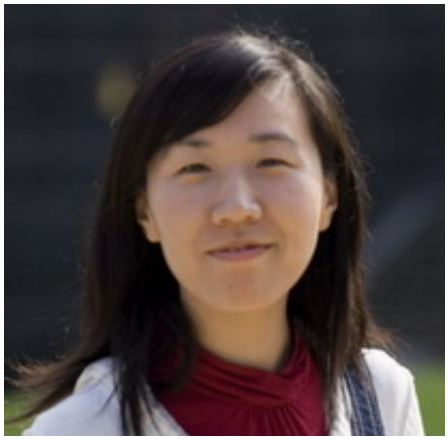
Technical Session D2-W4-T2: Broadband and Wireless Computing, Web, Cloud Computing, Cyber Security, and Machine Learning

Jing Gao

Assistant Professor, Department of Computer Science and Engineering
The State University of New York at Buffalo

ABSTRACT

BIOGRAPHY



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

Workshop Co-Chair and Session Chair

Li-San Wang

Assistant Professor of Pathology and Laboratory Medicine
Institute on Aging / Institute for Biomedical Informatics
University of Pennsylvania Perelman School of Medicine
1424 Blockley Hall, 423 Guardian Drive
University of Pennsylvania, Philadelphia, PA 19104 USA
Tel: +1-215-746-7015
Email: lswang@mail.med.upenn.edu
(賓州大學醫學院王立三教授)

BIOGRAPHY

Li-San Wang received his B.S. (1994) and M.S. (1996) in Electrical Engineering from the National Taiwan University. He received his M.S. (2000) and Ph.D. (2003) from the University of Texas at Austin, both in Computer Sciences, and was a postdoctoral fellow at the University of Pennsylvania between 2003 and 2006. Currently he is an Assistant Professor of Pathology and Laboratory Medicine, a faculty member of Penn Institute for Biomedical Informatics (IBI), and a fellow of Institute on Aging (IOA) and Penn Genome Frontiers Institute (PGFI) at University of Pennsylvania. Dr. Wang's research uses genetics, genomics, bioinformatics, and next-generation sequencing technology to study Alzheimer's disease and other neurodegenerative disorders. He has published more than seventy peer-reviewed book chapters and journals. He is the PI of NIA Genetics of Alzheimer's Disease Data Storage Site (NIAGADS) and organizes working groups for Alzheimer's Disease Genetic Consortium (ADGC), the International Genome of Alzheimer's Project (IGAP), and the NIH Alzheimer's Disease Sequencing Project (ADSP).

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

Innate immune activation modulates HIV infection

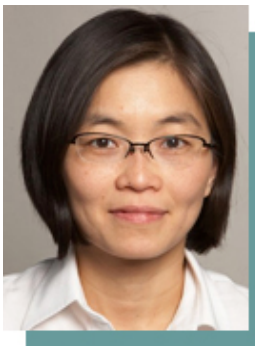
Theresa Li-Yun Chang

Associate Professor, Rutgers, The Sate University of New Jersey
225 Warren Street, Newark, NJ 07103, USA
Tel: +1-973-854-3265, Fax: +1-973-854-3101
Email: changth@umdnj.edu; theresa.chang@mssm.edu
(羅格斯新澤西州立大學張璨云教授)

ABSTRACT

Sexual transmission is the most common route of HIV infection and women account for nearly half of those infected worldwide. Prevention strategies employing different approaches are needed to reduce the probability of transmission. Innate immune activation at genital mucosa plays an important role in modulating HIV transmission. Sexually transmitted infections (STIs) and hormone changes are known to alter the likelihood of HIV transmission. I will discuss our studies on modulation of HIV infection through innate immune activation in the presence of STIs or estrogen.

BIOGRAPHY



Dr. Chang attended Chung Shan Medical and Dental College, Taichung for a year and then obtained her BS in Microbiology from Soochow University, Taipei (1989). She received her MS at Auburn University, AL and then her Ph.D with Dr. Alice Huang at New York University, NY in the field of Molecular Virology. In 1995, she did her post-doctoral trainings with Dr. Joan Steitz and then Dr. Xin-Yuan Fu at Yale University, CT. In 1999, she began to work on HIV pathogenesis with Dr. John Moore at Aaron Diamond AIDS research Institute, NYC.

She worked at a start-up company, Osel, Inc., CA for one year before starting her laboratory at Mount Sinai School of Medicine, NY as Assistant Professor (2002). In 2010, she moved her laboratory to Public Health Research Institute (PHRI), UMDNJ-New Jersey Medical School, Newark, which later merged with Rutgers, The Sate University of New Jersey, in July 2013. Currently she is Principal Investigator at PHRI and Associate Professor at Department Microbiology and Molecular Genetics. She has been working on the role of innate immunity and hormone of HIV pathogenesis and transmission. Other research interests include the interaction between HIV-human peritoneal macrophages, the interplay between microbiome and innate immunity, and the development of nanographene thermotherapy as a novel HIV eradication strategy. Her research has been supporting by NIH.

Dr. Chang is a member of American Association for the Advancement of Society, American Association of Immunologists, American Society of Microbiology, New York Academy of Science, Association for Women in Science (AWIS), and Society of Chinese Bioscientists in America. She serves as co-President of AWIS New York Metro chapter (2012-2013) and as an ad hoc reviewer of many journals. She also served on NIH study sections and National Medical Research Council, Singapore. She had edited a book and hold three patents. She has authored three peer-reviewed book chapters and papers on the topics of cell signaling, host-virus interaction,

HIV transmission and pathogenesis.

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

Abel Po-Hao Huang

Neurosurgeon, National Taiwan University Hospital, Yun-Lin branch
Clinical lecturer, College of Medicine, National Taiwan University Hospital
14F-3, No.57, Sec. 1, Chongqing S. Rd., Zhongzheng Dist.
Taipei City 100, Taiwan (R.O.C.)
Tel: +886-2-318-6188
Email: how.how0622@gmail.com
(台大醫院神經外科黃博浩醫師)

ABSTRACT

BIOGRAPHY

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

Integrated Genomic Analysis of Prostate Cancer Disparities between Caucasian and African American Populations

Bi-Dar Wang

Assistant Research Professor, Department of Pharmacology and Physiology
The George Washington University Medical Center,
2300 I Street, NW, Washington, DC 20037, USA
Tel: +1-202-994-3543, Fax: +1-202-994-2870
Email: wangbi@gwu.edu
(喬治華盛頓大學醫學院王必達教授)

ABSTRACT

Prostate cancer (PCa) is a disease conferred by multiple gene mutations, numerous alternations in gene expression and aberrant changes in genome composition/architecture. An area of research that continues to garner attention is PCa health disparities, wherein the African American (AA) population exhibits higher incidence and mortality rates compared to Caucasian Americans (CA). Although accumulating evidences have suggested that the widespread mRNA splicing and microRNA/mRNA deregulation may play crucial role in cancer development, the functional roles of mRNA splice variants and mRNA-microRNA genetic networks in PCa disparities remains largely unknown.

To identify the genetic predispositions and oncogenic networks associated with the observed PCa disparities, we applied a systems biology approach by combining: 1) exon and mRNA expression profiling, 2) microRNA profiling, 3) microRNA target searches, and 4) mRNA-microRNA genetic network analysis to elucidate the molecular mechanism underlying PCa disparities between AA and CA patients. Affymetrix human exon ST1.0 arrays and Agilent human miRNA V2 arrays were used to analyze the global mRNA splicing patterns, mRNA and microRNA expression profiles in AA and CA PCa specimens and the patient-matched normal counterparts. Our 4-way statistical analyses (AA cancer vs. CA cancer; AA cancer vs. AA normal, CA cancer vs. CA normal, AA normal vs. CA normal) of exon, mRNA or microRNA profiles have revealed >800 alternative splicing events, and hundreds and dozens of differentially expressed mRNAs and microRNAs, respectively (FDR< 0.1, fold change> 1.5).

Notably, many of the mRNA splice variants and mRNA-microRNA pairs reside within canonical oncogenic pathways. To further validate the genomic data and evaluate the functional consequences of these alternative splicing events and mRNA-microRNA deregulation, qRT-PCRs, western blots and immunohistochemistry assays were conducted in clinical samples and exon-, mRNA-specific siRNAs, or microRNA inhibitors were employed to suppress the candidate splice variants, mRNAs or microRNAs in PCa cell lines. The targeted knockdown of population-specific splice variants, mRNAs or microRNAs appears to have differential effects on cell proliferation, invasion and apoptosis in PCa cells. Taken together, our data suggest that mRNA splicing and differential mRNA-microRNA genetic networks may play critical roles in PCa disparities between AA and CA populations.

BIOGRAPHY

Dr. Bi-Dar Wang received his B.S. degree in agricultural chemistry (1992), and his M.S. (1994) and Ph.D. (1997) degrees in microbiology from National Taiwan University. After military service as a Second Lieutenant in Army in Taiwan, he continued his academic career as a Postdoctoral Fellow in molecular biology at Academia Sinica (1999-2001), and a Visiting Fellow in chromatin biology at NIH (2002-2006). In 2006 summer, he joined the George Washington University Medical Center in Washington DC as a Senior Research Scientist and then became an Assistant Research Professor in 2009. His current research works focus on cancer genetics and genomics, aiming to apply array-based (mRNA, microRNA, exon, copy number profiling) and sequencing-based (RNA-seq) approaches to identify critical genetic elements and genetic networks associated with aggressive prostate, colon and breast cancers. Dr. Bi-Dar Wang is an active member of American Association for Cancer Research. He was previously awarded National Science Council/MD Anderson Cancer Center Cooperative Postdoctoral Training Award, and National Research Grant in Genomic Medicine, NIH Visiting Fellowship Award and NIH Fellows Award for Research Excellence. His current research works are supported by a Junior Faculty Award from American Cancer Society, a CTSI-CN award from Children's National Medical Center and a recent award from Department of Defense.

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

GUCY2C at the intersection of obesity and colorectal cancer

Jieru Egeria Lin

Research Fellow, Thomas Jefferson University
1020 Locust Street, JAH 368,
Philadelphia, PA 19107, USA
Tel: +1-215-955-0054, Fax: +1-215-955-7006
Email: egerialin@gmail.com

ABSTRACT

There is an emerging link between body mass and intestinal malignancies, and obese patients have ~20-60% greater risk of, and ~2-fold greater mortality from, colorectal cancer. Although this epidemiological relationship is established, mechanisms that link obesity and colorectal tumorigenesis, and their reversibility, remain incompletely defined. Here, we explore the novel hypothesis that obesity and colorectal cancer are mechanistically linked through dysregulation of paracrine and endocrine hormone axes mediated by GUCY2C. GUCY2C is the receptor for the paracrine hormones guanylin in the colorectum and uroguanylin in small intestine. These paracrine hormones are the most commonly lost gene products in sporadic colorectal cancer, and their universal loss early in neoplasia is required for tumor initiation and progression in mice and humans. In that context, GUCY2C regulates intestinal homeostasis, and its silencing by hormone loss accelerates proliferation and the cell cycle, increases DNA damage, and reprograms cellular metabolism, which increases genetic- and carcinogen-induced colorectal cancer in mice. Beyond its role in colorectal tumor suppression, GUCY2C and uroguanylin comprise a novel gutbrain endocrine axis, evolutionarily conserved from invertebrates to humans, that regulates appetite, body mass and metabolism. Elimination of this endocrine axis in mice results in hyperphagia, obesity, diabetes and the metabolic syndrome. Unexpectedly, recent studies revealed that GUCY2C paracrine hormone expression in colon is eliminated by diet-induced obesity in mice and humans. Indeed, hormone expression appears to be reversibly modulated by ingested calories, rather than by the endocrine, adipokine or inflammatory milieu associated with obesity. Moreover, enforced expression of GUCY2C paracrine hormone by intestinal epithelial cells eliminates tumorigenesis induced by obesity. These observations suggest a model of cancer risk in which ingested calories contributing to obesity recapitulate mechanisms underlying sporadic colorectal cancer by suppressing paracrine hormone expression, silencing the GUCY2C tumor suppressor and disrupting epithelial homeostasis. They define a previously unrecognized mechanism linking diet and obesity to colorectal cancer and identify silencing of the GUCY2C tumor suppressor as a link between reversible risk factors like ingested calories and molecular mechanisms underlying cancer development. Moreover, they offer strategies for countering these risks, including calorie restriction and oral hormone therapy.

BIOGRAPHY

Dr. Jieru Egeria Lin received her B.S. degree in Pharmacy from National Taiwan University and her PhD degree in Structure Biology and Molecular Pharmacology from Thomas Jefferson University. She is currently a clinical research fellow at Thomas Jefferson University supported by NIH/T32 and ASCPT Young Investigator Award. She has been an investigator in 5 different clinical trials and an IRB committee member at Thomas Jefferson University. Her research

interests focus on tissue-specific pathways underlying intestinal tumorigenesis and their utility as a targets for colorectal cancer prevention. Her career goal is to integrate basic, translational and clinical research to advance novel basic observations form the laboratory to the patient. Dr. Lin is a member in American Society for Pharmacology and Experimental Therapeutics, American Association of Cancer Research, American Society for Clinical Pharmacology and Therapeutics, American Association for the Advancement of Science and Sigma Xi Scientific Research Society. She has published 24 articles in peer-reviewed journals and presented in 10 scientific meetings. Dr Lin has received awards from ASCPT, AACR, ASPET, and SigmaXi Research Society.

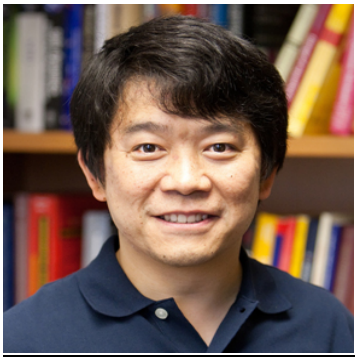
Technical Session D2-W3-T3: New Materials Science and Engineering, Nanotechnology and New Green Energy

Workshop Co-Chair and Session Chair

Jung-Tsung Shen

Assistant Professor, Department of Electrical & Systems Engineering
Washington University in St. Louis
(聖路易華盛頓大學電機暨系統工程學系沈榮聰教授)

BIOGRAPHY



Technical Session D2-W3-T3: New Materials Science and Engineering, Nanotechnology and New Green Energy

Atmospheric-Pressure-Plasma-Jet Rapid Sintering Process for TiO2 Photoanodes of Dye-Sensitized Solar Cells

I-Chun Cheng

Associate Professor, Graduate Institute of Photonics and Optoelectronics
and Department of Electrical Engineering, National Taiwan University
No. 1, Sec. 4, Roosevelt Road, Taipei, 10617 R.O.C. (Taiwan)
Tel: +886-2-3366-9648, Fax: +886-2-3366-9648
Email: iccheng@ntu.edu.tw
(台灣大學電機工程學系陳奕君教授)

ABSTRACT

Dye sensitized solar cells (DSSCs) have become a promising photovoltaic technology due to its low-cost and environmental friendliness. One of the key components for a DSSC is the TiO2 photoanode, which is important in photoelectron transport, dye-anchoring, and light trapping/scattering. Therefore, it is important to have a cost-effective fabrication process for photoanodes. Moreover, the fabrication cost and thermal budget can be significantly lowered if the processing time can be greatly reduced. In this study, we demonstrate a rapid sintering process for nanoporous TiO2 photoanodes of DSSCs using atmospheric pressure plasma jets (APPJs). The cell efficiency with APPJ- sintered TiO2 becomes comparable to that of the reference cell (with a furnace-sintered TiO2 photoanode) as the treatment time reaches 60 sec and beyond. The experimental result demonstrates that a 60 sec APPJ-sintering process can completely replace the conventional 510°C 15 min furnace-sintering for TiO2 photoanodes of DSSCs. The ultra-short APPJ sintering process time is made possible by the synergistic effect of the temperature and the reactivity of the plasma jet.

BIOGRAPHY

I-Chun Cheng received the B.S. and M.S. degrees in mechanical engineering at National Taiwan University, Taipei, Taiwan, in 1996 and 1998, respectively, and the Ph.D. degree in electrical engineering from Princeton University, Princeton, NJ, U.S.A., in 2004. Following her degree, she became a research associate at Princeton University. She joined the faculty of National Taiwan University, Taipei, Taiwan, in 2007, where she is currently an Associate Professor of Department of Electrical Engineering and Graduate Institute of Photonics and Optoelectronics. She has primarily worked in the fields of metal oxide thin film technology, dye-sensitized solar cells and flexible large-area-electronics.

Technical Session D2-W3-T3: New Materials Science and Engineering, Nanotechnology and New Green Energy

Light up the Way of Energy Sustainability: from Green IT to Solar Energy

Jifeng Liu

Assistant Professor, Thayer School of Engineering
Dartmouth College, Hanover, NH 03755
Tel: +1-603-646-9885, Fax: +1-603-646-8778
Email: Jifeng.Liu@dartmouth.edu

ABSTRACT

Energy sustainability has become a critical challenge for the modern society. Energy efficiency and renewable energy are the "twin pillars" of sustainability. In this talk we present applications of nanophotonics in both aspects: (1) Electronic-photonic synergy for Green Information Technology, in which the advantages of photons in energy-efficient, high bandwidth data transmission is combined with those of electrons in high capacity data processing on a single microchip; (2) Self-assembled nanophotonic structures for efficiency enhancement in thin-film solar cells and concentrated solar power (CSP) systems. Efficiently manipulating radiated electromagnetic energy, nanophotonics will "light up" the future of energy sustainability.

BIOGRAPHY

Jifeng Liu received his B.S. and M. S. degrees in materials science and engineering from Tsinghua University, Beijing, China, and the Ph.D. degree in materials science and engineering from Massachusetts Institute of Technology (MIT), Cambridge, MA in 2006.

He is currently an Assistant Professor at Thayer School of Engineering, Dartmouth College. His major research field is nanophotonic materials and devices for energy sustainability, including integrated Si photonics for ultralow energy photonic datalinks as well as nanomaterials and nanostructures for solar thermal and solar photovoltaics. He has authored or co-authored more than 90 scientific papers and contributed to 4 book chapters. He has been granted 9 U.S. patents related to optoelectronic materials and devices.

Prof. Liu is also a member of ASEE, ECS, MRS, and OSA. He received MRS Graduate Student Gold Award in 2004, and NSF Faculty Early Career Development (CAREER) award in 2013.

Technical Session D2-W3-T3: New Materials Science and Engineering, Nanotechnology and New Green Energy

Design and Fabrication of Multifunctional Three-Dimensional Nanostructured Materials

Chih-Hao Chang

Assistant Professor, Department of Mechanical & Aerospace Engineering
North Carolina State University
Raleigh, NC 27695
Tel: 919-513-7968, Fax: 919-515-7968
Email: chichang@ncsu.edu

ABSTRACT

Nanostructured material designs based on biological organisms have received significant interest across many research disciplines. By studying bio-inspired principles, researchers have engineered micro and nanostructures with unique properties that are not found in materials with macroscopic length scale. One such example that has been well-studied over the last decade is the "moth-eye" structures, which offers broadband, omnidirectional antireflection (AR) effects. However, the design of bio-inspired materials should not be limited to biology. Enabled by the recently advances in nanofabrication, nanostructured materials can be designed and engineered to have better performance, more functionality, and increased complexity as compared to their biological counterparts.

One approach to improve on nature's design is to combine multiple bio-inspired principles. For example, a single geometry with co-optimized optical and wetting effects can be designed by studying the underlying physical principles. These structures can be implemented on glass for windows with anti-glare, self-cleaning, and/or anti-fogging properties. Light reflection at the interface between two solid materials leads to thin-film interference, and results in colored appearance of many naturally occurring phenomenon, such as oil on water. While visually appealing, such interference effects can lead to undesirable wavelength-selective behavior in thin-film devices. Using the same bio-inspired principles, we examined the use of such subwavelength structure between two solid materials to suppress thin-film interference.

Lastly, I will introduce our work in utilizing light interactions with colloidal particles for 3D nanolithography. This approach integrates traditional "top-down" lithographic and "bottom-up" self-assembly processes. We have demonstrated this technique to pattern 3D periodic nanostructures with designable periods and hollow-core shell-like structures. Such processes are parallel, cost-effective, and scalable for nanoscale manufacturing.

BIOGRAPHY

Chih-Hao Chang received his B.S. (2002) in Mechanical Engineering from Georgia Institute of Technology. He received his M.S. (2004) and Ph.D. (2008) from Massachusetts Institute of Technology, both in Mechanical Engineering, and was a postdoctoral Researcher at Singapore-MIT Alliance for Research and Technology (SMART) Centre and MIT between 2008 and 2011.

Currently he is an Assistant Professor of Mechanical & Aerospace Engineering at North Carolina State University. Prof. Chang's research focuses on the design and fabrication of 2D/3D multifunctional nanostructures and their integration into microscale systems. He is also interested in developing novel scalable nanofabrication techniques based on both “top-down” lithography and “bottom-up” self-assembly processes. Prof. Chang is a member of Optical Society of America, American Chemical Society, and American Society of Mechanical Engineers. He received the inaugural Early Career Faculty Award from NASA in 2012 and the Ralph E. Powe Junior Faculty Award from the Oak Ridge Associated Universities (ORAU) in 2013.

Technical Session D2-W3-T3: New Materials Science and Engineering, Nanotechnology and New Green Energy

Mechanics and Energy Transfer in Scalable Plasmonic Nanomanufacturing

Liang Pan

Assistant Professor, Purdue University
West Lafayette, Indiana, USA
Tel: +1-765- 496-2341, Email: liangpan@purdue.edu
(普渡大学机械工程学院潘亮教授)

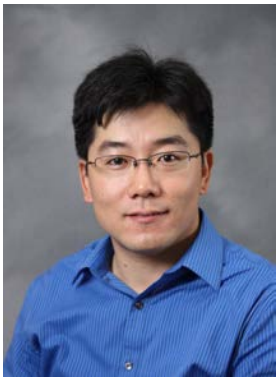
ABSTRACT

Nanomanufacturing provides the crucial engineering supports for many current and emerging applications, including semiconductor, data storage, alternative energy, biology and healthcare. There have been many exciting and significant findings in this field, however many scientific and engineering challenges have to be tackled in order for them to enter real world applications. At nanoscale many classical laws and theories start to break down and some other effects start to arise, bringing much of great opportunities and challenges in engineering research, particularly in the size range of 1~100 nm according to current trend of technology progression.

This seminar reports a new low-cost high-throughput maskless nanomanufacturing approach, aiming as the enabling technique for breaking optical diffraction limits in the future applications, which uses arrays of plasmonic lenses (PLs) that "fly" above the rotating surface to be thermally processed, concentrating short wavelength surface plasmons into deep sub-wavelength scales. A self-spacing air-bearing surface was designed to carry the array just a few nanometers above a substrate at linear speeds of tens of meter per second. Experimental results showed feature sizes far smaller than the far-field diffraction limit reaching state-of-the-art 22-nm half-pitch direct material processing capability using ultra-fast laser assisted nanoscale heat management and progressive multistage PL designs.

This nanomanufacturing scheme has the potential of a few orders of magnitude higher throughput than current maskless techniques, and opens a new cost effective route towards the next generation nano-manufacturing. Besides patterning and material processing, this nearfield technique can also lead to niche applications such as data storage, nanoscale metrology and imaging, and alternative energy.

BIOGRAPHY



Professor Liang Pan earned his M.S. and Ph.D. in Mechanical Engineering from University of California at Berkeley in 2009 and 2010. Before joining Berkeley, he received his B.S. and M.E. in Mechanics and Mechanical Engineering from University of Science and Technology of China.

He currently works as an Assistant Professor in the School of Mechanical Engineering at Purdue University. Prior joining Purdue, he worked as a Postdoctoral Researcher in the NSF's Nano-scale Science and Engineering Center (NSEC) for Scalable and Integrated

Nanomanufacturing (SINAM). He focuses on fundamentals of micro- and nano-scale physics and engineering, aiming on making breakthroughs of novel alternative approaches to keep current trend of continuous size scaling down for emerging nanotechnology by overcoming fundamental physic limits such as optical diffraction and superparamagnetic effect, with emphasis on the applications of lithography, imaging and metrology for manufacturing; and data storage, communication and computation for information technology.

Professor Pan's selected publications.

1. Samad M, Xiong S, Pan L, Yang H, Sinha S, Bogy D, Bhatia C, "A Novel Approach of Carbon Embedding in Magnetic Media for Future Head/Disk Interface", IEEE Transaction On Magnetics, 48(5), 1807-1812, 2012.
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4. Srituravanich W, Pan L (Equal Contribution), Wang Y, Sun Y, Bogy D, Zhang X, "Flying plasmonic lens in the near field for high-speed nanolithography", Nature Nanotechnology, 3(12), 733, 2008.
5. Pan L, Park Y, Xiong Y, Ulin-Avila E, Zeng L, Sun C, Bogy D, Zhang X, "High-throughput maskless nanolithography using flying plasmonic lens", Proc. of SPIE Vol. 7637, 763713-1.
6. Pan L, Park Y, Ulin-Avila E, Xiong Y, Zeng L, Sun C, Bogy D, Zhang X, "Parallel high-speed plasmonic nano-lithography", ICALEO Conf. Proc. 2010. (invited)
7. Dong F, Zhang Q, Chen D, Pan L, Guo Z, Wang W, Duan Z, Wu X, "An uncooled optically readable infrared imaging detector", Sensor and Actuator A, 133, 236-242, 2007.
8. Pan L, Zhang Q, Wu X, Duan Z, Chen D, Wang W, Guo Z, "MEMS Based Optomechanical Infrared Imaging", J. of Exp. Mech. 19, 4, 2004.

Technical Session D2-W4-T3: Broadband and Wireless Computing, Web, Cloud Computing, Cyber Security, and Machine Learning

Workshop Co-Chair and Session Chair

Chen-Hsiang (Jones) Yu

Director of Mobile Engineering and User Experience, Zappix and PetPace
25 Burlington Mall Road, Burlington, MA 01803, USA
Tel: +1 781.214.8124
Email: chyu@csail.mit.edu

BIOGRAPHY

Jones Yu is known as a computer scientist and a team lead in mobile industry. He earned B.E. and M.S. in Computer Science and Information Engineering (CSIE) from Tamkang University in 1998 and from National Taiwan University in 2000, respectively, and Ph.D. in Computer Science from MIT in 2012. His Ph.D. research focused on enhancing web pages on desktop and mobile browsers for two populations: non-native English readers and mobile users. Before coming to MIT, he worked as a team lead in the wireless industry for a few years. During his study at MIT, he continued his leadership and led teams winning several entrepreneurship and mobile application development competitions. Currently, he is Director of Mobile Engineering and User Experience at Zappix and PetPace.

Technical Session D2-W4-T3: Broadband and Wireless Computing, Web, Cloud Computing, Cyber Security, and Machine Learning

Oshani Seneviratne

PhD Candidate, Computer Science and Artificial Intelligence Laboratory
Department of Electrical Engineering and Computer Science
Massachusetts Institute of Technology

ABSTRACT

BIOGRAPHY

Technical Session D2-W4-T3: Broadband and Wireless Computing, Web, Cloud Computing, Cyber Security, and Machine Learning

Adapting User Interfaces to Cultural Differences in Perception and Preferences

Katharina Reinecke

Postdoctoral Fellow, Harvard School of Engineering and Applied Sciences
33 Oxford St., 02138 Cambridge, MA, USA
Email: reinecke@seas.harvard.edu

ABSTRACT

Behavioral and neurological findings show that our cultural background influences the way we perceive and interpret information. This also impacts which user interface designs we find most appealing and trustworthy, and how we interact with user interfaces. In this talk, I will (1) outline how preferences differ between various cultures, (2) describe the implications of these differences for user interface design, and (3) discuss a possible solution to the conventional "one size fits all" approach in user interface design with an approach called 'cultural adaptivity'. The main idea behind it is to develop intelligent user interfaces, which can automatically adapt their look & feel to the user's culture. Rather than only adapting to one country, cultural adaptivity is able to anticipate different influences on the user's cultural background, such as previous countries of residence, or differing nationalities of the parents. I will present the results of several experiments conducted in different countries, which showed that cultural adaptivity increases both work efficiency and user satisfaction. The presentation concludes with future directions that support the acquisition and analysis of data comparing various cultures, and novel ideas for user interfaces that improve the experience for people of different cultural backgrounds.

BIOGRAPHY

Katharina Reinecke received her PhD in computer science from the University of Zurich, Switzerland, in 2010, and she is currently a postdoctoral fellow at the Harvard School of Engineering and Applied Sciences. She will be joining the University of Michigan as an assistant professor this winter.

Her research focuses on cultural differences in users' interaction with technology with the goal to create culturally intelligent user interfaces that automatically adapt to people's preferences and perception. She has lived in five countries on four continents where she conducted user studies with people from around the globe. Recently, her work increasingly uses large datasets from companies such as Doodle and from her own experimental website LabintheWild.org to achieve large-scale comparisons of various cultures.

Technical Session D2-W4-T3: Broadband and Wireless Computing, Web, Cloud Computing, Cyber Security, and Machine Learning

Cyber-Physical Systems: From Learning, Optimization to Security

Haibo He

Associate Professor, Department of Electrical, Computer, and Biomedical Engineering
University of Rhode Island
Kingston, RI, 02881, USA.
Tel: (401) 874-5844; Fax: (401) 782-6422
Email: he@ele.uri.edu
Web: www.ele.uri.edu/faculty/he/

ABSTRACT

Recent research in complex systems, computational intelligence, and cyber-security has provided fundamental understanding and practical technologies to advance the cyber-physical systems (CPS). While CPS covers a wide range of application domains and enabling technologies, this talk will focus on how to integrate machine intelligence into the CPS to improve its learning, optimization, adaptation, resiliency, and security.

Specifically, this talk covers two key aspects of CPS design, computational intelligence and network security. From the computational intelligence perspective, the key objective is to achieve cognitive-alike optimization and prediction capability through learning. An essential contribution of this part is a recent development of a hierarchical adaptive/approximate dynamic programing (ADP) architecture for improved learning and optimization over time for goal-oriented behaviors. This architecture integrates a hierarchical goal generator network to provide CPS a more informative and detailed goal representation to guide its decision-making; therefore it hopefully could bring the brain-like general-purpose intelligence closer to reality. From the network security perspective, the key objective is to understand and model the complex system behavior with the interactions of system components and external environment. We use smart grid as an example to advance the vulnerability analysis and to develop innovative responses to maintain the integrity of power grids under complex attacks, both cyber attacks (e.g., cyber penetration to the system) and physical failures (e.g., grid fault caused by a snow storm or a hurricane). We consider both network topology and intrinsic power flow characteristics to understand system behavior of this CPS in complex attack scenarios, including cascading failure, single-node and multiple-node attacks, spatial-temporal attacks, sequential attacks, among others. Furthermore, the integration of both "computational intelligence" and "network security" together for advanced CPS research and design will also be discussed in this talk. Emerging opportunities and challenges along this direction will also be addressed during this talk.

BIOGRAPHY

Dr. He is an Associate Professor of Electrical Engineering at the University of Rhode Island (Kingston, RI). He received the B.S. and M.S. degrees in electrical engineering from Huazhong University of Science and Technology (HUST), Wuhan, China, in 1999 and 2002, respectively, and the Ph.D. degree in electrical engineering from Ohio University (Athens, OH) in 2006.

He currently directs the Computational Intelligence and Self-Adaptive Systems (CISA) Laboratory. His research interests include computational intelligence, machine learning, cyber security, cyber-physical systems, smart grid, and various application fields including sensor networks, robotics, biomedical applications, and cognitive communication networks. He has published one research book entitled "Self-Adaptive Systems for Machine Intelligence" with Wiley, 1 edited book (Wiley-IEEE), 6 edited conference proceedings (Springer). He has served regularly on the Chair positions of numerous international conferences in his field. He also serves on numerous Technical Committees within IEEE and other professional research communities, including the Chair of the IEEE Computational Intelligence Society (CIS) Neural Network Technical Committee (TC), Vice Chair of the Computational Intelligence in Smart Grid Task Force, IEEE-USA Energy Policy Committee, among others. He has delivered numerous Keynote/invited talks at various universities and organizations, and served as a Guest Editor/Editorial Board for several international journals. His research has been covered by national and international medias such as IEEE Smart Grid Newsletter, Providence Business News, URI Big Thinkers, among others. Currently, he is an Associate Editor of the IEEE Transactions on Neural Networks and Learning Systems and IEEE Transactions on Smart Grid.

He received numerous awards, including the K. C. Wong Research Award, Chinese Academy of Sciences (2012), National Science Foundation (NSF) CAREER Award (2011), Providence Business News (PBN) "Rising Star Innovator of the Year" Award (2011), and the Best Master Thesis award of Hubei Province, China (2002). He is a Senior Member of IEEE. More information of his research can be found at http://www.ele.uri.edu/faculty/he/.

Technical Session D2-W2-T4: Medicine, Public Health, Biomedical Science and Engineering

Session Chair

Yi-Hsiang (Sean) Hsu

Assistant Professor, School of Medicine
Harvard University
(哈佛大學醫學院許益祥教授)

BIOGRAPHY

Technical Session D2-W2-T4: Medicine, Public Health, Biomedical Science and Engineering

One-to-Many and Many-to-One Binding Mechanisms in Intrinsically Disordered Proteins

Wei-Lun Hsu

Ph.D. Student, Center for Computational Biology and Bioinformatics
Department of Biochemistry and Molecular Biology, Indiana University School of Medicine
410 W 10th St. HS5000, Indianapolis, IN46202
Tel: +1-317-721-3122, Fax: +1-317-278-9217
Email: hsu20@iu.edu

ABSTRACT

Intrinsically disordered proteins are proteins characterized by lack of stable tertiary structures under physiological conditions. Evidence shows that disordered proteins are not only highly involved in protein interactions, but also have the capability to associate with more than one partner.

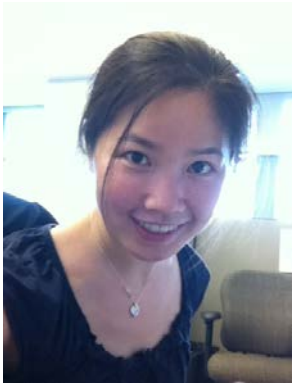
Short disordered protein fragments, called “molecular recognition features” (MoRFs), were hypothesized to facilitate the binding diversity of highly-connected proteins termed “hubs”. MoRFs often couple folding with binding while forming interaction complexes. Two protein disorder mechanisms were proposed to facilitate multiple partner binding and enable hub proteins to bind to multiple partners:

1. One region of disorder could bind to many different partners (one-to-many binding), so the hub protein itself uses disorder for multiple partner binding.
2. Many different regions of disorder could bind to a single partner (many-to-one binding), so the hub protein is structured but binds to many disordered partners via interaction with disorder.

Thousands of MoRF-partner protein complexes were collected from Protein Data Bank in this study, including 321 one-to-many binding examples and 514 many-to-one binding examples. The conformational flexibility of MoRFs was observed at atomic resolution to help the MoRFs to adapt themselves to various binding surfaces of partners or to enable different MoRFs with non-identical sequences to associate with one specific binding pocket. Strikingly, in one-to-many binding, post-translational modification, alternative splicing and partner topology were revealed to play key roles for partner selection of these fuzzy complexes. On the other hand, three distinct binding profiles were identified in the collected many-to-one dataset: similar, intersecting and independent. For the similar binding profile, the distinct MoRFs interact with almost identical binding sites on the same partner. The MoRFs can also interact with a partially the same but partially different binding site, giving the intersecting binding profile. Finally, the MoRFs can interact with completely different binding sites, thus giving the independent binding profile.

In conclusion, we suggest that protein disorder with post-translational modifications and alternative splicing are all working together to rewire the protein interaction networks.

BIOGRAPHY



Dr. Hsu is the member of Biophysical Society and Advancing Science, Serving Society. She was awarded the IU School of Medicine Biomedical Gateway (IBMG) Fellowship and Spirit Prize in Biology in Taipei Science Fair. She served as a student leader in Research and Investigation Team in 2000 NTU Public Health Service Team in Chiayi, Taiwan.

Her publications are listed below.

1. Hsu WL, Oldfield CJ, Eshel Faraggi, Dunker AK. Characterizing the binding profiles of many-to-one intrinsically disordered protein complexes. (In Progress).
2. Hsu WL, Oldfield CJ, Xue B, Meng J, Huang F, Romero P, Uversky V, Dunker AK. Exploring the binding diversity of intrinsically disordered proteins involved in one-to-many binding. Protein Sci. 2013 Mar;22(3):258-73. (selected as the editorial focus and video highlight).
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Technical Session D2-W2-T4: Medicine, Public Health, Biomedical Science and Engineering

Comparing and Intercoverting Expression Profiles from Microarrays to RNASeq

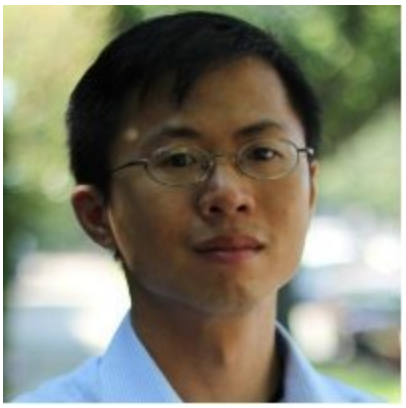
Yaoyu E. Wang

Associate Director, Center for Cancer Computational Biology
Dana-Farber Cancer Institute
Boston, MA, USA
Email: yewang@jimmy.harvard.edu
(波士頓達納法伯癌症研究所王耀煜博士)

ABSTRACT

Transcriptome profiling represents a static gene expression state of a biological sample across the genome that allows for direct genomic comparisons with multiple samples to determine genes that exhibit differential expression in various states. The technique is particularly useful in interrogating the process of tumorigenesis as it allows for hypothesis generation on molecular abnormalities and mechanisms that may contribute to the tumor phenotype. Furthermore, it provides information on molecular subtypes, the development of prognostic and predictive molecular signatures to guide therapeutics options. Currently, microarray and RNA-Sequencing (RNASeq), using next generation sequencing (NGS), are the two main technologies being used for transcriptome profiling. While RNASeq has been proven to be a more advanced technology than microarray in many aspects, practical challenges remain in utilizing RNASeq as the technology of choice. Furthermore, understanding the problem of cross comparing RNASeq data against the wealth of microarray data compiled in public domain in the last decades requires systematic evaluation of the two technologies. In this talk, I will briefly evaluate and compare these two technologies and provide an informatics solution framework for integrating public domain data with RNASeq.

BIOGRAPHY



Originated from Ping-Tung, Taiwan, Dr. Yaoyu E. Wang received dual bachelor degrees in biological science and computer science from Carnegie Mellon University in Pittsburgh. Dr. Wang undertook graduate work at Boston University, where he became interested in applying quantitative methods to study questions in protein evolution. He earned his Ph.D. in Bioinformatics in 2007 with his thesis on computational methods for identifying therapeutic targets against highly mutable pathogens. In 2007, Dr. Wang joined the Ragon Institute of MGH, MIT, and Harvard as Research Fellow, where he used sequencing technology to study HIV genome evolution in patients with different rate of disease progression.

Previously, he worked at the Center for Advance Genomic Technology of Boston University and the Division of Molecular Informatics of Pfizer Discovery Technology Center. He joined the Center for Cancer Computational Biology at Dana-Farber Cancer Institute as Bioinformatics Analyst in 2009. He has assumed the position of Associate Director in 2012 to oversee the NGS

sequencing, bioinformatics research consulting, and software engineering operations of the Center.

Technical Session D2-W2-T4: Medicine, Public Health, Biomedical Science and Engineering

Vitamin D and Type 2 Diabetes: From Observation to Intervention

Yiqing Song

Assistant Professor of Medicine
Division of Preventive Medicine
Brigham & Women's Hospital/Harvard Medical School
900 Commonwealth East Avenue
Boston, Massachusetts 02215
Tel: 617-278-0913
Fax: 617-731-3843
Email: ysong3@rics.bwh.harvard.edu
(哈佛医学院布莱根妇女医院宋一青教授)

ABSTRACT

Vitamin D deficiency has become a public health problem worldwide due to its increasing prevalence and potential health effects. Existing biologic and observational evidence strongly supports protective effects of vitamin D on type 2 diabetes. First, experimental studies have demonstrated that vitamin D is essential for pancreatic insulin secretion and peripheral insulin action through binding to the vitamin D receptor. Human studies, most from cross-sectional studies, have also shown that low dietary vitamin D intake or vitamin D levels were inversely related to glucose intolerance, insulin resistance, decreased insulin secretion, as well as prevalence of the metabolic syndrome. Furthermore, prospective data tended to support an inverse association between serum 25(OH) vitamin D levels and incident type 2 diabetes in a dose-response manner. Data from randomized clinical trials, albeit limited, suggest a protective effect of vitamin D treatment on insulin secretion and action in both non-diabetic and diabetic patients. However, these trials are limited by design due to small sample sizes, short intervention periods, insufficient vitamin D dose, and the lack of objective assessment of vitamin D status and insulin or glucose homeostasis. It remains unclear whether type 2 diabetes can be delayed or prevented by taking vitamin D supplements. Direct evidence from future clinical trials of higher dose vitamin D supplementation, such as the ongoing VITamin D and OmegA-3 TriaL (VITAL), will clarify any beneficial effects of vitamin D on primary prevention of type 2 diabetes and thus will inform public health and clinical guidelines for diabetes prevention.

BIOGRAPHY

YIQING SONG WAS BORN IN GERMU CITY, QINGHAI PROVINCE, CHINA.

Education:

1993 M.D. (clinical medicine), Beijing Medical University, Beijing, China
2000 M.A. (nutrition), University of Texas at Austin, Austin, US.
2005 Sc.D. (epidemiology and nutrition), Harvard School of Public Health, Boston, US

He is **Assistant Professor of Medicine** at Harvard Medical School and Associate Epidemiologist of the Division of Preventive Medicine at Brigham and Women's

Hospital (BWH), Boson, MA. His research focus is the epidemiology of type 2 diabetes, including the roles of genetic, lifestyle, and dietary factors. He has extensive experience in the evaluation of nutritional, biochemical, and genetic markers as predictors of obesity, metabolic syndrome, type 2 diabetes, and cardiovascular disease in the Women's Health Study (WHS), Physicians' Health Study (PHS), and the Women's Health Initiative-Observational Study (WHI-OS). Currently, he is the Principal Investigator of a NIDDK-funded R01 (DK088078) investigating diabetes prevention in the *Vit*amin D and Omeg*A*-3 *T*rial (*VITAL*) trial, as well as a project (NCI 3U01CA138962-04S1) related to magnesium levels, vitamin D supplementation, and cardiometabolic events. He authored and co-authored more than 80 peer-reviewed papers and 8 book chapters. His primary research focus is on the epidemiolgic study of the etiology and prevention of type 2 diabetes and cardiovascular disease. His current research has expanded to investigate complex interactions among nutrition, biomarkers, and genetic factors in the development of type 2 diabetes in several large prospective cohort studies. Additionally, he is also interested in the design, conduct, and methodology of systematic review and meta-analytic approaches for evidence synthesis from case-control and cohort studies, and randomized trials.

Dr. Song has professional memberships of American Society for Nutritional Sciences and the Society for International Nutrition Research, the American Society of Human Genetics, American Diabetes Association, American Heart Association, and the Society for Epidemiologic Research.

Awards:

1999	Hogg Memorial Scholarship and Cooke Endowment Scholarship, Graduate Program in Nutrition, Department of Human Ecology, University of Texas at Austin
2001-2005	The Irene and Fredrick J. Stare Nutrition Education Fund, Department of Nutrition, Harvard School of Public Health
2003	Carson Family Scholarship, Department of Nutrition, Harvard School of Public Health
2005	Boston Obesity Nutrition Research Center (BONRC) Travel Award, BONRC, Boston Medical Center
2006	American Diabetes Association's Travel Award for Young Investigators, 66th Scientific Sessions at Washington DC, June 9-13, 2006
2009	Finalist for the Mark Bieber Award by American Heart Association Council on Nutrition, Physical Activity, and Metabolism (NPAM), at Palm Harbor, Florida, March 10-14, 2009

Technical Session D2-W2-T4: Medicine, Public Health, Biomedical Science and Engineering

Alzheimer's Disease: A Genomics Approach

Li-San Wang

Assistant Professor of Pathology and Laboratory Medicine
Institute on Aging / Institute for Biomedical Informatics
University of Pennsylvania Perelman School of Medicine
1424 Blockley Hall, 423 Guardian Drive
University of Pennsylvania, Philadelphia, PA 19104 USA
Tel: +1-215-746-7015
Email: lswang@mail.med.upenn.edu
(賓州大學醫學院王立三教授)

ABSTRACT

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

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

BIOGRAPHY

Li-San Wang received his B.S. (1994) and M.S. (1996) in Electrical Engineering from the National Taiwan University. He received his M.S. (2000) and Ph.D. (2003) from the University of Texas at Austin, both in Computer Sciences, and was a postdoctoral fellow at the University of Pennsylvania between 2003 and 2006. Currently he is an Assistant Professor of Pathology and Laboratory Medicine, a faculty member of Penn Institute for Biomedical Informatics (IBI), and a fellow of Institute on Aging (IOA) and Penn Genome Frontiers Institute (PGFI) at University of Pennsylvania. Dr. Wang's research uses genetics, genomics, bioinformatics, and next-generation sequencing technology to study Alzheimer's disease and other neurodegenerative disorders. He has published more than seventy peer-reviewed book chapters and journals. He is the PI of NIA Genetics of Alzheimer's Disease Data Storage Site (NIAGADS) and organizes working groups for Alzheimer's Disease Genetic Consortium (ADGC), the International Genome of Alzheimer's Project (IGAP), and the NIH Alzheimer's Disease Sequencing Project (ADSP).

Technical Session D2-W3-T4: New Materials Science and Engineering, Nanotechnology and New Green Energy

Workshop Co-Chair and Session Chair

Lin-wen Hu

Associate Director & Principal Research Scientist
Nuclear Reactor Laboratory (NRL), Massachusetts Institute of Technology
(麻省理工學院核子反應爐實驗室副主任胡玲文博士)

BIOGRAPHY

Technical Session D2-W3-T4: New Materials Science and Engineering, Nanotechnology and New Green Energy

Silicon Photonics and Photonics Crystals

Wei Jiang

Associate Professor, Department of Electrical and Computer Engineering &
Institute for Advanced Materials, Devices and Nanotechnology
Rutgers, The State University of New Jersey
94 Brett Road, Piscataway, NJ 08854-8058, USA
Tel: +1-732-445-2164, Fax: +1-732-445-2820
Email: wjiangnj@rci.rutgers.edu

ABSTRACT

Silicon photonics is an emerging technology that can potentially reshape the entire landscape of photonics technology owing to its low-lost fabrication and monolithic integration advantages. Photonic crystal nanostructures offer novel physical mechanisms, such as the slow-light effect and superprism effect, to help reduce the size and improve the performance of silicon photonic devices. This talk will review our recent work on silicon photonic crystal devices such as electro-optic modulators, thermo-optic switches, slot photonic crystal waveguides, and mode-symmetry-transform devices. Fundamental physics problems pertaining to these novel devices, including slow light loss, interband scattering, and thermo-optic properties will be discussed.

Looking forward, silicon photonics is in the search for new directions. Based on our recent work, several promising directions will be discussed. Advantages of silicon photonics in high density integration and coherent communications will be highlighted. Potential applications in high-performance computing and big data will be discussed.

BIOGRAPHY

Wei Jiang received his B.S. degree in physics from Nanjing University, Nanjing, China, in 1996, and his M.A. degree in physics and his Ph.D. degree in electrical and computer engineering from the University of Texas, Austin, in 2000 and 2005, respectively.

He is currently an associate professor in the department of electrical and computer engineering of Rutgers, the State University of New Jersey. His research interests encompass silicon photonics, photonic crystals, nanophotonics, and their applications in communications, computing, and sensing. Prior to joining the Rutgers faculty, he conducted research from 2004 to 2007 at a technology startup Omega Optics, Inc., Austin, Texas, where he was the principal investigator of a number of research projects funded by AFOSR, AFRL, NSF, and NASA. Prof. Jiang contributed to the fundamental understanding of slow light, superprism effects, and photonic crystal interface properties, and is an inventor of the slot photonic crystal waveguide. In 2007, the first high-speed photonic crystal modulator was demonstrated on silicon through his research project. Based on a driving-current scaling law he discovered, Dr. Jiang first predicted, in 2007, the baseline power consumption of high-speed silicon electro-optic devices, which was verified by subsequent experiments.

Prof. Jiang is a senior member of IEEE, and a member of OSA and SPIE. He received the 2012 DARPA Young Faculty Award, the 2011 Rutgers ECE Outstanding Young Researcher Award, and the 2005 Ben Streetman Prize from UT-Austin. He was also a Baoshan Iron and Steel Scholar in his senior year at Nanjing University.

Technical Session D2-W3-T4: New Materials Science and Engineering, Nanotechnology and New Green Energy

Nano Plasmonic Devices based on Metasurfaces

Yongmin Liu

Assistant Professor
Department of Mechanical and Industrial Engineering
Department of Electrical and Computer Engineering
Northeastern University
360 Huntington Avenue
Boston, MA 02115, USA
Tel: +1-617-373-4457, Fax: +1-617-373-8970
Email: y.liu@neu.edu
(东北大学电子与计算机工程系刘咏民教授)

ABSTRACT

Plasmonics has become an extremely active and successful research area in nano optics. It focuses on the unique properties and applications of surface plasmons, which are collective charge oscillations coupled with photons. In particular, plasmonics promises ultra-compact and ultra-fast optoelectronic devices, as it is the critical link between photonics and electronics by inheriting the strength of the two technologies in terms of operation speed and footprint.

In this talk, I will present two examples to show that metasurfaces, a new class of quasi-2D metamaterials, allow us to design novel plasmonic devices. First, I will discuss a subwavelength-scale highly efficient plasmonic source for unidirectional generation of surface plasmons. This device consists of two nano magnetic resonators with detuned resonant frequencies. At the operating wavelength, incident photons can be efficiently channeled into surface plasmons modulated by the electric field polarization. By tailoring the relative phase at resonance and the separation between the two nano-resonators, surface plasmons can be steered to predominantly propagate along one specific direction. Second, I will demonstrate that one-dimensional metallic gratings, a simple metasurface with practical geometries, are capable of strongly modifying the dispersion, and thus the propagation characteristic of surface plasmons in an unprecedented manner. We are able to realize normal, non-divergent as well as anomalous diffraction of surface plasmons. In particular, all-angle and broadband negative refraction of surface plasmons is achieved, thanks to the unique hyperbolic constant frequency contour of surface plasmons propagating along the metasurface. These finding could be used to realize on-chip hyperbolic lenses for super-imaging resolution, and high-density optical interconnect for broadband optical communication.

BIOGRAPHY

Yongmin Liu received his B.S. and M.S. degrees in Physics at Nanjing University (Nanjing, China) in 2000 and 2003, respectively. After obtaining his Ph.D. degree in Applied Science and Technology at the University of California, Berkeley in 2009, he stayed at UC Berkeley as a

postdoctoral fellow for three years. In fall 2012, he joined the faculty of Northeastern University at Boston with a joint appointment in Department of Mechanical & Industrial Engineering and Department of Electrical & Computer Engineering.

Dr. Liu's research interests include nano optics, nanoscale materials and engineering, nano devices, plasmonics, metamaterials, biophotonics, nano optomechanics, and nonlinear and quantum optics of metallic nanostructures. He has authored and co-authored over 30 journal papers including Science, Nature, Nature Nanotechnology, Nature Communications, Physical Review Letters and Nano Letters. Dr. Liu is the recipient of Chinese Government Award for Outstanding Students Abroad (2009), International Society for Optical Engineering (SPIE) Scholarship Award (2008), and Tse-Wei Liu Memorial Fellowship at UC-Berkeley (2008).

Technical Session D2-W3-T4: New Materials Science and Engineering, Nanotechnology and New Green Energy

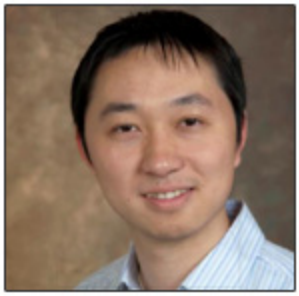
Juejun Hu

Assistant Professor, University of Delaware
Newark, DE 19716, USA
Tel: +1-302-831-6878, Fax: +1-302-831-4545
Email: hujuejun@udel.edu
(特拉华州立大学材料科学与工程系胡崛隽教授)

ABSTRACT

Chalcogenide glasses, namely the amorphous compounds containing sulfur, selenium, and/or tellurium, have emerged as a promising material candidate for integrated photonics given their wide infrared transparency window, almost infinite capacity for composition alloying, as well as high linear and nonlinear indices. This talk will review our recent progress on the processing and characterization of integrated photonic devices based on chalcogenide glass materials. Specifically, we will focus on three application areas: light management in photovoltaic cells using high-index, large-area glass nanostructures, on-chip nano-cavity enhanced spectroscopic chemical sensing, and photonic integration on unconventional plastic substrates for chip-to-chip optical interconnects.

BIOGRAPHY



Juejun (JJ) Hu received his PhD from MIT in 2009 and is currently an assistant professor in the Department of Materials Science & Engineering at the University of Delaware. Dr. Hu's primary research interest focuses on the enhanced photon-matter interactions in nanophotonic structures made of novel infrared glasses, with applications ranging from chemical sensing, photovoltaics, magneto-optics, and photonic integration on unconventional plastic substrates. Dr. Hu has authored and co-authored over 40 refereed journal publications since 2006 and has been awarded 6 U.S. patents.

Technical Session D2-W3-T4: New Materials Science and Engineering, Nanotechnology and New Green Energy

Chien-Wen Hsieh

Assistant Professor, Institute of Lighting and Energy Photonics
National Chiao Tung University
(交通大學光電學院謝建文教授)

ABSTRACT

BIOGRAPHY

Technical Session D2-W4-T4: Broadband and Wireless Computing, Web, Cloud Computing, Cyber Security, and Machine Learning

Workshop Co-Chair and Session Chair

Chen-Hsiang (Jones) Yu

Director of Mobile Engineering and User Experience, Zappix and PetPace
25 Burlington Mall Road, Burlington, MA 01803, USA
Tel: +1 781.214.8124
Email: chyu@csail.mit.edu

BIOGRAPHY

Jones Yu is known as a computer scientist and a team lead in mobile industry. He earned B.E. and M.S. in Computer Science and Information Engineering (CSIE) from Tamkang University in 1998 and from National Taiwan University in 2000, respectively, and Ph.D. in Computer Science from MIT in 2012. His Ph.D. research focused on enhancing web pages on desktop and mobile browsers for two populations: non-native English readers and mobile users. Before coming to MIT, he worked as a team lead in the wireless industry for a few years. During his study at MIT, he continued his leadership and led teams winning several entrepreneurship and mobile application development competitions. Currently, he is Director of Mobile Engineering and User Experience at Zappix and PetPace.

Technical Session D2-W4-T4: Broadband and Wireless Computing, Web, Cloud Computing, Cyber Security, and Machine Learning

A Measurement-based Study of MultiPath TCP Performance over Wireless Networks

Yung-Chih Chen

Ph.D. Candidate, School of Computer Science
University of Massachusetts at Amherst
140 Governor's Drive, Amhrest MA 01003, USA
Email: yungchih@cs.umass.edu
(麻州大學安默斯特分校陳勇志)

ABSTRACT

With the popularity of mobile devices and the pervasive use of cellular technology, people can now access the Internet ubiquitously. As most smart phones and mobile devices are equipped with dual interfaces (WiFi and 3G/4G), they provide a natural platform to connect to the Internet using multi-path TCP, which leverages path diversity to improve performance and provide robust data transfer. However, little has been explored about how people can benefit from using multi-path TCP under different traffic types, such as Web browsing or online video streaming. Furthermore, little has been investigated on the impact multi-path TCP may have at the application level due to delay and latency variation.

In this talk, we take some initial steps to understand how multi-path TCP performs in the wild, and focus on simple 2-path multi-path TCP scenarios (as most mobile devices have dual interfaces). We seek to answer the following questions: How much can a user benefit from using multi-path TCP when an additional cellular network interface is available, relative to using the WiFi interface alone? What are the performance impacts when the associated multi-path TCP flows are of different sizes? We are especially interested in understanding how the application level performance is affected when path characteristics (e.g., round trip times and loss rates) are diverse. We address these questions by conducting measurements using one commercial Internet service provider and three major cellular carriers in the US.

BIOGRAPHY

Yung-Chih Chen received his B.S. (2004) from Nation Tsing Hua University at Hsinchu, Taiwan and M.S. (2010) from University of Massachusetts at Amherst, both in computer science. Currently he is a Ph.D. candidate at the school of Computer Science of the University of Massachusetts at Amherst, and is a research assistant in the Computer Network Research Group, led by Professor Don Towsley and Professor Jim Kurose. He was summer research intern once at Raytheon BBN Technology in 2008, and once at Bell Labs/Acatel Lucent Technologies in 2009. Mr. Chen's research interests focus on mobility modeling, protocol design and analysis, multi-path TCP, and performance evaluation.

Technical Session D2-W4-T4: Broadband and Wireless Computing, Web, Cloud Computing, Cyber Security, and Machine Learning

Digital Humanities and its Challenges to Information Technologists

Shih-Pei Chen

Postdoctoral researcher, Fairbank Center for Chinese Studies, Harvard University
IQSS, 1737 Cambridge Street, Cambridge MA 02138, United States
Tel: +1-617-495-0833, Fax: +1-617-496-5149
Email: shihpeichen@fas.harvard.edu

ABSTRACT

The availability of large quantity of digital texts in the humanities has posted a challenge for historians, literature scholars, and social scientists, since the traditional way of carefully going through a small number of texts is no longer sufficient for digesting the large volume of content. On the other hand, computers can "read" digital texts in an extremely efficient way. But the reading by machines is rather shallow comparing to the critical reading by humanities scholars who can always read sophisticated meanings out of the texts and answer one's research questions based on that. Thus, the challenge lies in the gap between human and machine -- how to make information technologies helpful for humanities scholars, who rely their research much more on qualitative analyses than the quantitative ones?

In this talk, I will share my experience in working closely with both historians and computer scientists for ten years, the challenges I encountered in developing information technologies for historical research, and the new directions I observed.

BIOGRAPHY

Shih-Pei Chen received her B.S. in Applied Mathematics at National Chiao Tung University, Hsinchu, Taiwan in 1998. She received her M.S. and Ph.D. in Computer Science and Information Engineering at National Taiwan University, Taipei, Taiwan in 2003 and 2011 accordingly.

Dr. Chen is currently a Postdoctoral Researcher at the Fairbank Center for Chinese Studies and the Project Manager for the China Biographical Database Project at Harvard University (Cambridge, Massachusetts). Her publications include: Information Technology for Historical Document Analysis (Ph.D. dissertation, 2011), Discovering Relationships from Imperial Court Documents of Qing China (2012), and On Building a Full-Text Digital Library of Historical Documents (2012). Her research interests are digital libraries, digital archives, and digital humanities, with a focus on information technologies for historical research.

Technical Session D2-W4-T4: Broadband and Wireless Computing, Web, Cloud Computing, Cyber Security, and Machine Learning

Web Page Enhancement on Desktop and Mobile Browsers

Chen-Hsiang (Jones) Yu

Director of Mobile Engineering and User Experience, Zappix and PetPace
25 Burlington Mall Road, Burlington, MA 01803, USA
Tel: +1 781.214.8124
Email: chyu@csail.mit.edu

ABSTRACT

The Web is a convenient platform to deliver information, but reading web pages is challenging.

My research focuses on investigating techniques to enhance web pages on desktop and mobile browsers for two specific populations: non-native English readers and mobile users. There are three issues addressed in this talk: web page readability, web page skimmability and continuous reading support on mobile devices.

I will present the Jenga Format, a text transformation that makes reading easier by breaking up blocks of text. Reading is still time-consuming for non-native readers. I will present Froggy GX, which was designed to improve reading under time constraints. Even native readers struggle when reading the Web on mobile devices, especially when context switches happen in reading-on-the-go situations. I will present Read4Me browser, which was designed to support continuous reading on a mobile device. User studies showed that Jenga Format and Froggy GX improved both reading comprehension and user satisfaction, and Read4Me browser provided the best reading experience among all studied conditions.

BIOGRAPHY

Jones Yu is known as a computer scientist and a team lead in mobile industry. He earned B.E. and M.S. in Computer Science and Information Engineering (CSIE) from Tamkang University in 1998 and from National Taiwan University in 2000, respectively, and Ph.D. in Computer Science from MIT in 2012. His Ph.D. research focused on enhancing web pages on desktop and mobile browsers for two populations: non-native English readers and mobile users. Before coming to MIT, he worked as a team lead in the wireless industry for a few years. During his study at MIT, he continued his leadership and led teams winning several entrepreneurship and mobile application development competitions. Currently, he is Director of Mobile Engineering and User Experience at Zappix and PetPace.

Technical Session D2-W4-T4: Broadband and Wireless Computing, Web, Cloud Computing, Cyber Security, and Machine Learning

Ping-Cheng Yeh

Associate Professor, Department of Electrical Engineering
National Taiwan University
(台灣大學電機工程學系葉丙成教授)

BIOGRAPHY


Taipei Economic and Cultural
Office in Boston
(駐波士頓台北經濟文化辦事處)
99 Summer Street, Suite 801
Boston, MA 02110
Tel: 617-737-2050/1

駐美國台北經濟文化代表處

Taipei Economic and Cultural Representative Office
in the United States
4201 Wisconsin Avenue, N.W., Washington, D.C. 20016
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