The 9th Emerging Information and Technology Conference
(EITC-2009)

Advancing Technology Innovations through Collaboration

Conference Proceedings

Massachusetts Institute of Technology
Cambridge, Massachusetts, U.S.A.

Thursday - Friday, August 6th - 7th, 2009

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Welcome Message

Distinguished colleagues:

It is with pleasure that we welcome all of you to join us in the 9th Emerging Information and Technology Conference (EITC-2009). This conference will be held at MIT with four parallel technical tracks that highlight the advancement of emerging technologies.

The main mission of EITC is to strengthen the technical and business ties between Asian and North American universities, R&D institutions, and industries. This conference was initiated by visionary leaders who recognized that globalization is a driving force for accelerated intellectual and economic development. Interactions among Asian Pacific and North American professionals are a catalyst for technology innovations. Since the inception of EITC, many outstanding academic and industrial leaders around the world contributed to the success of this conference and inspired many young scholars and professionals.

The theme of this conference is "Advancing Technology Innovations through Collaboration". This theme underscores the essence of what EITC is built on: interdisciplinary, intergenerational, and international collaborations. Many of us have witnessed the rapid expansion of information technology in the past two decades. The explosive growth of Internet has brought the world together and now the enormous shifts in technology landscape require our swift adaptation to new technological advances. In the midst of many challenges ahead, let's ask ourselves: What is the next transformational technology that will reshape the world, and how can we work collaboratively to advance this technology? We truly look forward to experts from Energy/Environment/Sustainability, Nanotechnology/NEMS/MEMS, Bioinfomatics/ Biotechnology/Medicine/Public Health, and C4I (Content, Computer, Communication, Consumer Electronics, and Integration)/SoC (System-on-a-Chip) technical tracks to share their research and to stimulate discussions.

Owing to the tireless efforts of the organizing committee and the generosity of our sponsors, EITC-2009 is shaping up to be a successful event. We look forward to your participation, and hope you enjoy the historic and cultural attractions in Boston during your visit.

Sincerely yours,

Sow-Hsin Chen	General Conference Chair	Massachusetts Institute of Technology
Lin-Wen Hu	Conference Co-Chair	Massachusetts Institute of Technology
Chin Pan	Conference Co-Chair	National Tsing Hua University

Conference Themes

The EITC-2009 consists of following four workshops:

- Workshop 1 (W1): Energy, Environment, Sustainability
- Workshop 2 (W2): Bioinformatics, Biotechnology, Medicine, Public Health
- Workshop 3 (W3): Nanotechnology, NEMS, MEMS
- Workshop 4 (W4): C4I (Content, Computer, Communication, Consumer Electronics, and Integration), SoC (System-on-a-Chip)

Planning Committee

Conference General Chair

Sow-Hsin Chen	陳守信	Massachusetts Institute of Technology

Conference Chairs

Lin-Wen Hu	胡玲文	Massachusetts Institute of Technology
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Program Committee

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Workshop Track/Session Chairs

Workshop 1: Energy, Environment and Sustainability

Minking K. Chyu	邱民京	University of Pittsburgh
Ping-Hei Chen	陳炳煇	National Taiwan University

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

Track 1: Bioinformatics and Biotechnology

Yin-Ching Iris Chen	陳盈靜	Massachusetts General Hospital & Harvard University

Jung-Hsien Chiang	蔣榮先	National Cheng Kung University
Jung-Ying Tzeng	曾仲瑩	North Carolina State University
Li-San Wang	王立三	University of Pennsylvania

Track 2: Medicine and Public Health

Hung-Yi Chiou	邱弘毅	Taipei Medical University
Yi-Hsiang Hsu	許益祥	Harvard University
Hong-Yo Kang	康宏佑	Chang Gung University
Jeng-Shin Lee	李政欣	Harvard University

Workshop 3: Nanotechnology, NEMS and MEMS

Track 1: Nanotechnology

Alex K-Y Jen	任廣禹	University of Washington
Wei-Fang Su	林唯芳	National Taiwan University

Track 2: NEMS and MEMS

Fan-Gang Tseng	曾繁根	National Tsing Hua University

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

Track 1: C4I (Content, Computer, Communications, Consumer Electronics, and Integration)

Sao-Jie Chen	陳少傑	National Taiwan University
Si-Pin Ma	馬席彬	National Tsing Hua University
Chen-Mou Cheng	鄭振牟	National Taiwan University
Wei Hwang	黃威	National Chiao-Tung University

Track 2: SoC (System-on-a-Chip)

Sao-Jie Chen	陳少傑	National Taiwan University
Darrin J. Young		Case Western Reserve University
Yao-Wen Chang	張耀文	National Taiwan University

Executive Secretary Office

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Conference Program and Proceedings

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Huan-Ying Lin	林奐瑩	Harvard University

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Public Relation

Julian Lee	李再仁	Taiwan Trade Center, New York

Advanced Registration

Commercial Division, Taipei Economic & Cultural Office in Boston
駐波士頓台北經濟文化辦事處 商務組

On-Site Registration

The Republic of China Student Association of M.I.T.
麻省理工學院中華民國(台灣)同學會

Harvard Taiwan ROC Student Club
哈佛大學台灣(中華民國)同學會

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The Republic of China Student Association of M. I. T.
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Science and Technology Division, Taipei Economic and Cultural Representative Office in the U.S.
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Taiwan Trade Center, New York
對外貿易發展協會 駐紐約辦事處

Conference Program

Wednesday August 5th, 2009

August 5th (Wednesday) 7:00 pm - 10:00 pm : Welcome Dinner (By Invitation)
Hosted by **Kuo-Tung Yang** (teco@tecoboston.org)
Director General, Taipei Economic and Cultural Office in Boston
駐波士頓臺北經濟文化辦事處 楊國棟 處長

Thursday August 6th, 2009

August 6th (Thursday) 8:00 am - 6:00 pm : Registration (Room: 4-146)

August 6th (Thursday) 8:30 am - 9:15 am : Opening Speech (Room: 4-163)
Conference Co-Chair: **Dr. Lin-wen Hu**, Massachusetts Institute of Technology
麻省理工學院 胡玲文 博士
Conference Co-Chair: **Professor Chin Pan**, National Tsing Hua University
清華大學 潘欽 教授

Minister Lou-Chuang Lee (chr@nsc.gov.tw)
National Science Council, Executive Yuan, Taiwan, Republic of China
行政院國家科學委員會 李羅權 主任委員

EITC 2009 General Chair: **Professor Sow-Hsin Chen** (sowhsin@mit.edu)
"Opening welcome and remarks on the world-wide interest in Neutron Scattering Spectroscopy as a powerful tool for the energy related advanced materials and bio-materials research"
Department of Nuclear Science and Engineering, Massachusetts Institute of Technology
(Academician, Academia Sinica, Taiwan)
麻省理工學院 核子科學與工程系 陳守信 教授 (中央研究院院士)

August 6th (Thursday) 9:15 am - 10:45 am : Technical Session D1-W1-T1: Emerging Energy Technologies (Room: 4-159)
Chair: **Professor Minking K. Chyu**, University of Pittsburgh
匹茲堡大學 邱民京 教授

"Opportunities and Challenges of Green Energy Industry in Taiwan"
Dr. Hsin-Sen Chu (HsinSenChu@itri.org.tw)
Executive Vice President, Industrial Technology Research Institute (ITRI)
工業技術研究院 副院長 曲新生 博士

"Two Phase Flow and Heat Transfer in Microchannels for Energy Applications"
Professor Chin Pan (cpan@ess.nthu.edu.tw)
Dean, College of Nuclear Science, National Tsing Hua University
清華大學 原子科學院 潘欽 院長

"Multiscale Modeling of Atomization and Spray"
Professor Chien-Pin Chen (cchen@che.uah.edu)

Department of Chemical and Materials Engineering, University of Alabama, Huntsville
阿拉巴馬大學 化學與材料工程系 陳謙斌 教授

August 6th (Thursday) 9:15 am - 10:45 am : Technical Session D1-W2-T1: Analysis in Genetic Studies (Room: 4-153)
Chair: **Professor Jung-Ying Tzeng**, North Carolina State University
北卡洛來那州立大學 曾仲瑩 教授

"A Forest-Based Approach in Genomewide Association Study"
Professor Ching-Ti Liu (ctliu@bu.edu)
Department of Biostatistics, Boston University
波士頓大學 生物統計系 柳清地 教授

"A Combined Approach Using Case-Control and Family Data with Consideration of Population Stratification"
Professor Ren-Hua Chung (rchung@med.miami.edu)
Miami Institute for Human Genomics, University of Miami
邁阿密大學 人類基因研究所 鍾仁華 教授

"Methods for Detecting Interactions between Genetic Polymorphisms and Prenatal Environment Exposure with a Mother-Child Design"
Professor Shuang Wang (sw2206@columbia.edu)
Mailman School of Public Health, Columbia University
哥倫比亞大學 公共衛生學院 王爽 教授

"Kernel Machine Approaches for the Analysis of Genome Wide Association Studies"
Dr. Michael Chiao-An Wu (mwu@hsph.harvard.edu)
Department of Biostatistics, Harvard School of Public Health
哈佛大學 公共衛生學院 吳肇安 博士

August 6th (Thursday) 9:15 am - 10:45 am : Technical Session D1-W3-T1: Nanomaterial (Room: 4-149)
Chair: **Professor Alex K.-Y. Jen**, University of Washington
華盛頓大學 任廣禹 教授

"Novel Optical Properties of Semiconductor Nanocomposites"
Professor Yang-Fang Chen (yfchen@phys.ntu.edu.tw)
Department of Physics, National Taiwan University
台灣大學 物理系 陳永芳 教授

"One-dimensional Nanomaterials for Energy Applications"
Dr. Kuei-Hsien Chen (chenkh@pub.iams.sinica.edu.tw)
Research Fellow, Institute of Atomic and Molecular Sciences, Academia Sinica, Taiwan
中央研究院 原子與分子科學研究所 陳貴賢 博士

"Microreactor-Assisted Nano Deposition Process"
Professor Chih-hung (Alex) Chang (changch@che.orst.edu)
Department of Chemical Engineering, Oregon State University
奧勒岡州立大學 化學工程系 張至弘 教授

August 6th (Thursday) 9:15 am - 10:45 am : Technical Session D1-W4-T1: Baseband System-on-Chip (Room: 4-145)
Chair: **Professor Hsi-Pin Ma**, National Tsing-Hua University
清華大學 馬席彬 教授

"The Sandbridge Sandblaster SB3500 Low Power SoC Implementation"
Dr. John Glossner (jglossner@sandbridgetech.com)
CTO and Executive Vice President, Sandbridge Technologies, Lowell, Massachusetts

"A Baseband Testbed for Multiuser Mobile MIMO/OFDMA Communications"
Professor Hsi-Pin Ma (hp@ee.nthu.edu.tw)
Department of Electrical Engineering, National Tsing Hua University
清華大學 電機工程系 馬席彬 教授

"Cognitive Radio Networks"
Professor Kwang-Cheng Chen (chenkc@cc.ee.ntu.edu.tw)
Department of Electrical Engineering, National Taiwan University
台灣大學 電機工程系 陳光禎 教授

August 6th (Thursday) 10:45 am - 11:00 am : Break

August 6th (Thursday) 11:00 am - 12:30 pm : Technical Session D1-W1-T2: Energy Technologies (Room: 4-159)
Chair: **Professor Chin Pan**, National Tsing Hua University
清華大學 原子科學院 潘欽 院長

"Carbon Dioxide Capture and Sequestration"
Dr. Yee Soong (yee.soong@netl.doe.gov)
National Energy Technology Laboratory, U.S. Department of Energy
美國能源部 宋逸 博士

"Coal Gasification and Its Applications to Clean Energy"
Professor Ting Wang (twang@uno.edu)
Director of Energy Conversion and Conservation Center, University of New Orleans
紐奧良大學 機械工程系 王亭 教授

"Carbon Capture Technology which Can Reduce Raging Sand Storm"
Dr. Hsiao-Yuan Bruce Li (bli@21-centurysilicon.com)
President and CTO, 21-Century Silicon, Garland, Texas
21-Century Silicon 總裁 李曉遠 博士

August 6th (Thursday) 11:00 am - 12:30 pm : Technical Session D1-W2-T2: Medicine and Public Health (Room: 4-153)
Chair: **Professor Hung-Yi Chiou**, Taipei Medical University
台北醫學大學 邱弘毅 教授

"New Therapeutic Technologies for Diabetes. Inhalation, Deposition, and Fate of Insulin and Other Therapeutic Proteins"

Professor Joseph Brain (brain@hsph.harvard.edu)
Director, Center for Children and Environmental Health, Harvard University Center for the Environment
Cecil K. and Philip Drinker Professor of Environmental Physiology, Harvard School of Public Health

"Taiwan Stroke Center and Registry - Current Issues in Research and Clinical Practice"
Professor Hung-Yi Chiou (hychiou@tmu.edu.tw)
Dean, College of Public Health and Nutrition, Taipei Medical University
台北醫學大學 公共衛生暨營養學院院長 邱弘毅 教授

"Genetic and Biochemical Predictors of Type 2 Diabetes in Women"
Professor Simin Liu (siminliu@ucla.edu)
Department of Epidemiology, UCLA School of Public Health
加州大學洛杉磯分校 流行病學系 劉思敏 教授

"Nutrition and the Risks of Type 2 Diabetes and Cardiovascular Diseases. The nurses' Health Study"
Dr. Yiqing Song (ysong3@rics.bwh.harvard.edu)
Department of Medicine, Brigham and Women's Hospital and Harvard Medical School
哈佛大學 醫學院 宋一青 博士

August 6th (Thursday) 11:00 am - 12:30 pm : Technical Session D1-W3-T2: NEMS and MEMS (Room: 4-149)
Chair: **Professor Fan-Gang Tseng**, National Tsing Hua University
清華大學 曾繁根 教授

"Optical Micromirror Actuation Using Thermocapillary Effect in Microdroplets"
Professor Yen-Wen Lu (ywleen@rit.edu)
Microsystems Engineering, Rochester Institute of Technology
羅徹斯特理工學院 微系統工程研究所 盧彥文 教授

"A Gas Sensing System for Indoor Air Quality and Polluted Environmental Monitoring"
Professor Da-Jeng Yao (djyao@mx.nthu.edu.tw)
Institute of NanoEngineering and MicroSystems, National Tsing-Hua University
清華大學 奈米工程與微系統研究所 饒達仁 教授

"From High Throughput Protein Micro Array toward Ultra High Sensitive Single Molecule Nanoarray"
Professor Fan-Gang Tseng (fangang@ess.nthu.edu.tw)
Department of Engineering and System Science, National Tsing Hua University
清華大學 工程與系統科學系 曾繁根 教授

August 6th (Thursday) 11:00 am - 12:30 pm : Technical Session D1-W4-T2: Medical IC (Room: 4-145)
Chair: **Professor Darrin Young**, Case Western Reserve University
凱斯西儲大學 楊駿 教授

"Silicon NMR Radio-Frequency Biomolecular Sensor"
Professor Donhee Ham (donhee@seas.harvard.edu)

School of Engineering & Applied Sciences, Harvard University

"A Release-on-Demand Wireless CMOS Drug Delivery SoC Based on Electrothermal Activation Technique"
Professor Yao-Joe Joseph Yang (yjy@ntu.edu.tw)
Associate Chair, Department of Mechanical Engineering, National Taiwan University
台灣大學 機械工程系 楊燿州 教授

"A Wireless and Batteryless 10-bit Implantable Blood Pressure Sensing Microsystem for Real-time
Genetically Engineered Mice Monitoring"
Professor Darrin J. Young (djy@case.edu)
Department of Electrical Engineering and Computer Science, Case Western Reserve University
凱斯西儲大學 楊駿 教授

August 6th (Thursday) 12:30 pm - 1:45 pm : Lunch (Room: 4-163)
"Hi-Tech Investment Opportunities in the New Era of Cross-Strait Relations"
Julian Lee (trlee@taitra.org.tw)
Director, Taiwan Trade Center, New York
對外貿易發展協會 駐紐約辦事處 主任 李再仁

August 6th (Thursday) 1:45 pm - 2:45 pm : Keynote Session D1-W3-K1 Nanotechnology (Room: 4-159)
Chair: **Professor Chin Pan**, National Tsing Hua University
清華大學 潘欽 教授

"Nanotechnology for Energy Applications"
Professor Gang Chen (gchen2@mit.edu)
Director of Micro and Nano Engineering Laboratories, Massachusetts Institute of Technology
麻省理工學院 陈刚 教授

August 6th (Thursday) 1:45 pm - 2:45 pm : Keynote Session D1-W2-K1 Biotechnology (Room: 4-153)
Chair: Room: 4-153, University of Pennsylvania
賓州大學 王立三 教授

"Epigenetic Regulation of Memory Formation in Health and Disease"
Professor Li-Huei Tsai (lhtsai@mit.edu)
Department of Brain and Cognitive Sciences, Massachusetts Institute of Technology
Academician, Academia Sinica, Taiwan
中央研究院 蔡立慧 院士

August 6th (Thursday) 1:45 pm - 2:45 pm : Keynote Session D1-W4-K1: System on Chip (Room: 4-145)
Chair: **Professor Sao-Jie Chen**, National Taiwan University
台灣大學 陳少傑 教授

"Mobile Phones and Multicores: Programming Nightmare or Architectural Renaissance"
Professor Arvind (arvind@csail.mit.edu)
Computer Science and Artificial Intelligence Laboratory, Massachusetts Institute of Technology

August 6th (Thursday) 2:45 pm - 4:15 pm : Technical Session D1-W1-T3: Fuel Cells (Room: 4-159)
Chair: **Professor Ping-Hei Chen**, National Taiwan University
台灣大學 陳炳煇 教授

"Molecular Quantum Mechanics and Multiscale Design of Fuel Cells and Photoelectrochemical Cells"
Professor Che-Wun Hong (cwhong@pme.nthu.edu.tw)
Department of Power Mechanical Engineering, National Tsing Hua University
清華大學 動力機械系 洪哲文 教授

"Optimization of Proton Exchange Membrane Fuel Cells by Inverse Heat Transfer Theory"
Professor Chin-Hsiang Cheng (chcheng@mail.ncku.edu.tw)
Department of Aeronautics and Astronautics, National Cheng Kung University
成功大學 航空太空工程研究所 鄭金祥 教授

"Characteristic and Findings of Hydrogen Literature and Full Cell Patents: 1965 - 2006"
Professor Ming-yueh Tsay (mytsay@nccu.edu.tw)
Graduate Institute of Library, Information and Archival Studies, National Chengchi University
政治大學 圖書資訊與檔案學研究所 蔡明月 教授

August 6th (Thursday) 2:45 pm - 4:15 pm : Technical Session D1-W2-T3: Systems Biology (Room: 4-153)
Chair: **Professor Jung-Hsien Chiang**, National Cheng Kung University
成功大學 蔣榮先 教授

"Systems Approaches towards Brain Tumor Biology"
Dr. Leslie Chen (lchen@systemsbiology.org)
Post Doctoral Fellow, Institute for Systems Biology, Seattle
系統生物研究所 陳彥瑜 博士

"Runx1 is Required for the Endothelial to Haematopoietic Cell Transition but not Thereafter"
Dr. Michael Jin-Feng Chen (michchen@mail.med.upenn.edu)
Post-doc Fellow, School of Medicine, University of Pennsylvania
賓州大學 醫學院 陳錦峰 博士

"Role and Mechanism of Alpha-E-Catenin in Regulation of Intercellular Adhesion and Cell Proliferation"
Dr. Wen-Hui Lien (wlien@mail.rockefeller.edu)
Postdoctoral Fellow, The Rockefeller University, New York
洛克菲勒大學 連文慧 博士

August 6th (Thursday) 2:45 pm - 4:15 pm : Technical Session D1-W3-T3: Polymer Solar Cell (Room: 4-149)
Chair: **Professor Yang-Fang Chen**, National Taiwan University
台灣大學 陳永芳 教授

"New Side-Chain Tethered Polythiophene for Heterojunction Solar Cell"

Professor Kung-Hwa Wei (khwei@mail.nctu.edu.tw)
Chairman, Department of Materials Science and Engineering, National Chiao-Tung University
交通大學 材料科學與工程系 韋光華 主任

"ZnO Nanorod Hybrid Material for High Efficient Photovoltaic Device"
"Fabrication of Submicron Optical Cavity by Using Laser Reformation Technique"
Professor Ching-Fuh Lin (cflin@cc.ee.ntu.edu.tw)
Graduate Institute of Photonics and Optoelectronics, National Taiwan University
台灣大學 光電工程學研究所 林清富 教授

"Molecular Self-Assembly for Flexible Electronics"
Professor Hong Ma (hma@u.washington.edu)
Department of Materials Science & Engineering, University of Washington
華盛頓大學 材料科學與工程系 麻洪 教授

August 6th (Thursday) 2:45 pm - 4:15 pm : Technical Session D1-W4-T3: Design Automation (Room: 4-145)
Chair: **Professor Yao-wen Chang**, National Taiwan University
台灣大學 張耀文 教授

"Manufacturing for Design"
Professor Martin D. F. Wong (mdfwong@illinois.edu)
Department of Electrical and Computer Engineering, University of Illinois, Urbana Champaign
伊利諾大學 電機與計算機工程系 黃定發 教授

"VLSI and LCD Process Variation Analysis and Cures"
Professor Charlie Chung-Ping Chen (cchen@cc.ee.ntu.edu.tw)
Department of Electrical Engineering, National Taiwan University
台灣大學 電機工程系 陳中平 教授

"Scalable Hardware Synthesis and Verification with Craig Interpolation"
Professor Jie-Hong Roland Jiang (jhjiang@cc.ee.ntu.edu.tw)
Department of Electrical Engineering, National Taiwan University
台灣大學 電機工程系 江介宏 教授

August 6th (Thursday) 4:15 pm - 4:30 pm : Break

August 6th (Thursday) 4:30 pm - 6:00 pm : Technical Session D1-W1-T4: Green Energy (Room: 4-159)
Chair: **Dr. Sean Shao-Hwa Wang**, Industrial Technology Research Institute
工業技術研究院 王韶華 博士

"Biomass-Ethanol Conversion: A Renaissance of Fermentation Technologies"
Professor J. H. David Wu (davidwu@che.rochester.edu)
Department of Chemical Engineering, University of Rochester
羅徹斯特大學 化學工程系 吳政惠 教授

"Smarter Energy"
Dr. Jen-Yao Chung (jychung@us.ibm.com)

Senior Manager, Industry Technology and Solutions, IBM Thomas J. Watson Research Center
國際商業機械公司 華生研究中心 鐘健堯 博士

"Accelerate the Path to Renewable Energy by Business Model innovation"
Dr. Sean Shao-Hwa Wang (seanwang@itri.com)
President, Industrial Technology Research Institute (ITRI) International, San Jose
工業技術研究院 北美公司 總經理 王韶華 博士

"Impact of Green Building on Global Warming"
Adjunct Professor Jeffrey S. Seigel (jeffreyseigel@optonline.net)
Department of Civil Engineering, Polytechnic Institute of New York University

August 6th (Thursday) 4:30 pm - 6:00 pm : Technical Session D1-W2-T4: Medicine and Public Health (Room: 4-153)
Chair: **Professor Hong-Yo Kang**, Chang Gung University
長庚大學 康宏佑 教授

"Ubiquitination in Signal Transduction and Cancer"
Professor Hui-Kuan Lin (hklin@mdanderson.org)
The University of Texas M. D. Anderson Cancer Center, Houston
德州大學 安得生癌症中心 林慧觀 教授

"Vitamin D Metabolism and Its Role on the Natural History of Prostate Cancer"
Professor Tai Cheng Chen (taichen@bu.edu)
Section of Endocrinology, Diabetes, and Nutrition, Boston University School of Medicine
波士頓大學 醫學院 內分泌糖尿營養科 陳泰成 教授

"Molecular Mechanisms and Clinical Relevance of Androgen and Androgen Receptor Actions"
Professor Hong-Yo Kang (hkang3@mail.cgu.edu.tw)
Graduate Institute of Clinical Medical Sciences, Chang Gung University
長庚大學 臨床醫學研究所 康宏佑 教授

August 6th (Thursday) 4:30 pm - 6:00 pm : Technical Session D1-W3-T4: NEMS and MEMS (Room: 4-149)
Chair: **Professor Jeff Tza-Huei Wang**, Johns Hopkins University
約翰霍普金斯大學 王澤輝 教授

"Creating the Next-Generation Small-Scale Machines for Precision Engineering, Microscopy and Biomedical Applications"
Dr. Shih-Chi Chen (scchen@mit.edu)
Research Fellow, Wellman Center for Photomedicine, Massachusetts General Hospital
麻省總醫院 生醫光電中心 陳世祈 博士

"General Electric Manipulations of Microfluids"
Professor Shih-Kang Fan (skfan@mail.nctu.edu.tw)
Institute of Nanotechnology, National Chiao Tung University
交通大學 奈米科技研究所 范士岡 教授

"Industrial Applications of MEMS - From Implantable Silicon Probe to Optical Switch"

Dr. Pinyen Lin (pinyen.lin@xerox.com)
Senior Research Scientist, Xerox Research Center, Webster, New York
美國全錄公司 研究中心 林斌彥 博士

"Convergence of Quantum Dot Biosensors and Microfluidic Single Molecule Spectroscopy for Molecular
Analysis of Diseases"
Professor Jeff Tza-Huei Wang (thwang@jhu.edu)
Departments of Mechanical Engineering & Biomedical Engineering, Johns Hopkins University
約翰霍普金斯大學 機械工程系與生物醫學工程系 王澤輝 教授

August 6th (Thursday) 4:30 pm - 6:00 pm : Technical Session D1-W4-T4: C4I (Room: 4-145)
Chair: Professor Chen-Mou Cheng, National Taiwan University
台灣大學 鄭振牟 教授

"Low Power Wireless Communication Makes the World Freedom of Connect"
Z. K. Cheng (zkc@ichipdesign.com)
Vice President and Chief Architect, iCHIPdesign International, Garland, Texas
iCHIPdesign 副總裁 鄭志剛

"Telecom Transformation and Business Model Required for Future Telematics Services"
Dr. Shing TenqChen (stc@cht.com.tw)
Chunghwa Telecom Laboratories, Taiwan
中華電信公司 電信研究所 鄧陳興 博士

"Cryptographic Computing on Graphics Cards"
Professor Chen-Mou Cheng (ccheng@cc.ee.ntu.edu.tw)
Department of Electrical Engineering, National Taiwan University
台灣大學 電機工程系 鄭振牟 教授

August 6th (Thursday) 7:00 pm - 9:00 pm : Conference Dinner (By Invitation)
Hosted by **Minister Lou-Chuang Lee** (chr@nsc.gov.tw)
National Science Council, Executive Yuan, Taiwan, Republic of China
行政院國家科學委員會 李羅權 主任委員

Friday August 7th, 2009

August 7th (Friday) 8:00 am - 6:00 pm : Registration (Room: 4-146)

August 7th (Friday) 9:15 am - 10:45 am : Technical Session D2-W1-T1: Nuclear and Hydrogen Energy (Room: 4-159)
Chair: **Professor Minking Chyu**, University of Pittsburgh
匹茲堡大學 邱民京 教授

"A Preliminary Study of High Temperature Gas Cooled Reactor and Hydrogen Production in Taiwan"
Professor Ching-Chang Chieng (cchieng@ess.tshu.edu.tw)
Department of Engineering Sciences and Systems, National Tsing Hua University

清華大學 工程科學與系統系 錢景常 教授

"A View of Nuclear Hydrogen Production in Large Scale Power Generation System"
Professor Minking Chyu (mkchyu@pitt.edu)
Chair, Department of Mechanical Engineering and Materials Science, University of Pittsburgh
匹茲堡大學 機械工程與材料科學系主任 邱民京 教授

"Boiling Heat Transfer Enhancement of Nanoparticle Thin Film Coatings"
Dr. Lin-wen Hu (lwhu@mit.edu)
Associate Director, MIT Nuclear Reactor Laboratory
麻省理工學院 核子反應爐實驗室 副主任 胡玲文 博士

August 7th (Friday) 9:15 am - 10:45 am : Technical Session D2-W2-T1: Biomedical Imaging Technology (Room: 4-153)
Chair: **Dr. Yin-Ching Iris Chen**, Massachusetts General Hospital
麻省總醫院 陳盈靜 博士

"Constructing a Rich Internet Application (RIA) framework for PACS"
Professor Chia-Hung Hsiao (chhsiao@mail.tcu.edu.tw)
Department of Medical Informatics, Tzu Chi University
慈濟大學 醫學資訊系 蕭嘉宏 教授

"Clinical Application of Diffusion MRI"
Dr. J.-Y. George Chiou (jychiou@bwh.harvard.edu)
Department of Radiology, Brigham and Women's Hospital, Harvard Medical School
哈佛醫學院 布里翰婦女醫院 放射科 邱志遠 博士

"Using High-Resolution Multi-Sliced CT for Coronary Angiography"
Dr. Chun-Shan Sam Yam (csyam@bidmc.harvard.edu)
Department of Radiology, Beth Israel Deaconess Medical Center, Harvard Medical School
哈佛醫學院 貝斯以色列醫學中心 放射科 任振山 博士

"Pharmacological MRI, Neuroscience, Neurodegeneration, and Drug Discovery"
Dr. Yin-Ching Iris Chen (iris@nmr.mgh.harvard.edu)
Athinoula A. Martinos Center for Biomedical Imaging, Massachusetts General Hospital
麻省總醫院 生物醫學影像中心 陳盈靜 博士

August 7th (Friday) 9:15 am - 10:45 am : Technical Session D2-W3-T1: Nanotechnology - Fuel Cell (Room: 4-149)
Chair: **Professor Kung-Hwa Wei**, National Chiao-Tung University
交通大學 韋光華 教授

"Carbon Nanotubes for Energy Storage and Conversion Devices"
Professor Bingqing (B.Q.) Wei (weib@udel.edu)
Department of Mechanical Engineering, University of Delaware
特拉華大學 機械工程系 魏秉庆教授

"Microphase Seperation Nanostructure and Nanoparticles for Proton Exchange Membranes Used in Fuel Cells"

Professor Chi-Yang Chao (cychao138@ntu.edu.tw)
Department of Materials Science and Engineering, National Taiwan University
台灣大學 材料科學與工程系 趙基揚 教授

"Converting an Inconvenient Truth into a Convenient Business"
Peter C. Mei (pmei@21-centurysilicon.com)
Chairman and CEO, 21-Century Silicon, Garland, Texas
21-Century Silicon 執行長 梅家駒

August 7th (Friday) 9:15 am - 10:45 am : Technical Session D2-W4-T1: Multi-Processor (Room: 4-145)
Chair: **Professor Wei Hwang**, National Chiao-Tung University
交通大學 黃威 教授

"H.264 Video CODEC"
Professor Kenneth Hsu (kwheec@ritvax.isc.rit.edu)
Department of Computer Engineering, Rochester Institute of Technology
羅徹斯特理工學院 計算機工程系 許根旺 教授

"Microdisplay for Mobile Video Revolution"
Dr. Bor-Yeu Tsaur (btsaur@kopin.com)
Executive Vice President and General Manager, Kopin Corporation, Westborough, Massachusetts
高平磊晶科技 執行副總裁 曹伯禹 博士

"Sense and Avoid Technology for Unmanned Aircraft Access to National Airspace"
Dr. Won-Zon Chen (won-zon.chen@ngc.com)
Northrop Grumman Aerospace Systems, El Segundo, California
諾斯洛普葛魯曼公司 陳萬鍾 博士

August 7th (Friday) 10:45 am - 11:00 am : Break

August 7th (Friday) 11:00 am - 12:30 pm : Technical Session D2-W1-T2: Micro- and Nanoscale Energy Systems (Room: 4-159)
Chair: **Professor Ping-Hei Chen**, National Taiwan University
台灣大學 陳炳煇 教授

"Sensor Network for Energy-Saving Applications"
Professor Ping-Hei Chen (phchen@ntu.edu.tw)
Department of Mechanical Engineering, National Taiwan University
台灣大學 機械工程系 陳炳煇 教授
-
"Green Life Style Technology Development for Energy Saving"
Professor Da-sheng Lee (f11167@ntut.edu.tw)
Dept. of Energy and Refrigerating Air Conditioning Engineering, National Taipei University of Technology
台北科技大學 能源與冷凍空調工程系 李達生 教授

"Third Generation Solar Cells"
Professor Wei-Fang Su (suwf@ntu.edu.tw)

Department of Materials Science and Engineering, National Taiwan University
台灣大學 材料科學與工程系 林唯芳 教授

"Applications of Guided Mode Resonance device in Communication, LED and PV"
Professor Jenq-Yang Chang (jychang@dop.ncu.edu.tw)
Department of Optics and Photonics, National Central University
中央大學 光電科學與工程系 張正陽 教授

August 7th (Friday) 11:00 am - 12:30 pm : Technical Session D2-W2-T2: Medicine and Public Health (Room: 4-153)
Chair: **Dr. Jeng-Shin Lee**, Harvard Medical School
哈佛大學 醫學院 李政欣 博士

"Development of Cell and Gene Therapy"
Dr. Jeng-Shin Lee (jlee@hihg.med.harvard.edu)
Deputy Director, Harvard Gene Therapy Initiative, Harvard Medical School
哈佛大學 醫學院 基因治療計畫 李政欣 博士

"Gene Therapy of the Eye"
Dr. Tiansen Li (tli@meei.harvard.edu)
Massachusetts Eye and Ear Infirmary, Harvard Medical School
哈佛大學 醫學院 麻省眼耳專科醫院 李田森 博士

"Induced Pluripotent Stem Cells Using a Single Excisable Lentiviral Vector"
Professor Gustavo Mostoslavsky (gmostosl@bu.edu)
Department of Medicine, Boston University School of Medicine

August 7th (Friday) 11:00 am - 12:30 pm : Technical Session D2-W3-T2: Solder and Atomic Layer Deposition (Room: 4-149)
Chair: Professor Chih-Hung Chang, Oregon State University
奧勒岡州立大學 張至弘 教授

"Assembly and Integration of Nano-Components Using Lead-Free Nano-Solders"
Professor Zhiyong Gu (zhiyong_gu@uml.edu)
Department of Chemical Engineering, University of Massachusetts at Lowell
麻州大學洛爾分校 化學工程系 谷志勇 教授

"Interface Engineering of Organic Electronics with Atomic-Layer-Deposited Thin Films"
Professor Feng-Yu Tsai (ftsai@ntu.edu.tw)
Department of Materials Science and Engineering, National Taiwan University
台灣大學 材料科學與工程系 蔡豐羽 教授

"Nanodiamond, Carbon Nanowalls and Applications"
Professor Yonhua Tzeng (tzengyo@mail.ncku.edu.tw)
Dean of Electrical Engineering and Computer Science, National Cheng Kung University
成功大學 電資學院院長 曾永華 教授

August 7th (Friday) 11:00 am - 12:30 pm : Technical Session D2-W4-T2: System on Chip (Room: 4-145)

Chair: **Professor Kenneth Hsu**, Rochester Institute of Technology
羅徹斯特理工學院 許根旺 教授

"On-demand Memory Platform for Multi-Task Wireless Video Entertainment Systems"
Professor Wei Hwang (hwang@mail.nctu.edu.tw)
Microelectronics and Information Systems Research Center, National Chiao-Tung University
交通大學 電子工程系 黃威 教授

"XML Content Processors for Web Application Firewall"
Professor Sheng-De Wang (sdwang@cc.ee.ntu.edu.tw)
Department of Electrical Engineering, National Taiwan University
台灣大學 電機工程系 王勝德 教授

"QuteVP: A SystemC-based Virtual Platform for SoC HW/SW Co-Design and Co-Verification"
Professor Chung-Yang (Ric) Huang (ric@cc.ee.ntu.edu.tw)
Department of Electrical Engineering, National Taiwan University
台灣大學 電機工程系 黃鐘揚 教授

August 7th (Friday) 12:30 pm - 1:45 pm : Lunch

August 7th (Friday) 1:45 pm - 2:45 pm : Keynote Speech (Room: 4-163)
Moderator: **Dr. Shan-nan Chang** (sxc135@tecoboston.org)
Director of Cultural Division, Taipei Economic and Cultural Office in Boston
駐波士頓台北經濟文化辦事處 文化組 組長 張善楠 博士

"Broad-based societal implications of IT development: A case-presentation on the convergence of IT and large-scale digital content on world culture and heritage"
Professor Ching-chih Chen (chingchih.chen@simmons.edu)
Graduate School of Library and Information Science, Simmons College, Boston
Project Director, Global Memory Net, NSF International Digital Library Program
美國國家科學基金會 全球記憶網 計畫首席負責人
聯合國 教科文組織 世界遺產中心 遺產記憶網 合作計畫首席負責人 陳劉欽智 教授

August 7th (Friday) 2:45 pm - 4:15 pm : Technical Session D2-W2-T3: Computational Biology (Room: 4-153)
Chair: **Professor Li-San Wang**, University of Pennsylvania
賓州大學 王立三 教授

"Discovery of a Novel Target for Cancer Therapy Using High-throughput Technologies"
Professor Hsueh-Fen Juan (yukijuan@ntu.edu.tw)
Department of Life Science, National Taiwan University
台灣大學 生命科學系 阮雪芬 教授

"High-Performance Computing in Network Biology"
Professor Chun-Hsi (Vincent) Huang (huang@cse.uconn.edu)
Department of Computer Science and Engineering, University of Connecticut
康乃狄克大學 計算機科學與工程系 黃俊熹 教授

"Understanding Chromatin Organization and Gene Regulation with ChIP-seq"

Dr. Clifford Meyer (cliff@research.dfci.harvard.edu)
Research Scientist, Department of Biostatistics and Computational Biology,
Dana-Farber Cancer Institute, Harvard School of Public Health

"Methods and Systems for ChIP-seq Data Analysis"
Professor D. Frank Hsu (hsu@cis.fordham.edu)
Department of Computer and Information Sciences, Fordham University, New York
紐約復旦大學 計算機與資訊科學系 許德標 教授

August 7th (Friday) 2:45 pm - 4:15 pm : Technical Session D2-W4-T3: Network-on-Chip (Room: 4-145)
Chair: **Professor Sao-Jie Chen**, National Taiwan University
台灣大學 陳少傑 教授

"Error Control for On-chip Interconnect Networks"
Professor Paul Ampadu (ampadu@ece.rochester.edu)
Department of Electrical and Computer Engineering, University of Rochester

"Application-Aware Oblivious Routing and Bandwidth-Adaptive Networks"
Professor Srini Devadas (devadas@mit.edu)
Department of Electrical Engineering and Computer Science, Massachusetts Institute of Technology

"Multiband RF-Interconnect for Reconfigurable Network-on-Chip Communications"
Professor Mau-Chung Frank Chang (mfchang@ee.ucla.edu)
Director of High Speed Electronics Laboratory, University of California at Los Angeles
加州大學洛杉磯分校 電機工程系 張懋中 教授

August 7th (Friday) 4:15 pm - 4:30 pm : Break

August 7th (Friday) 4:30 pm - 6:00 pm : Technical Session D2-W2-T4: Medicine and Public Health (Room: 4-153)
Chair: **Dr. Yi-Hsiang Hsu**, Harvard University
哈佛大學 醫學院 許益祥 博士

"Omics Era: Transcriptomics, Pathway and Signature Analyses to Predict Diseases"
Professor Tianhua Tim Niu (tn7b@cms.mail.virginia.edu)
Department of Psychiatry and Neurobehavioral Sciences, University of Virginia School of Medicine
弗吉尼亞大學 醫學院 精神醫學與神經行為科學系 牛天華 教授

"The Link between Bone and Energy Metabolisms. Genome-Wide Association Studies of Complex Traits in
the Framingham Study"
Dr. Yi-Hsiang (Sean) Hsu (yhhsu@hsph.harvard.edu)
Institute for Aging Research, Hebrew SeniorLife, Harvard Medical School
哈佛大學 醫學院 希伯來老化醫學研究中心 許益祥 博士

"Parental and Offspring Genome-Wide DNA Methylation Changes, Residential Petrochemical Exposure,

and Childhood Leukemia Risk"
Dr. Chen-Yu Liu (cliu@hsph.harvard.edu)
Research Fellow, Department of Environmental Health, Harvard School of Public Health
哈佛公共衛生學院 環境衛生系 劉貞佑 博士

"Finding Disease Related Modules in Co-expressed Protein Interaction Networks"
Professor Hsuan-Cheng Huang (hsuancheng@ym.edu.tw)
Institute of Biomedical Informatics, National Yang-Ming University
陽明大學 生物醫學資訊研究所 黃宣誠 教授

August 7th (Friday) 4:30 pm - 6:00 pm : Technical Session D2-W4-T4: C4I (Room: 4-145)
Chair: **Professor Kwang-Cheng Chen**, National Taiwan University
台灣大學 陳光禎 教授

"Autonomous Robot Team Formation and Cooperation"
Professor Shanchieh Jay Yang (jay.yang@rit.edu)
Department of Computer Engineering, Rochester Institute of Technology
羅徹斯特理工學院 計算機工程系 楊善傑 教授

"An Adaptive Reasoning and Learning Framework for Cognitive Radio Systems"
Professor Pao-Ann Hsiung (pahsiung@cs.ccu.edu.tw)
Department of Computer Science and Information Engineering, National Chung-Cheng University
中正大學 資訊工程系 熊博安 教授

"A Fast Time-to-Market SoC Design Platform"
Dr. Emerson Mingfu Hsiao (emerson@faraday-tech.com)
Director, Field Application and Marketing, Faraday Technology Corporation, Sunnyvale, California
智原科技 蕭明富 博士

August 7th (Friday) 7:00 pm - 9:00 pm : Post-Conference Dinner (by Invitation)
Hosted by **Dr. Hsin-Hsiung Chang** (hhchang@tecrosd.org)
Science and Technology Division, Taipei Economic and Cultural Representative Office in the U.S.
駐美國台北經濟文化代表處 科技組 組長 張新雄 博士

Abstracts and Biographies

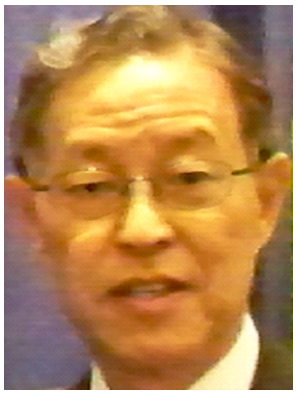
Welcome Dinner (By Invitation)

Hosted by

Kuo-Tung Yang (楊國棟 處長)

Director General, Taipei Economic and Cultural Office in Boston
99 Summer Street, Suite 801, Boston, Massachusetts 02110, USA
Tel: +1-617-737-2050, Fax: 1-617-737-1260
Email: teco@tecoboston.org

BIOGRAPHY



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Opening Speech

Conference Co-Chair

Lin-Wen Hu, PhD (胡玲文 博士)

Associate Director
Principal Research Scientist
MIT Nuclear Reactor Laboratory
138 Albany Street, Cambridge, Massachusetts 02139, USA
Tel: +1-617-258-5860, Fax: +1-617-253-7300
Email: lwhu@mit.edu

BIOGRAPHY

Lin-wen Hu (Nuc Eng PhD, 1996; MS, 1993; MIT; Nuc Eng MS, 1991; BS, 1989, National Tsing-Hua University) is the Associate Director for Research Development and Utilization at the MIT Nuclear Reactor Laboratory (NRL). She directs NRL's research program, irradiation services, and outreach activities and is responsible for the development, design, and safety reviews of major reactor experiments. Her research interests include fluid dynamics and heat transfer, computational fluid dynamics simulations, fission reactor design and safety analysis, and research reactor applications.

Dr. Hu holds a Senior Reactor Operator license for the 5MW MIT Research Reactor issued by the US Nuclear Regulatory Commission, and is a licensed Professional Engineer in the State of Massachusetts. Among other professional activities, she served as the Chairperson of the Isotope and Radiation Division of the American Nuclear Society (ANS) and recently as a member of the National Academies study committee on "State of the Science of Nuclear Medicine". The research projects she is currently working on include transport phenomena and two-phase heat transfer properties of nanoparticles colloids (nanofluids) and enhancement of boiling heat transfer with nanoparticle coatings funded by DOE's Infrastructure in Nuclear Innovations and Education (INIE) program, Electric Power Research Institute (EPRI), AREVA, ABB Corporate Research; and MIT Research reactor conversion feasibility study supported by DOE's Reduced Enrichment Research and Test Reactor (RERTR) program. Dr. Hu is also a Principal Investigator of the Advanced Test Reactor National Scientific User Facility (ATR-NSUF).

Dr. Hu is a member of the American Nuclear Society and American Society of Mechanical Engineers, and has authored more than 90 peer-reviewed papers and technical reports.

Opening Speech

Conference Co-Chair

Chin Pan, PhD (潘欽 院長)

Dean, College of Nuclear Science
Professor, Department of Engineering and system Science
Director, Energy and environmental Research Center
National Tsing Hua University
Hsinchu, Taiwan, Republic of China
Email: cpan@ess.nthu.edu.tw

BIOGRAPHY

Dr. Chin Pan is a professor of the Department of Engineering and System Science and the Dean of the College of Nuclear Science of the National Tsing Hua University (NTHU). Dr. Pan received his BS degree in nuclear engineering from National Tsing Hua University in 1979, MS and Ph.D degrees in nuclear engineering from University of Illinois at Urbana-Champaign (UIUC) in 1983 and 1985, respectively. After receiving his doctoral degree, Dr. Pan served as a visiting research assistant professor at UIUC before joining NTHU as an associate professor in 1986 and promoted to full professor in 1990. From August 1992 to August 1993, Dr. Pan conducted research and served as a Visiting Professor of the Department of Nuclear Engineering of UIUC with a fellowship from the National Science Council of Taiwan, ROC. In the summer of 1998, he conducted microchannel boiling studies in the Department of Engineering Science of the University of Oxford as an academic visitor with a visiting fellowship from Engineering and Physical Sciences Research Council, UK. In the next summer, he conducted researches on multidimensional modeling of two-phase flow in the Rensselaer Polytechnic Institutes as a visiting scholar with a fellowship from the National Science Council of Taiwan, ROC. He served as the Chairman of the Department of Engineering and System Science of NTHU from February, 2001 to January, 2004 and the director of the Center for Energy and Environmental Research from December 2003 to July 2008. He served as the chairman of the academic committee for joint projects of Atomic Energy Council and National Science Council from 2001 to 2005. He is now serving as the chairman of the Advisory Committee of Nuclear Safety in the Atomic Energy Council. Dr. Pan has been serving as the Dean of College of Nuclear Science since August, 2005.

Dr. Pan's research activities for the past two decades have been in the areas of two-phase flow, boiling heat transfer and energy engineering with a special focus on transition boiling, nucleate boiling near CHF, nuclear reactor thermalhydaulics, two-phase flow instability with or without nuclear coupling, two-phase natural circulation loops, microchannel two-phase flow, microchannel boiling, microchannel heat sink, microchannel reactor, and thermal-fluid transport in fuel cell systems, especially micro direct methanol fuel cells. He published a book in Chinese entitled "Boiling Heat Transfer and Two-phase Flow" in 2001. He

authored and co-authored about 60 SCI journal papers and 80 conference papers. He received a distinguished research award in 1998 and three excellent research awards earlier from the National Science Council of Taiwan, ROC. He also received an distinguished industry – academia collaboration award from the Ministry of Education of Taiwan, ROC in 2003.

Opening Speech

Guest Speaker

Lou-Chuang Lee, PhD (李羅權 博士)

Minister, National Science Council, Executive Yuan, Taiwan, Republic of China
No. 106, HoPing E. Road, Sec.2, Taipei 10622, Taiwan (R.O.C.)
Tel: +886-2-27377992, Fax: +886-2-27377566
Email: chr@nsc.gov.tw

BIOGRAPHY

Dr. Lee graduated from National Taiwan University and earned his Ph.D. in physics from the California Institute of Technology. From 1978 to 1995, he was a professor in physics department of University of Alaska. After returning to Taiwan, he became Dean of National Cheng Kung University's College of Science (1995-2001), President of the National Space Organization (2001-2004), President of the National Applied Research Lab. (2003-2006), President of the National Central University (2006-2008) and in May 2008 was appointed Minister of the National Science Council.

Opening Speech

Opening welcome and remarks on the world-wide interest in Neutron Scattering spectroscopy as a powerful tool for the energy related advanced materials and bio-materials research

EITC 2009 General Chair

Sow-Hsin Chen, PhD (陳守信 院士)

Professor, Department of Nuclear Science and Engineering
Massachusetts Institute of Technology
77 Massachusetts Avenue, 24-209A
Cambridge, Massachusetts 02139-4307 , USA
Tel: +1-617-253-3810, Fax: 1-617-258-8863
Email: sowhsin@mit.edu

BIOGRAPHY

Prof. Sow-Hsin Chen, a soft condensed matter physicist, is a professor of nuclear science and engineering at the MIT since 1968. Born in Taiwan, he received his BS in physics (National Taiwan University, 1956), MS in physics (National Tsing-Hua University, 1958), MS in nuclear science (University of Michigan, 1962), and Ph.D. in physics (McMaster University, Canada, 1964) under the Nobel Laureate, Prof. B. N. Brockhouse. Then, he was a postdoctoral fellow with Nobel Laureate, Prof. N. Bloembergen, at Harvard from 1967-8 before joining MIT.

An author with 5 books, and over 370 research articles in journals like *Nature*, *Science*, *PNAS*, *Physical Reviews*, *Physical Review Letters*, etc., and a Fellow of APS, AAAS and Neutron Scattering Society of America (NSSA), he has received many honors and awards including the Alexander von Humboldt US Senior Scientist Award from Germany (1987), Fellow of the Japan Society for Promotion of Science (1995), Career Achievement Award of MIT (2002), and the Distinguished Alumnus Award of National Tsing-Hua University (2006). He is an academician of the Academia Sinica of Taiwan since 2006. He is a recipient of the NSSA 2008 Clifford G. Shull Prize for his seminal contribution in science of supercooled interfacial water.

His main research area is in thermal neutron, synchrotron x-ray, and laser light spectroscopy of soft condensed matter. They include molecular dynamics of confined water in deeply supercooled states, in porous glasses, and near hydrophilic and hydrophobic surfaces such as those in proteins, DNAs and carbon nanotubes. Most recently, his group discovered the second low-temperature critical point of water. He is regarded as one of the foremost international experts on the dynamical properties of water, both in theory

and experiments. His work on the discovery of the second critical point of water was chosen by Prof. H. Eugene Stanley, a member of the US National Academy of Sciences and expert in phase transition of low-temperature water, as the most significant research in water in the "last 6 months" (Research Highlight section of *Nature*, December 8, 2005). He and his co-workers received the PNAS 2006 Cozzarelli Prize for the paper "The violation of the Stokes–Einstein relation in supercooled water" PNAS, 103, 12974-12978, for its "outstanding scientific excellence and originality".

Session D1-W1-T1: Emerging Energy Technologies

Session Organizer & Chair

Minking K. Chyu, PhD (邱民京 教授)

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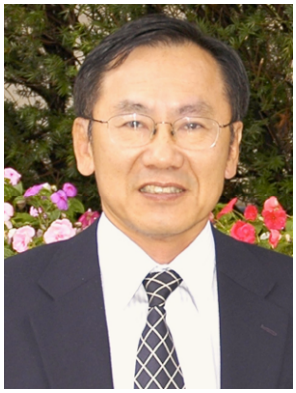
BIOGRAPHY



Dr. Minking K. Chyu is presently the Leighton Orr Chair Professor and Chairman of Mechanical Engineering and Materials Science Department at the University of Pittsburgh. He received his Ph.D. degree in Mechanical Engineering from the University of Minnesota in 1986. He was a faculty member at Carnegie Mellon University for 14 years before joining the University of Pittsburgh in 2000. His primary research activity lies in thermal issues relating to power and propulsion systems, which has been funded by several national turbine programs, e.g. HOST, IHPTET, and DOE-UTSR, and turbine industry, e.g. Pratt and Whitney, Siemens, and Solar Turbines. Professor Chyu is a recipient of NASA Certificates of Recognition for his contribution on space shuttle program, Air Force Summer Research Fellow, Department of Energy Oak Ridge Research Fellow, and DOE Advanced-Turbine-System Faculty Fellow. He is a Fellow of the American Society of Mechanical Engineers (ASME), Associate Fellow of American Institute of Aerospace and Aeronautics (AIAA), and a US delegate to the Scientific Council of the International Centre of Heat and Mass Transfer (ICHMT). He was named the Engineer of The Year by the ASME Pittsburgh Chapter in 2002. In 2007, he was elected as Institute-of-Advanced-Energy-System (IAES) Fellow by the National Energy Technology Laboratory (NETL), Department of Energy. He serves as an Associate Editor for the Journal of Heat Transfer, ASME, a Guest Editor for AIAA Journal of Propulsion and Power in Turbine Science and Technology, and an Advisory Board Member, International Journal of Fluid Machinery and Systems. He has published more than 200 technical papers in archive journals and conference proceedings.

Session D1-W1-T1: Emerging Energy Technologies

Opportunities and Challenges of Green Energy Industry in Taiwan

Hsin-Sen Chu, PhD (曲新生 博士)

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ABSTRACT

Taiwan is committed to building world-class green energy industries. As the Executive Yuan announced in April a blueprint for the Xusheng Project, Taiwan's green energy industry development program with reliable and long-term incentives now in place, the investment in green energy technologies will continue to rise.

Taiwan's solar PV and light-emitting diodes industries are well established and renowned for their competitiveness that has the bright commercial future. The program goes further, targeting the potential industries such as bio fuels, electric vehicles, energy information telecommunication, hydrogen fuel cells and wind power.

Strategically, Taiwan will strengthen in R&D for further technology improvements to create niche markets. We will take advantages of local well developed industries to intrinsically leverage the move of Green Energy Technology. For example, PV industry will focus on the techniques of CIGS and thin film where high efficiency and innovative application such as BIPV are the main targets to achieve. LED lighting technique will focus on the path towards intelligent human factor lighting. AC LED is one of the key researches in the future whereas standardization is urgently needed. Due to the intermittent nature of renewable energy, robust energy storage systems are also among the R&D deployment. Deploying Smart Grid/AMI via ICT, the strongest industry in Taiwan, can instantly realize the optimization of electricity consumption whilst stimulating economy. Taiwan has also invested on the technique of CCS as it can effectively capture and sequestrate CO2 in the long run.

In order to speed up the growth of Green Energy Industry, Taiwan is sincerely willing to collaborate with international community.

BIOGRAPHY

Dr. Hsin-Sen Chu was born in Hsinchu, Taiwan on June 12, 1952. He received B.S., M.S., and Ph.D. (1982) degrees from Taiwan National Cheng-kung University, all in mechanical engineering. He is the Executive Vice President of the Industrial Technology Research Institute (ITRI) in Taiwan, a non-profit R&D organization engaging in applied research and technical service. In over thirty five years ITRI has been dedicated to research and development and industrial services etc., and continued to assist the government in executing industrial technology policies and promoting industrial development by nourishing industrial technology capabilities.

He came to ITRI in 2001 and held the position of General Director of Energy and Resource Laboratories for three years (2001-2004) before moving to the current post. He was a specialist in heat transfer and micro-cooling technology, and also was the project leader to develop the first kilowatt-level PEM fuel cell co-generation system in Taiwan in 2002. He has worked to establish fuel cell R&D framework by founding a Testing Center, organizing Taiwan Fuel Cells Partnership and PEM Fuel Cell Technology Forum.

Recently ten years, he has been paying most efforts to study energy related technologies and policies, while also helping government with this field on regulations, education and industrial incentives. He has been an active advocate on environmental issues, many of which are related to energy use.

Prior to ITRI, Dr. Chu was for seventeen years at the National Chiao-tung University, where he taught and held various positions including Vice Dean of the Engineering School, Director of the High Efficiency Energy Technology Research Center and Director of Mechanical Manufacturing & Heat Flow Research Center. He was a visiting scholar at the University of California (Berkeley) during 1985-86. He was a five-time recipient of National Science Council (NSC) research award and winner of the prestigious TECO Science & Technology Award in 2004, and listed as the Fellow of the American Society of Mechanical Engineers (ASME, June 2008).

Session D1-W1-T1: Emerging Energy Technologies

Two Phase Flow and Heat Transfer in Microchannels for Energy Applications

Chin Pan, PhD (潘欽 院長)

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Professor, Department of Engineering and system Science
Director, Energy and environmental Research Center
National Tsing Hua University
Hsinchu, Taiwan, Republic of China
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ABSTRACT

Two-phase flow and heat transfer in microchannels are of significant fundamental interest and diversified energy applications, such as micro direct methanol fuel cell (DMFC) and microchannel reformer. Convective boiling in microchannel also has great potential serving as a heat sink for the cooling of next generation microelectronics. For the past decade we have been conducting flow boiling in microchannel investigating bubble dynamics, eruptive boiling, two-phase flow pattern, heat transfer capability and two-phase flow instability. Using high speed video camera, it is shown that eruptive boiling is a form of rapid bubble nucleation, after which the bubble merges with a slug bubble downstream in a short distance or evolves to a slug bubble. We also first show that the slug bubble grows exponentially and propose a simple model to explain the phenomenon. We presented the stability map on the plane of subcooling number versus phase change number and it is demonstrated that using diverging microchannels with artificial cavities may suppress effectively the two-phase flow instability. Two-phase flow with bubbles generated by chemical reactions in a microchannels has also been studying to explore bubble dynamics, evolution of two-phase flow pattern, flow pattern transition instability. The results reveal that a diverging design may help the removal of bubbles in micro fuel channel in the anode of a micro DMFC and, more importantly, the diverging cross section design promotes chemical reactions in the microchannel, which may have significant implication for the design of a microchannel reactor. Condensation of steam in a microchannel is also of significant interest for the cathode design of a fuel cell. We have been exploring the evolution of two-phase flow pattern in microchannels with different designs of channel cross section.

BIOGRAPHY

Dr. Chin Pan is a professor of the Department of Engineering and System Science and the Dean of the College of Nuclear Science of the National Tsing Hua University (NTHU). Dr. Pan received his BS degree in nuclear engineering from National Tsing Hua University in 1979, MS and Ph.D degrees in nuclear engineering from University of Illinois at Urbana-Champaign (UIUC) in 1983 and 1985, respectively. After

receiving his doctoral degree, Dr. Pan served as a visiting research assistant professor at UIUC before joining NTHU as an associate professor in 1986 and promoted to full professor in 1990. From August 1992 to August 1993, Dr. Pan conducted research and served as a Visiting Professor of the Department of Nuclear Engineering of UIUC with a fellowship from the National Science Council of Taiwan, ROC. In the summer of 1998, he conducted microchannel boiling studies in the Department of Engineering Science of the University of Oxford as an academic visitor with a visiting fellowship from Engineering and Physical Sciences Research Council, UK. In the next summer, he conducted researches on multidimensional modeling of two-phase flow in the Rensselaer Polytechnic Institutes as a visiting scholar with a fellowship from the National Science Council of Taiwan, ROC. He served as the Chairman of the Department of Engineering and System Science of NTHU from February, 2001 to January, 2004 and the director of the Center for Energy and Environmental Research from December 2003 to July 2008. He served as the chairman of the academic committee for joint projects of Atomic Energy Council and National Science Council from 2001 to 2005. He is now serving as the chairman of the Advisory Committee of Nuclear Safety in the Atomic Energy Council. Dr. Pan has been serving as the Dean of College of Nuclear Science since August, 2005.

Dr. Pan's research activities for the past two decades have been in the areas of two-phase flow, boiling heat transfer and energy engineering with a special focus on transition boiling, nucleate boiling near CHF, nuclear reactor thermalhydaulics, two-phase flow instability with or without nuclear coupling, two-phase natural circulation loops, microchannel two-phase flow, microchannel boiling, microchannel heat sink, microchannel reactor, and thermal-fluid transport in fuel cell systems, especially micro direct methanol fuel cells. He published a book in Chinese entitled "Boiling Heat Transfer and Two-phase Flow" in 2001. He authored and co-authored about 60 SCI journal papers and 80 conference papers. He received a distinguished research award in 1998 and three excellent research awards earlier from the National Science Council of Taiwan, ROC. He also received an distinguished industry – academia collaboration award from the Ministry of Education of Taiwan, ROC in 2003.

Session D1-W1-T1: Emerging Energy Technologies

Multiscale Modeling of Atomization and Spray

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ABSTRACT

Liquid fuels make up a large portion of modern energy supply. Many modern combustion systems utilize liquid fuels, including gas turbines, automotive and aircraft engines, liquid-fueled rockets, and liquid-fuels furnaces. In 2007, oil covered more than 45% of the total primary energy supply. Liquid fuels are typically injected as a spray into combustion chamber. The injected liquid jet undergoes a series of dynamic processes leading to primary and secondary atomization, evaporation and ultimately combustion. Combustion efficiency, stabilities, as well as control of combustion emission, are all directly linked to the liquid-fuel atomization/spray evaporation processes. Most sprays originate from turbulent liquid nozzles. A new approach to account for turbulence effects and finite thermal conductivity within atomizing droplets of an evaporating spray is presented in this talk. Liquid turbulence level within the injector is accounted for to model primary atomization. The finite conductivity model is based on the two-temperature film theory, in which the turbulence characteristics of the droplet are used to estimate the effective thermal diffusivity for the liquid-side film thickness. Both one-way and two-way coupling calculations were performed to investigate the performance of this model against the published experimental data. We will also present recent developments in pulsating injector feed-line for investigating primary atomization instabilities, as well as swirl-swirl multiscale injector atomization modelling.

BIOGRAPHY

Dr. Chien-Pin Chen received his B. S. degree from National Taiwan University in 1978, and his Ph.D. from Michigan State University, U.S.A. in 1983, both in Chemical Engineering. He was a Research Fellow at McMaster University, Canada in 1984, and was a Research Scientist at NASA-Marshall Space Flight Center, U.S.A., from 1984-1986. He is currently the Graduate Director and Professor of Chemical Engineering at the University of Alabama in Huntsville, U.S.A. His awards include *University of Alabama Foundation Award for Outstanding Research*, American Institute of Aeronautics and Aerospace *Outstanding Young Aerospace Engineer of the Year award*, and NASA *Group Achievement Award*, and *National Research Council* Resident Researcher award. He has conducted research projects including multiphase flows, spray combustion, turbulence modeling, computational fluid dynamics, and most recently, Lab-on-Chip and micro process engineering. He has been Principle Investigator of more than

twenty NASA, Air Force, U. S. Army Strategic Defense Commend, Cray Research Inc., Rockwell Int. contracts/grants, and is author of more than ninety technical publications.

Session D1-W2-T1: Analysis in Genetic Studies

Session Organizer & Chair

Jung-Ying Tzeng, PhD (曾仲瑩 教授)

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Email: tzeng@stat.ncsu.edu

BIOGRAPHY

Dr. Jung-Ying Tzeng received her bachelor degree in public health (major in epidemiology) and a master degree in biostatistics from the National Taiwan University, Taipei Taiwan, in 1994 and 1997 respectively. She earned her Ph.D. degree in statistics from Carnegie Mellon University, Pittsburgh PA., in 2003. Her Ph.D. research was under the supervision of Dr. Kathryn Roeder and her dissertation received the Umesh Gavasakar Thesis Award.

In 2003, she joined the Department of Statistics and the Bioinformatics Research Center at the North Carolina State University, Raleigh NC, as an assistant professor. Her research area is in statistical genetics, including methods for studying susceptibility genes for complex traits, association analysis, haplotype-based analysis, and multiple testing problems. She is currently the PI of an NSF grant "Haplotype-based Association Modeling for Whole-Genome Scan and Candidate Gene Studies" and the PI of an NIH R01 grant "Genome-wide Haplotype Association Analysis in Mental Disorders" for developing statistical methods for multismarker association modeling. She is an associate editor for Biometrics, and has served as an ad hoc reviewer for several NIH study sections.

Dr. Tzeng is currently a member of the American Statistical Association and the American Society of Human Genetics.

Session D1-W2-T1: Analysis in Genetic Studies

A Forest-Based Approach in Genomewide Association Study

Ching-Ti Liu, PhD (柳清地 教授)

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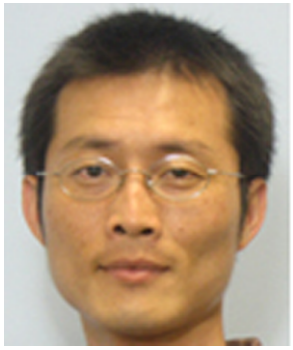
ABSTRACT

Multiple genes, gene-by-gene interactions, and gene-by-environment interactions are believed to underlie most complex diseases. However, such interactions are difficult to identify. While there have been recent successes in identifying genetic variants for complex diseases, it still remains difficult to identify gene-gene interactions. To overcome this difficulty, we propose a forest-based approach and a concept of variable importance. The proposed approach is demonstrated by simulation study for its validity and illustrated by a real data analysis for its use. Analyses of both real data and simulated data based on published genetic models show the effectiveness of our approach. This is joint work with Drs. Xiang Chen, Meizuo Zhang and Heping Zhang

BIOGRAPHY



Dr. Ching-Ti Liu received his Ph.D. degree in Statistics from University of California, Los Angeles on September 2006. Under the supervision of Dr. Ker-Chau Li, his Ph.D. research has focused on the study of transcriptional regulation of protein complexes in Yeast. He then carried out his postdoctoral training with Dr. Heping Zhang at Yale University and started to work on statistical genetics.

In 2008, he joined the Department of Biostatistics, School of Public Health at the Boston University, Boston MA, as an assistant professor. His research interest mainly focuses on the development of statistical and computational approaches for genetics/genomics and bioinformatics studies. Recently, he has been involved in the development of computational approach to identify haplotype interactions and statistical methods to utilize multiple phenotypes. In collaboration work, he has been involved in the age-related bone loss genetic study and diabetes metabolism genetic study.

Dr. Liu is currently a member of the American Statistical Association, International Genetic Epidemiology Society and Institute of Mathematical Statistics.

Session D1-W2-T1: Analysis in Genetic Studies

A Combined Approach Using Case-Control and Family Data with Consideration of Population Stratification

Ren-Hua Chung, PhD (鍾仁華 教授)

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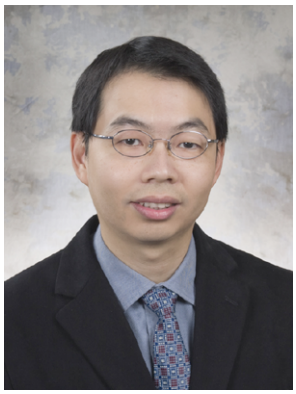
ABSTRACT

Family-based and population-based association analyses are two commonly used designs for complex disease-gene mapping. With datasets for genome-wide association studies from different consortia available, statistical power can be increased if the datasets can be combined. This requires a method that can accommodate the different study designs. Moreover, population stratification can cause spurious association for population-based association analysis. For family-based association analysis that infers missing parental genotypes based on the allele frequency estimated in the entire sample, the parental mating-type probabilities may not be correctly estimated in the presence of population stratification. Therefore, the approach that can combine family and case-control data should also properly account for population stratification. While several methods have been proposed to accommodate family and case-control data, they all have restrictions. Most of them require a homogeneous sample, which is often violated in the combining of different consortia. One of the methods, FamCC, can account for population stratification and use general family structures but requires parental data, which are often unavailable for late-onset diseases. We propose CAPL, extended from the family-based test APL, to combine family and case-control data. CAPL can accommodate case-control data and families with multiple affected siblings and missing parents. Population stratification is considered in CAPL using the Ward clustering algorithm. We used simulations to demonstrate that CAPL is a valid test either in a homogeneous population or in the presence of population stratification. We also showed that CAPL can have more power than other methods that combine family and case-control data.

BIOGRAPHY



Dr. Ren-Hua Chung was born in Hualien County in Taiwan on September 21, 1978. He received his B.S. degree in computer science from National Chiao-Tung University, Hsin-Chu Taiwan, in 2000. He completed his M.S. degree in computer science from University of California at Davis, Davis CA, in 2003. He earned his Ph.D. degree in bioinformatics from North Carolina State University, Raleigh NC, in 2007.

From January 2007 to March 2008, he worked as a postdoctoral research associate at the Center for Human Genetics at Duke University, Durham NC. In April 2008, he joined the Miami Institute for Human Genomics at University of Miami, Miami FL, as a research assistant professor. His research interests focus on method development for complex disease gene-mapping, particularly for family-based association analysis.

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

Session D1-W2-T1: Analysis in Genetic Studies

Methods for Detecting Interactions between Genetic Polymorphisms and Prenatal Environment Exposure with a Mother-Child Design

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ABSTRACT

Prenatal exposures such as polycyclic aromatic hydrocarbons (PAH) and early postnatal environmental exposures are of particular concern because of the heightened susceptibility of the fetus and infant to diverse environmental pollutants. Marked inter-individual variation in response to the same level of exposure was observed in both mothers and their newborns, indicating susceptibility might be due to genetic factors. With the mother-child pair design, existing methods developed for parent-child trio data or random sample data are either not applicable or not designed to optimally use the information. To take full advantage of this unique design which provides partial information on genetic transmission and has both maternal and newborn outcome status collected, we developed a likelihood-based method that uses both the maternal and the newborn information together and jointly models gene-environment interactions on maternal and newborn outcomes. Through intensive simulation studies, the proposed method has demonstrated much improved power in detecting gene-environment interactions. The application on a real mother-child pair data from a study conducted in Krakow, Poland suggested four significant gene-environment interactions after multiple comparisons adjustment.

BIOGRAPHY

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

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

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

Session D1-W2-T1: Analysis in Genetic Studies

Kernel Machine Approaches for the Analysis of Genome Wide Association Studies

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ABSTRACT

Advances in high-throughput genotyping have culminated in the development of genome wide association studies (GWAS). With the goal of identifying gene variants, epistatic effects, and gene-environment interactions that are related to a clinical phenotype, GWAS hold the potential for comprehensive achievement of many important biological, medical, and public health goals that have eluded scientific efforts for decades. Statistical analysis constitutes an important step in achieving such goals. However, the high-dimensionality of the feature space, the limited availability of samples, and the complex interactions between genetic features impose a grand challenge in analyzing GWAS data. To overcome such difficulties, we introduce a flexible non-parametric modeling framework for high-dimensional genetic data. Specifically, we consider the use of kernel machine regression and propose efficient procedures for modeling and making inference in this setting. The advantages of our approach will be made evident via theoretical and empirical investigations as well as data applications.

BIOGRAPHY

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

He will join the Department of Biostatistics at the University of North Carolina, Chapel Hill, NC as an assistant professor this fall. His current research focuses on the development of statistical methods for high-dimensional genomic data with an emphasis on variable selection and statistical learning approaches. Previously, he has completed internships at the National Institute of Dental and Craniofacial Research and the National Human Genome Research Institute at NIH.

Dr. Wu's is a member of the American Statistical Association (ASA), the Eastern North American Region (ENAR) of the International Biometrics Society, the International Society for Computational Biology, the

Institute of Mathematical Statistics, the International Chinese Statistical Association (ICSA), and the Mu Sigma Rho National Statistics Honorary Society. His research has received awards from the ASA Section on Statistical Computing and ASA Section on Graphical Statistics, ENAR, and the ICSA.

Session D1-W3-T1: Nanomaterial

Session Organizer & Chair

Alex K.-Y. Jen, PhD (任廣禹 教授)

MSE Chair
Boeing/Johnson Chair Professor of Materials Science & Engineering
Director, Institute of Advanced Materials & Technology
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BIOGRAPHY

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Session D1-W3-T1: Nanomaterial

Novel Optical Properties of Semiconductor Nanocomposites

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ABSTRACT

Two intriguing properties of novel nanocomposite materials based on semiconductors will be presented. Firstly, it is shown that the enhancement of band gap emission and the suppression of defect loss can be achieved simultaneously under a suitable design of semiconductor and metal compsites. Defect radiation has been always considered as the most important loss for an emitter based on band gap emission. Here, a novel approach is proposed which goes against this conventional wisdom. Based on the resonance effect between the surface plasmon of metal nanoparticles and defect emission, it is possible to convert the useless defect radiation to the useful excitonic emission with a giant enhancement factor. Through the transfer of the energetic electrons excited by surface plasmon from metal nanoparticles to the conduction band of the emitter, the band gap emission can be greatly enhanced, w hile the defect emission can be suppressed to noise level. This new mechanism should be very useful for the design of highly efficient solid state emitters.

Next, an approach of controlling liquid crystals using a laser beam without external bias is reported. In our design, in addition to liquid crystals, a patterned semiconductor was also included. It is discovered that the average pretilt angle of liquid crystals can be controlled by adjusting excitation power, and the relationship was found to follow the predicted photovoltaic effect. Besides, the photogenerated electric field was found to have both perpendicular and horizontal components, which is very useful to control the orientation of liquid crystals to an arbitrary direction. Optical switch devices can be readily designed using this approach. This result opens a new avenue for the investigation of the interplay between semiconductor and liquid crystal.

BIOGRAPHY

EDUCATION

1972-1976 B. S. in Physics, National Tsin-Hua University, Taiwan
1980-1984 Ph. D. in Physics, Purdue University, USA

WORK EXPERIENCE

1991-now	Professor of Department of Physics, National Taiwan University
1986-1991	Associate Professor of Department of Physics, National Taiwan University
1984-1986	Post Doctoral Member of Division of Applied Science at Harvard University, USA

HONORS & AWARDS

Outstanding research award of National Science Council of Republic of China (1994, 1995, 1997)
Sun Yet-Sen Academic Prize (1994)
National Lecture Chair of Ministry of Education of Republic of China (2001)
Fellow of Chinese Physical Society (2002)
Fellow of World Innovation Foundation (2002)
Distinguished professor and chair professor of National Taiwan University (2006-2007).

PATENTS

Crystalline SiCN with a direct optical band gap of 3.8eV, U.S. Patent 53935705, Aug. 10,1999~2014

PUBLICATIONS

317 Scientific papers have been published in different scientific journals.

PROFESSIONAL MEMBERSHIP

Taiwan
Chinese Physical Society, Material Research Society
USA
American Physical Society

Session D1-W3-T1: Nanomaterial

One-dimensional Nanomaterials for Energy Applications

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ABSTRACT

The emerging of the nanotechnology arrives just in time when the issue of energy crisis and global climate change become a major issue. In the past people were sure about the future shortage of fossil fuels but skeptical about the climate change. Nowadays, we're definitely sure about global warming and realized that more fossil resources might even jeopardize the climate further. Renewable energies are the answers to both issues. However, most of the renewable energies are either premature or too high in cost for applications. Nanotechnology provides great opportunities for the renewable energy researches. Atomic scale manipulation and engineering at the interface, surface of the components open up devices such as next-generation photovoltaic cells, super-capacitors, hydrogen storage materials, high efficiency thermal electric converter, low cost and long lifetime fuel cells, next generation batteries, etc. This talk will overview our effort in the synthesis of one-dimensional (1-D) nanomaterials and their potential application in energy applications such as fuel cells, supercapacitors, and photovoltaics. Key ideas, their niches and major holdbacks will be presented to initiate discussions. The project is supported by National Science Council (97-2120-M -001-009) and US AFOSR-AOARD.

Key words: nanomaterials, fuel cell, supercapacitor, photovoltaic, plasmonic

BIOGRAPHY

EDUCATION
Ph.D. and M.S. in Applied Science, Harvard University, (1984-1989)
B.S. in Electrical Engineering, National Taiwan University, Taiwan (1977-1981)

WORK EXPERIENCE
Institute of Atomic & Molecular Sciences, Academia Sinica (1993-present)
Center for Condensed Matter Sciences, National Taiwan University (joint appointment) (2002-present)
General Electric Research and Development Center, Schenectady, NY (1990-1993)

HONORS & AWARDS
2008 Outstanding Scholar Awards of the Foundation for the
2005 Outstanding Research Award, National Science Council, Taiwan

PATENTS
5 U.S. Patents; 5 Taiwan Patents

PUBLICATIONS
232 Scientific papers have been published in different scientific journals; 4 book chapters.

PROFESSIONAL MEMBERSHIP
Materials Research Society, Electrochemical Society, American Vacuum Society.

Session D1-W3-T1: Nanomaterial

Microreactor-Assisted Nano Deposition Process

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ABSTRACT

Nanostructured thin films were deposited by microreactor-assisted chemical processes. This technique uses continuous flow microreactors for the synthesis and deposition of nanomaterials. In synthesis, microreactor technology offers large surface-area-to-volume ratios within microchannel structures to accelerate heat and mass transport. This accelerated transport allows for rapid changes in reaction temperatures and concentrations leading to more uniform heating and mixing in the deposition process. Consequently, microreactors have been demonstrated to yield dramatic enhancements in controlling the quantum dot size distributions, thereby minimizing particle size variability. The possibility of synthesizing nanomaterials in the required volumes at the point-of-application eliminates the need to store and transport potentially hazardous materials, while providing new opportunities for tailoring novel nanostructures and nanoshaped features. Microreactors have been found to radically improve cycle times and yields associated with the production of a broad range of materials including both inorganic and organic materials that cover a variety of applications such as dendrimers, functionalized metal nanoclusters, metal oxide semiconductor nanoparticles. In particular, we have used microreactors to dispense reactant streams directly onto moving or stationary substrates to yield nanostructured thin films. Results-to-date demonstrate the possibility to control the reacting flux including small intermediate-reaction molecules, macromolecules, nanoclusters, nanoparticlse, and structured assemble of nanoparticles directly after synthesis. These results also suggest the possibility of producing many types of nanostructured films using low cost solution chemistry.

This work is supported by the National Science Foundation's Process and Reaction Engineering program under a CAREER grant # CBET-0654434.

BIOGRAPHY

Chih-hung (Alex) Chang was born in Taipei, Taiwan 1969. He received a B.S. degree from the Department of Chemical Engineering, National Taiwan University in June 1991. He received his PhD degree in chemical engineering from University of Florida, Gainesville Florida in December 1999.

He did a research project to study deposition of thin film platinum on titanium substrates using electrochemical methods with Prof. Shi-Chern Yen as his undergraduate thesis. He was awarded a scholarship from the National Science Council for this research activity. He served in Taiwanese Army as a second lieutenant from 1991 till 1993. He worked for Nan-Ya Plastics Co. for one year as a research engineer from 1993 to 1994. He received a graduate fellowship from the Department of Chemical Engineering, University of Florida (UF), and started the graduate program in August 1994. His dissertation research concerned the development of a manufacturing process for the growth of thin-film photovoltaic (PV) cells using rapid thermal processing (RTP) under Prof. Timothy J. Anderson's guidance. He joined Oregon State University in January, 2000. He is currently an associate professor in the School of Chemical, Biological, and Environmental Engineering. He was a visiting professor in the Materials Science and Engineering Department at National Taiwan University from April 2008 till September 2008 sponsored by the National Science Council of Taiwan.

Prof. Chang is a member of a number of professional societies including American Institute of Chemical Engineers, The Electrochemical Society, American Vacuum Society, Institute of Electrical and Electronics Engineers, American Chemical Society, Material Research Society, American Association for the Advancement of Science, Microscopy Society of American, and Society of Information Display. He is a SHARP Labs of America scholar and a recipient of AVS Graduate Research award, National Science Foundation's CAREER award, and awardees of W.M. Keck Foundation. His group has studied solution based thin film deposition processes, ink jet printing, microreaction technology, and X-ray absorption fine

Session D1-W4-T1: Baseband System-on-Chip

Session Organizer & Chair

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BIOGRAPHY

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

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

Dr. Ma's research interests include communications system design, baseband signal processing, and low power digital ASIC implementations for communications SoC. His group is working on the system design, signal processing algorithm development, and SoC implementation for advanced communications systems such as multi-user mobile MIMO communications, closed-loop MU/MIMO communications, and cognitive radio. He has published 8 journal and 24 conferences papers, and 2 US patents and other international patents. He also has two cases of technology transfer to the industries.

Session D1-W4-T1: Baseband System-on-Chip

The Sandbridge Sandblaster SB3500 Low Power SoC Implementation

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ABSTRACT

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BIOGRAPHY

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Session D1-W4-T1: Baseband System-on-Chip

A Baseband Testbed for Multiuser Mobile MIMO/OFDMA Communications

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ABSTRACT

In this presentation, a configurable and power efficient multiuser MIMO-OFDMA baseband processor for mobile communications is proposed. To solve the carrier frequency offset (CFO) problem in multiuser transmission, an inter-carrier interference-based (ICI-cancellation-based) CFO estimator is implemented based on the proposed search criterion of minimum signal-to- interference-noise (SINR) ratio. Compared to state-of-the-art methods, the mean-square-error (MSE) of the proposed CFO estimator can be reduced to almost 1/100. Moreover, the authors propose an efficient architecture that saves 78% of the hardware complexity by employing Taylor series expansion for ICI/multiple-access interference (MAI) cancellation. Meanwhile, a 2D linear channel estimator assists the CFO estimator and tracks the time-variant multipath channel. Two kinds of MIMO detector, vertical Bell Laboratory layered space-time (V-BLAST) and V-BLAST with maximum likelihood (V-ML), are adopted to minimize output latency and achieve the best ML bit-error rate (BER) performance. An ASIC fabricated by 0.13 μm 1P8M CMOS technology is implemented with the best normalized power efficiency of 2.31 Mbps/mW compared to existing approaches and less than 1.5 dB implementation loss. In addition, the whole transceiver is integrated and verified by a system-on-chip (SoC) platform to demonstrate its efficacy.

BIOGRAPHY

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

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

Dr. Ma's research interests include communications system design, baseband signal processing, and low power digital ASIC implementations for communications SoC. His group is working on the system design,

signal processing algorithm development, and SoC implementation for advanced communications systems such as multi-user mobile MIMO communications, closed-loop MU/MIMO communications, and cognitive radio. He has published 8 journal and 24 conferences papers, and 2 US patents and other international patents. He also has two cases of technology transfer to the industries.

Session D1-W4-T1: Baseband System-on-Chip

Cognitive Radio Networks

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ABSTRACT

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BIOGRAPHY

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Session D1-W1-T2: Energy Technologies

Session Organizer & Chair

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BIOGRAPHY

Dr. Chin Pan is a professor of the Department of Engineering and System Science and the Dean of the College of Nuclear Science of the National Tsing Hua University (NTHU). Dr. Pan received his BS degree in nuclear engineering from National Tsing Hua University in 1979, MS and Ph.D degrees in nuclear engineering from University of Illinois at Urbana-Champaign (UIUC) in 1983 and 1985, respectively. After receiving his doctoral degree, Dr. Pan served as a visiting research assistant professor at UIUC before joining NTHU as an associate professor in 1986 and promoted to full professor in 1990. From August 1992 to August 1993, Dr. Pan conducted research and served as a Visiting Professor of the Department of Nuclear Engineering of UIUC with a fellowship from the National Science Council of Taiwan, ROC. In the summer of 1998, he conducted microchannel boiling studies in the Department of Engineering Science of the University of Oxford as an academic visitor with a visiting fellowship from Engineering and Physical Sciences Research Council, UK. In the next summer, he conducted researches on multidimensional modeling of two-phase flow in the Rensselaer Polytechnic Institutes as a visiting scholar with a fellowship from the National Science Council of Taiwan, ROC. He served as the Chairman of the Department of Engineering and System Science of NTHU from February, 2001 to January, 2004 and the director of the Center for Energy and Environmental Research from December 2003 to July 2008. He served as the chairman of the academic committee for joint projects of Atomic Energy Council and National Science Council from 2001 to 2005. He is now serving as the chairman of the Advisory Committee of Nuclear Safety in the Atomic Energy Council. Dr. Pan has been serving as the Dean of College of Nuclear Science since August, 2005.

Dr. Pan's research activities for the past two decades have been in the areas of two-phase flow, boiling heat transfer and energy engineering with a special focus on transition boiling, nucleate boiling near CHF, nuclear reactor thermalhydaulics, two-phase flow instability with or without nuclear coupling, two-phase natural circulation loops, microchannel two-phase flow, microchannel boiling, microchannel heat sink, microchannel reactor, and thermal-fluid transport in fuel cell systems, especially micro direct methanol fuel cells. He published a book in Chinese entitled "Boiling Heat Transfer and Two-phase Flow" in 2001. He

authored and co-authored about 60 SCI journal papers and 80 conference papers. He received a distinguished research award in 1998 and three excellent research awards earlier from the National Science Council of Taiwan, ROC. He also received an distinguished industry – academia collaboration award from the Ministry of Education of Taiwan, ROC in 2003.

Session D1-W1-T2: Energy Technologies

Carbon Dioxide Capture and Sequestration

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ABSTRACT

General scientific community consensus agrees that there is a link between global climate change and atmospheric concentrations of carbon dioxide. Studies have shown a correlation between a rise in atmospheric CO_2 and increasing mean global temperature since the advent of the industrial era. Worldwide CO_2 emissions from human activity have increased from an insignificant level two centuries ago to more than 33 billion tons today. The U.S. Energy Information Administration predicts that, if no action is taken, the United States will emit approximately 6,850 million metric tons of CO_2 by 2030. To decrease the impact of CO_2 on global climate, several strategies are under development that will potentially remove CO_2 from the atmosphere or decrease CO_2 emissions.

Principle strategies for carbon management include: (i) increasing the efficiency of energy conversion; (ii) using low-carbon or carbon-free energy sources; and (iii) capturing and sequestering CO_2 emissions. The latter strategy termed ³ CO_2 sequestration² permits continued use of fossil fuels for the generation of electric power while ensuring CO_2 emission reductions, and has gained increased attention in recent years.

NETL¹s primary Carbon Sequestration research and development objectives are: (1) lowering the cost and energy penalty associated with CO_2 capture from large point sources; and (2) improving the understanding of factors affecting CO_2 storage permanence, capacity, and safety in geologic formations and terrestrial ecosystems. Carbon capture and sequestration begins with the separation and capture of CO_2 from power plant flue gas and other stationary CO_2 sources. At present, this process is costly and energy intensive, accounting for the majority of the cost of sequestration. However, analysis shows the potential for cost reductions of 30 to 45 percent for CO_2 capture. Post-combustion, pre-combustion, and oxy-combustion capture systems being developed are expected to be capable of capturing more than 90 percent of flue gas CO_2.

The next step is to sequester (store) the CO_2. The primary means for carbon storage are injecting CO_2 into geologic formations or using terrestrial applications. Geologic sequestration involves taking the CO_2 that has been captured from power plants and other stationary sources and storing it in deep underground geologic formations in such a way that CO_2 will remain permanently stored. Geologic formations such as oil and gas reservoirs, unmineable coal seams, basalt formations, organic rich shale and underground saline formations are potential options for storing CO_2. This presentation will begin with an overview of the NETL in-house research efforts in CO_2 capture/sequestration and selected technologies will be discussed.

BIOGRAPHY

Dr. Yee Soong is presently a Research Group Leader within the Geosciences Division under Office of Research and Development, National Energy Technology Laboratory, Department of Energy. He received his BS in Chemical Engineering from National Cheng Kung University in 1978 and his MS in Chemical Engineering from Cleveland State University in 1982. He received his Ph.D. in Chemical Engineering from University of Pittsburgh in 1986. Dr. Soong has worked at NETL since 1986. Over that span, he has published 70 journal articles, 4 U.S. patents, and 3 pending patents. His research areas include syngas catalysis, reaction kinetics, reactor engineering, hydrodynamics, combustion, computer simulation, solid-solid separations, nanoparticles, enhanced oil recovery, and CO_2 capture and CO_2 sequestration.

Session D1-W1-T2: Energy Technologies

Coal Gasification and Its Applications to Clean Energy

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ABSTRACT

With the potential of global warming looming, employing clean technology to generate energy and power with low carbon emission has become one of the most important issues discussed by the general public, various industries, and state and federal legislators. The situation has been further compounded by the volatility in international gas/oil prices and the uncertainty in sustainable fuel and energy supplies. Therefore, using renewable, alternative, and diversified fuel sources has become an important issue. Considering a large portion of emissions coming from existing coal power plants, we should assume the responsibility of using coal cleanly with minimum environmental impact. This presentation focuses on reviewing and comparing the current coal utilization technologies including (a) Coal Fired Pressurized Fluidized Combustion (PFBC) (b) Traditional and Super-critical Pulverized Coal Power Plants (c) Integrated Gasification Combined Cycle (IGCC) (d) Mild Air-blown Gasification Integrated Combined Cycle (MaGIC), and (e) Coal-Biomass Co-gasification Center. Advantages and disadvantages of each method for employing carbon sequestration technologies are assessed as well as the energy efficiency, emissions, and impact of each method on the environment.

BIOGRAPHY

Professor Ting Wang currently is the Jack & Reba Matthey Endowed Chair for Energy Research and Director, Energy Conversion and Conservation Center at the University of New Orleans. He has been involved in energy conservation and power generation in full spectrum for the past 29 years. He is an experimentalist with significant Computational Fluid Dynamics (CFD) experience. In the area of power generation, his specialties lie in gasturbine power generation with applications on combined power generation, co-generation, integrated gasification combined cycle (IGCC), mild gasification (MaGIC), distributed generation, and micro-turbine applications. He has conducted both fundamental and applied research with funding from U.S. governmental agencies and industries. Professor Wang is an ASME Fellow and a member of American Institute of Aerospace and Aeronautics (AIAA). Currently, he serves as the Chair of the Coal, Biomass, and Alternative Fuels Committee and a member of the ASME Gas Turbine Heat Transfer Committee. He has published over 200 research papers and reports and was the recipient of the ASME George Westinghouse Silver Medal for his contributions to the power in general. He was appointed by former Louisiana Governor ³Mike² Foster to serve as a member of the Comprehensive Energy

Policy Advisory Commission. In 2009, he received the Outstanding Teaching Award at the University of New Orleans.

Session D1-W1-T2: Energy Technologies

Carbon Capture Technology which Can Reduce Raging Sand Storm

H. Bruce Li – President/CTO (李曉遠 博士)
Peter C. Mei – CEO (梅家駒)

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ABSTRACT

Carbon dioxide in power plant flue gas can easily be captured as Sodium Bicarbonate via Solvay process. Glass sheets can be made using only solar reflective heating under vacuum on properly mixed of sand, sodium bicarbonate and small amount of lime stone. High purity carbon dioxide so obtained can subsequently liquidated. Thin glass sheet can be used to cover deserted area for water conservation as well as reducing raging sand storms.

BIOGRAPHY

H. Bruce Li, PhD, P.E. – Founder/President/CTO

Dr. H. Bruce Li currently serves as the President and CTO of 21-Century Silicon, Inc., a manufacturer of Solar Grade Silicon of 99.9999% purity to replace Siemens Process Silicon which is in great shortage since 2005. Dr. Li is also the Founder and Technology Provider for GhG SaviorTech which addresses Carbon Capture challenge with major emphasis on profit producing on careful cash-flow planning.

Formerly Dr. Li has 16 years with Texas Instruments. From 1975 to 1978, when he was with TI's Central Research Laboratories, he invented and perfected Magnetic Bubble Memory package design, the only Active Package in the entire history of Electronics Backend fabrication. He also involved with Jack Kilby's DOE solar cell project (Project Illinois, $15 million 1976-78) with the aim of totally re-vitalize photovoltaic manufacturing procedures. Dr. Li is broadly trained in Chemical Engineering, Nuclear Science, Solid State Physics and Electronics. He is instrumental in solving complex technology issues.

H. Bruce Li, PhD, PE – Founder/CTO

Dr. Li was born July 9th, 1935 in Hangzhou, China, and went to Taiwan at an age of 13. After finished high school in Kangshan, he passed entrance examinations to National Taiwan University, Provincial

Tainan Engineering College, and Provincial Taipei Normal College. He earned a BS in Chemical Engineering in 1957 from National Taiwan University, MS Physics 1966 and PhD Physics 1969, both from Oklahoma State University. He got his electronics training from his ROTC service at Chinese Air Force Signal School in Kangshan, graduation Rank No. 1, the only Chem. E. in a squadron of EE graduates. From 1959-61, he studied Nuclear Physics and made up undergraduate physics courses at Institute of Nuclear Sciences, National Tsinghua University, Hsinchu.

In Dr. Li's dissertation, the only one in the history of science using ultra-centrifuge generated gravitational force to balance and measure the repulsive force created by electric double-layer of colloidal silica particles of nanometer in diameter.

Session D1-W2-T2: Medicine and Public Health

Session Organizer & Chair

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BIOGRAPHY

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Session D1-W2-T2: Medicine and Public Health

New Therapeutic Technologies for Diabetes. Inhalation, Deposition, and Fate of Insulin and Other Therapeutic Proteins

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ABSTRACT

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BIOGRAPHY

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Session D1-W2-T2: Medicine and Public Health

Taiwan Stroke Registry - Current Issues in Research and Clinical Practice

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ABSTRACT

Stroke is a leading cause of death and adult disability in Taiwan. A nation-wide stroke registry has been ongoing since May 1, 2006 to collect information and data on patients with new onset of stroke to establish demographic profiles of stroke patients and to monitor quality of stroke prevention and care.

Starting May 1, 2006, a one-month pilot study has been initiated and then a web-based Taiwan Stroke Registry system has been in operation for entry of new stroke patients by 39 participating hospitals. Data have been collected prospectively; starting with the admission of new stroke patients. Logic check for typo and inconsistency, and web-based and on-site audits by a contract research organization independent of the Registry investigators and participating hospitals have been employed to ensure accuracy of entered data.

By July 31, 2008, 30599 stroke events have been entered into the Registry. The majority had ischemic stroke (74.0%). TOAST classification shows the following distributions: large artery artherosclerosis (27.7%), small vessel occlusion (37.7 %), cardioembolism (10.9 %), specific etiology (1.5 %) and undetermined etiology (22.2 %). Among patients with ischemic stroke, intracranial lesions constitute 23.2% and extracranial 5.4%. Only 1.5% of ischemic stroke patients received tPA.

Characteristic stroke demography and stroke subtypes in Taiwan are different from those observed in the Western countries but are similar to other Asian countries. A well-conducted stroke registry with large sample size as Taiwan Stroke Registry can provide important and accurate data on research and clinical practice in this particular area and ethnic group. For research, this database has been employed (1) to analyze the difference in clinical manifestation and outcome between intracerebral hemorrhage patients with and without prior antithrombotic agents; (2) to investigate risk factors and outcomes of ischemic stroke patients with or without intracranial or extracranial stenosis; (3) to explore the effect of large artery stenosis on prognosis of lacunar stroke. Moreover, the Registry also provides the best platform for clinical practice. In the Registry, we have the record of medication at prior-hospital, in-hospital and discharge. Thus, our stroke registry group is going to identify the best dosage of IV t-PA and Aspirin for stroke treatment in Taiwanese. We also have a sub-study to investigate the potential impact of peripheral arterial disease for stroke. Finally, through the detailed analyses of the data, the results will be offered insights into developing effective strategies for stroke prevention and care.

BIOGRAPHY

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Session D1-W2-T2: Medicine and Public Health

Genetic and Biochemical Predictors of Type 2 Diabetes in Women

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ABSTRACT

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BIOGRAPHY

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Session D1-W2-T2: Medicine and Public Health

Nutrition and the Risks of Type 2 Diabetes and Cardiovascular Diseases. The nurses' Health Study

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ABSTRACT

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BIOGRAPHY

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Session D1-W3-T2: NEMS and MEMS

Session Organizer & Chair

Fan-Gang Tseng, PhD (曾繁根 教授)

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BIOGRAPHY

Prof. Fan-Gang Tseng received his Ph.D. degree in mechanical engineering from the University of California, Los Angeles, USA (UCLA), under the supervision of Prof. C.-M. Ho and C.-J. Kim in 1998. After one year with USC/Information Science Institute as a senior engineer working on a new microfabrication process, EFAB, he became an assistant professor with Engineering and System Science Department of National Tsing-Hua University, Taiwan from August, 1999, and advanced to associate professor in August, 2002, as well as full professor in August 2006. His research interests are in the fields of Bio-MEMS/Bio-Nano and Nano/Micro-Fluidic Systems. He received 19 patents, wrote 3 book chapters including “Micro Droplet Generators” in MEMS Handbook by CRC press and ”Technological Aspects of Protein Microarrays and Nanoarrays” in Protein Microarrays by Jones and Bartlett Publishers, published more than 60 SCI Journal papers, 30 EI papers, and 140 conference technical papers in MEMS, Bio-N/MEMS, and micro/nano fluidics related fields, and served as the technique committee member as well as co-chair in many international conferences including IEEE NANOMED07, IEEE NANO07, APCOT06, IEEE NEMS 06, ROBIO 2005, ISMNT 06, IS3M 00, and IEEE Transducers’01 and the reviewer for more than 15 SCI cited journals. He received several awards, including Mr. Wu, Da-Yo Memorial Award from National Science Council, Taiwan (2005), four best paper/poster awards (1991, 2003, 2004, and 2005), NTHU new faculty research award (2002), NTHU outstanding teaching award (2002), NTHU academic booster award (2001), and NSC research award (2000).

Session D1-W3-T2: NEMS and MEMS

Optical Micromirror Actuation Using Thermocapillary Effect in Microdroplets

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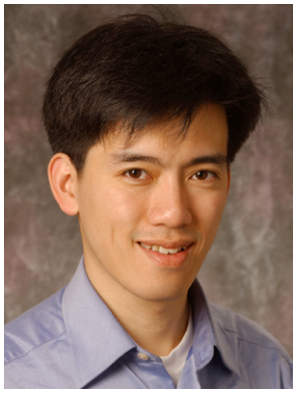
ABSTRACT

We present a simple means that utilizes surface tension gradient to cause droplet deformation, and to tilt micro-objects. Thermocapillary or Marangoni effect, and contact angle hysteresis are employed to control the droplet shape and position. The device consists of a microplate placed on the droplet, and can produce a 6.5° tilting angle when actuated at 30 V. It shows the potential applications in scanning micromirror and display technology.

BIOGRAPHY



Yen-Wen Lu received his Ph.D. in Mechanical and Aerospace Engineering from the University of California, Los Angeles (UCLA) in 2004. He received an M.S. from the University of Michigan and a B.S. from the National Taiwan University. He was in Mechanical and Aerospace Engineering Department and Institute for Advanced Materials, Devices, and Nanotechnology (IAMDN) at Rutgers University before he joined Microsystems Engineering Doctoral Program at Rochester Institute of Technology in 2007. He has received several awards, including FEAD Faculty Award, and Texas Instrument/Harvey Award. His research projects have been supported by federal agency and industrial company in the United States; they include microhand integration, wettability control, and optical device development. His research interests focus the design, fabrication, and system integration in MEMS and nanotechnology. He is currently with National Taiwan University.

Session D1-W3-T2: NEMS and MEMS

A Gas Sensing System for Indoor Air Quality and Polluted Environmental Monitoring

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ABSTRACT

Electronic nose today has found applications for indoor air quality, health care, safety and security, food product quality control, environmental monitoring, medical diagnosis, pharmaceuticals, military applications, detection of hazardous gases, etc. For many of these applications, it is desirable to have a portable electronic nose has always been of interest because of its size and convenience.

Surface acoustic wave (SAW) sensors are generally known as high-resolution mass-sensitive transducers. They are composed of piezoelectric crystal plus at least one layer of chemically interactive material deposited on one of their surfaces in order to infer a given chemical sensitivity. The traditional way of a SAW-based electronic nose system is to read out the frequency by the use of an instrument such as spectrum analyzer or frequency counter. The large size and volume of these equipments strongly reduce the mobility of the system and the feasibility of portable applications. Therefore, readout electronics that can replace these instruments is one of the keys to a portable SAW-based electronic nose.

We have developed a new portable electronic nose based on a SAW sensor array and its readout electronics. The SAW array is based on 2 X 2 non-continuously working oscillators for sensors coated with different polymer/mesoporous carbon composite materials. Signals of the SAW array can be obtained by a readout PCB and a microprocessor. Experiments indicate good results for this portable system to perform gas detection and recognition applications.

BIOGRAPHY

Prof. Yao is an associate professor at Institute of NanoEngineering and MicroSystems (NEMS), National Tsing Hua University, Taiwan. He was born at Taipei, Taiwan in 1969, and received his Ph.D. from department of Mechanical and Aerospace Engineering, University of California at Los Angeles (UCLA) in 2001. His dissertation was focused on the design and fabrication of in-plane MEMS thermoelectric

microcooler (μ-TEC), which can be used for cooling microchip locally or stabilizing temperature for bio-medical applications. He is the member of IEEE, ASME, and IMPACT.
His research scope is to combine his strong backgrounds (MEMS and thermal fluidics) on micro science researches. From the application points of view, BioMEMS and MEMS packaging are his focused research topics. From the fundamental science points of view, thermo-fluidic MEMS and thin film property measurement are the selected research topics. To build the multidisciplinary research team for developing interdisciplinary technologies under his research scope is his goal at National Tsing Hua University.

Session D1-W3-T2: NEMS and MEMS

From High Throughput Protein Micro Array toward Ultra High Sensitive Single Molecule Nanoarray

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ABSTRACT

Protein microarrays have been employed to screen tens to thousands of proteins simultaneously for the observation of the biochemical activities in the protein-protein, protein-nucleic acid and small molecule interactions. This technology allows high throughput analysis and holds great potential for basic molecular biology research, disease marker identification, toxicological response profiling and pharmaceutical target screening. However, proteins easily malfunction in harsh environments so that they are hardly preserved before the application because of their complex and fragile structures. On the other hand, identify scarce amount of proteins less than fM range is very important and challenge for disease diagnosis at very early stage. As a result, the procedures for protein micro array formation are very important for preserving protein functionality to ensure useful protein assays, as well as the improvement of the detection sensitivity up to single molecule event but with high dynamic range for disease early detection. Therefore, this presentation provides a novel view from the preparation of high efficient protein micro chip toward ultra high sensitive single protein molecule array through the technology integration of BioMEMS and Bio-Nanotechnology.

BIOGRAPHY

Prof. Fan-Gang Tseng received his Ph.D. degree in mechanical engineering from the University of California, Los Angeles, USA (UCLA), under the supervision of Prof. C.-M. Ho and C.-J. Kim in 1998. After one year with USC/Information Science Institute as a senior engineer working on a new microfabrication process, EFAB, he became an assistant professor with Engineering and System Science Department of National Tsing-Hua University, Taiwan from August, 1999, and advanced to associate professor in August, 2002, as well as full professor in August 2006. His research interests are in the fields of Bio-MEMS/Bio-Nano and Nano/Micro-Fluidic Systems. He received 19 patents, wrote 3 book chapters including “Micro Droplet Generators” in MEMS Handbook by CRC press and ”Technological Aspects of Protein Microarrays and Nanoarrays” in Protein Microarrays by Jones and Bartlett Publishers, published more than 60 SCI Journal papers, 30 EI papers, and 140 conference technical papers in MEMS, Bio-

N/MEMS, and micro/nano fluidics related fields, and served as the technique committee member as well as co-chair in many international conferences including IEEE NANOMED07, IEEE NANO07, APCOT06, IEEE NEMS 06, ROBIO 2005, ISMNT 06, IS3M 00, and IEEE Transducers'01 and the reviewer for more than 15 SCI cited journals. He received several awards, including Mr. Wu, Da-Yo Memorial Award from National Science Council, Taiwan (2005), four best paper/poster awards (1991, 2003, 2004, and 2005), NTHU new faculty research award (2002), NTHU outstanding teaching award (2002), NTHU academic booster award (2001), and NSC research award (2000).

Session D1-W4-T2: Medical IC

Session Organizer & Chair

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BIOGRAPHY

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Session D1-W4-T2: Medical IC

Silicon NMR Radio-Frequency Biomolecular Sensor

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ABSTRACT

I will present our recent work that showcases how silicon RF chips can be used not only for wireless RF applications, but also for biosensing aimed at early disease detection and low-cost medicine. The main function of our RF chip is to manipulate and monitor RF dynamics of protons in water via nuclear magnetic resonance (NMR). Target biological objects such as cancer marker proteins alter the proton dynamics, which is the basis for our biosensing. The RF chip has a receiver noise figure of only 0.6 dB. This high sensitivity made possible our construction of an entire NMR system around the RF chip in a 2-kg platform, which is 60 times lighter, yet 60 times more mass sensitive than a state-of-the-art commercial benchtop NMR system. Our system is a circuit designer's approach to pursue early disease detection in a low-cost, portable platform.

BIOGRAPHY

Donhee Ham is a full professor at Harvard University, where he is with Electrical Engineering and Applied Physics, School of Engineering and Applied Sciences.

He received the B.S. degree in physics from Seoul National University, Korea, in 1996, where he graduated summa cum laude with the Valedictorian Prize as well as the Presidential Prize, ranked top 1st across the Natural Science College, and also with the Physics Gold Medal (sole winner). Following 1.5 years of mandatory military service in the Republic of Korea Army, he proceeded to California Institute of Technology, where he received the M.S. degree in physics in 1999 working on general relativity and gravitational astrophysics, and Ph.D. degree in electrical engineering in 2002 winning the Charles Wilts Prize, best thesis award in Electrical Engineering. His doctoral work examined statistical physics of electrical circuits. He was the recipient of the IBM Doctoral Fellowship, Li Ming Scholarship, IBM Faculty Partnership Award, IBM Research Design Challenge Award, Silver Medal in the National Mathematics Olympiad, and the fellow of the Korea Foundation of Advanced Studies. He shared Harvard's Hoopes prize with William Andress. He was recognized by MIT Technology Review as among the world's top 35 young innovators in 2008 (TR35), for his group's work on CMOS RF biomolecular sensor utilizing nuclear spin resonance to pursue early disease detection and low-cost medicine.

Donhee Ham's work experiences include Caltech-MIT Laser Interferometer Gravitational Wave Observatory (LIGO), IBM T. J. Watson Research Center, IEEE conference technical program committees including the IEEE International Solid-State Circuits Conference (ISSCC) and the IEEE Asian Solid-State Circuits Conference (ASSCC), advisory board for the IEEE International Symposium on Circuits and Systems (ISCAS), international advisory board for the Institute for Nanodevice and Biosystems, and various US, Korea, and Japan industry, government, & academic technical advisory positions on subjects including ultrafast electronics, science & technology at the nanoscale, and the interface between biotechnology and solid-state circuits. He served as a guest editor for the IEEE Journal of Solid-State Circuits (JSSC; Jan 2009 special issue) and was a co-editor of CMOS Biotechnology with Springer (2007).

Ham's current research projects include: quantum wire based THz plasmonics; CMOS electrochemistry; active neuron-silicon circuits; NMR quantum computing on silicon; physics of information; and RF and mixed-signal integrated circuits.

Session D1-W4-T2: Medical IC

A Release-on-Demand Wireless CMOS Drug Delivery SoC Based on Electrothermal Activation Technique

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ABSTRACT

In this work, we present the first implantable release-on-demand CMOS drug delivery SoC, in which a wireless controller/actuation circuitry and a drug delivery array are monolithically integrated. The SoC is implemented in TSMC 0.35um technology with a die size of 2.48mm2.

Each cell of the drug delivery array consists of a reservoir containing drug formulations and a metal membrane capping the reservoir. Metal interconnects are also patterned on the array for directing electrical current to the top of the membranes. The membranes, which consist of multiple layers of titanium and platinum, are realized by post-IC photolithography and lift-off processes while the cavities for reservoirs are formed by CMOS compatible post-IC deep dry etching from the backside of the die. To increase the volume capacity of the reservoirs, a polydimethylsilicane (PDMS) layer fabricated by the soft-lithography process is aligned and bonded to backside of the die. Note that both titanium and platinum have been used in standard CMOS process for metal silicides or metal diffusion barrier and thus are CMOS compatible. The activation process for each individual cell is similar to the operation of an electrical fuse. Since the cross-sectional area of the membrane is smaller than that of interconnect, temperature elevation on the center of the membrane can be achieved by Joule heating as electrical current passes through the membrane. Drug in each cell reservoir can be released after the membrane is heated to the point of failure.

Compared with current technologies, the advantages of our proposed device include lower system cost, smaller device size and lower power consumption. This device can be implanted by minimally invasive surgery and is suitable for the localized diagnosis/therapy of cancers, or the immediate treatment of unpredictable heart attacks by releasing drugs such as nonapeptide leuprolide acetate or nitroglycerin. Physicians can also make non-invasive therapy modification by using the wireless capability. Experimental results show that the reservoir contents can be successfully released by wireless commands.

BIOGRAPHY

Yao-Joe Joseph Yang (S'98–M'01) received the B.S. degree from the National Taiwan University, Taipei, Taiwan, in 1990, and the M.S. and the Ph.D. degrees in electrical engineering from the Massachusetts Institute of Technology, Cambridge, in 1997 and 1999, respectively.

He worked at the Coventor Inc., Cambridge, as a senior application engineer from 1999 to 2000,. Since 2000, he has been with the Department of Mechanical Engineering, National Taiwan University, Taipei. Currently, he is an Associate Professor and serves as the deputy chair of the department. He is also the Director for CAD Technology in the Northern NEMS Center sponsored by the National Science Council, Taiwan. Since 2005, he serves as the deputy Secretary General of the Chinese Institute of Automation Engineering (CIAE). Currently, he is one of the committee members of the CIAE.

His research interests include microelectromechanical systems, nanotechnology, high-precision micromachining, flexible sensing arrays, sensor network, parallel processing, and semiconductor devices and vacuum microelectronics modeling. He has been consulted by more than three U.S-based companies and four Taiwan-based organizations. Dr. Yang is a member of IEEE. He is also the recipient of the Outstanding Young Researcher Award (Dr. Da-Yu Wu's Award) of the National Science Council.

Session D1-W4-T2: Medical IC

A Wireless and Batteryless 10-bit Implantable Blood Pressure Sensing Microsystem for Real-time Genetically Engineered Mice Monitoring

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ABSTRACT

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Lunch

Hi-Tech Investment Opportunities in the New Era of Cross-Strait Relations

Tsay-Ren Lee (Julian Lee), MBA (李再仁 主任)

Executive Director, Taiwan Trade Center, New York
Vice Chairman, Committee on Trade Fairs, Trade Marts and High-tech Parks, World Trade Centers Association
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ABSTRACT

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BIOGRAPHY

Degrees:
MBA, International Business Education and Research Program, University of Southern California, 1992
Bachelor of Law, National Taiwan University, 1974

Summary:
With 30 years service in TAITRA, Taiwan's foremost non-profit trade promotion organization, Mr. Lee was posted to Taiwan Trade Center, New York (TTCNY) in 2005. TTCNY's major responsibilities are to promote two-way trade and business alliances between USA and Taiwan.
Mr. Lee's previous work experience was in trade promotion and exhibitions. He was Executive Vice President of TAITRA and the Chairman of Taiwan Convention and Exhibition Association before being assigned to New York Office.

Keynote Session D1-W1-K1: Energy and Nanotechnology

Session Organizer & Chair

Chin Pan, PhD (潘欽 教授)

Dean, College of Nuclear Science
Professor, Department of Engineering and system Science
Director, Energy and environmental Research Center
National Tsing Hua University
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BIOGRAPHY

Dr. Chin Pan is a professor of the Department of Engineering and System Science and the Dean of the College of Nuclear Science of the National Tsing Hua University (NTHU). Dr. Pan received his BS degree in nuclear engineering from National Tsing Hua University in 1979, MS and Ph.D degrees in nuclear engineering from University of Illinois at Urbana-Champaign (UIUC) in 1983 and 1985, respectively. After receiving his doctoral degree, Dr. Pan served as a visiting research assistant professor at UIUC before joining NTHU as an associate professor in 1986 and promoted to full professor in 1990. From August 1992 to August 1993, Dr. Pan conducted research and served as a Visiting Professor of the Department of Nuclear Engineering of UIUC with a fellowship from the National Science Council of Taiwan, ROC. In the summer of 1998, he conducted microchannel boiling studies in the Department of Engineering Science of the University of Oxford as an academic visitor with a visiting fellowship from Engineering and Physical Sciences Research Council, UK. In the next summer, he conducted researches on multidimensional modeling of two-phase flow in the Rensselaer Polytechnic Institutes as a visiting scholar with a fellowship from the National Science Council of Taiwan, ROC. He served as the Chairman of the Department of Engineering and System Science of NTHU from February, 2001 to January, 2004 and the director of the Center for Energy and Environmental Research from December 2003 to July 2008. He served as the chairman of the academic committee for joint projects of Atomic Energy Council and National Science Council from 2001 to 2005. He is now serving as the chairman of the Advisory Committee of Nuclear Safety in the Atomic Energy Council. Dr. Pan has been serving as the Dean of College of Nuclear Science since August, 2005.

Dr. Pan's research activities for the past two decades have been in the areas of two-phase flow, boiling heat transfer and energy engineering with a special focus on transition boiling, nucleate boiling near CHF, nuclear reactor thermalhydaulics, two-phase flow instability with or without nuclear coupling, two-phase natural circulation loops, microchannel two-phase flow, microchannel boiling, microchannel heat sink, microchannel reactor, and thermal-fluid transport in fuel cell systems, especially micro direct methanol fuel cells. He published a book in Chinese entitled "Boiling Heat Transfer and Two-phase Flow" in 2001. He authored and co-authored about 60 SCI journal papers and 80 conference papers. He received a

distinguished research award in 1998 and three excellent research awards earlier from the National Science Council of Taiwan, ROC. He also received an distinguished industry – academia collaboration award from the Ministry of Education of Taiwan, ROC in 2003.

Keynote Session D1-W1-K1: Energy and Nanotechnology

Nanotechnology for Energy Applications

Gang Chen, PhD (陳剛 教授)

Carl Richard Soderberg Professor of Mechanical Engineering, Massachusetts Institute of Technology
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ABSTRACT

Nanotechnology focuses on small scale effects. Energy is a global issue. Despite such disparities, there is a growing consensus that nanoscience and nanotechnology can have a profound impact on energy generation, storage, and utilization by exploiting the significant differences of energy states and transport between nanostructures and macrostructures. In this talk, I will discuss a few examples to demonstrate the potential of nanoscale effects for efficient energy utilization. One example is thermoelectric energy conversion. By exploring the interface scattering of electrons and phonons, the thermoelectric figure of merit can be improved in nanocomposites via thermal conductivity reduction. In an opposite example, it will be shown that thermal conductivity of polymers can be improved by significantly by exploring one-dimensional transport. Mass production will be a crucial factor in exploring nanotechnology for energy applications and will be discussed. At the end, I will also briefly introduce our new DOE funded S3TEC Center.

BIOGRAPHY

Dr. Gang Chen is currently the Carl Richard Soderberg Professor of Power Engineering at Massachusetts Institute of Technology. He obtained his Ph.D. degree from UC Berkeley in 1993. He was an assistant professor at Duke University from 1993-1997, and associate professor at University of California at Los Angeles from 1997-2000, and moved to MIT in 2000. He is a recipient of the NSF Young Investigator Award, a Guggenheim Fellow, an ASME fellow, the ASME Heat Transfer Memorial Award, and MIT Warren and Towneley Rohsenow Professorship. He has published extensively in the area of nanoscale energy transport and conversion and nanoscale heat transfer. He serves on the editorial boards for five journals in heat transfer and nanotechnology and chairs the advisory board of ASME Nanotechnology Institute. He is the director of Solid-State Solar-Thermal Energy Conversion Center (S3TEC Center) funded under US Department of Energy's Energy Frontier Research Centers Program.

Keynote Session D1-W2-K1: Biotechnology

Session Organizer & Chair

Li-San Wang, PhD (王立三 教授)

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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 and a fellow of the Institute on Aging, University of Pennsylvania. Dr. Wang's research interests include phylogenetics, comparative genomics, and microarray analysis.He has authored twenty six peer-reviewed book chapters and journals on computational biology and bioinformatics, and served on the program and organizing committees of several international workshops and conferences.

Keynote Session D1-W2-K1: Biotechnology

Epigenetic Regulation of Memory Formation in Health and Disease

Li-Huei Tsai, PhD (蔡立慧 院士)

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ABSTRACT

Neurodegenerative diseases of the central nervous system are often associated with impaired learning and memory, eventually leading to dementia. Currently, effective therapeutic strategies for restoring cognition in these patients are lacking. We have been exploring strategies that facilitate re-establishment of learning ability and access to long-term memories. The CK-p25 transgenic mice previously created in this lab allows temporally and spatially restricted induction of neuronal loss and learning/memory impairment which serves as an ideal model for testing therapeutic strategies. Chromatin modifications, especially histone-tail acetylation, have been implicated in memory formation. Increased histone-tail acetylation induced by inhibitors of histone deacetylases (HDACis) facilitates learning and memory in wildtype mice as well as in mouse models of Rubinstein-Taybi syndrome, a developmental brain disorder. We found that increased histone acetylation as a result of HDACi treatment reinstated learning behavior and re-established access to long-term memories after significant brain atrophy and neuronal loss had already occurred in the CK-p25 mice. Moreover, increased histone acetylation by HDACi induced sprouting of dendrites and increased number of synapses, thus, long-lasting changes of neural circuits which may underlie its beneficial effects on cognition. Currently, all available HDACis target multiple histone deacetylases. Identification of the histone deacetylase family member(s) specifically involved in memory formation will help elucidate the mechanism(s) by which chromatin remodeling regulates memory and allow the development of potent and selective HDACi useful for clinical applications.

BIOGRAPHY

Dr. Li-Huei Tsai was born in Taipei, Taiwan.

EDUCATION:

National Chung Hsing University, Taichung Taiwan	D.V.M.	1983
University of Wisconsin, Madison	M.S.	1986 veterinary sciences
University of Texas Southwestern Medical Center	Ph.D.	1990 microbiology
Cold Spring Harbor Laboratory, NY Harlow Lab	Post doc	1990
Mass General Hospital Harlow Lab, Cancer Center, MA	Post doc	1990-94

In 1986, she started her Ph.D. at the University of Texas Southwestern. Under the direction of Bradford Ozanne, she graduated in 1990 and joined Ed Harlow's laboratory at Cold Spring Harbor Laboratory and Massachusetts General Hospital for postdoctoral training. During her time in the Harlow lab, she isolated two proteins prominently expressed in the nervous system: cyclin-dependent kinase 5 (Cdk5) and its regulatory activator p35. She was appointed Assistant Professor of Pathology at Harvard Medical School in 1994, elected Investigator of Howard Hughes Medical Institute in 1997, and promoted to Professor of Pathology in 2002. In 2006, she relocated her lab to MIT and became the Picower Professor of Neuroscience in the Picower Institute for Learning and Memory. She began directing the Neurobiology Program at the Stanley Center for Psychiatric Research in 2007, and recently became the Head of the Picower Institute for Learning and Memory at M.I.T., in Cambridge.

1998-2000	NIH Study Section (ad hoc)- Molecular, cellular and developmental processes in neural and other excitable cells (MDCN-2)
2001-2003	NIH Study Section - Molecular, cellular and developmental processes in neural and other excitable cells (MDCN-2)
2003-present	NIH Study Section – Neurogenesis and Cell Fate (NCF)
2003-present	NINDS Board of Scientific Counselors
2005-2006	Scientific Advisory Board, Alzheimer Research Forum Foundation
2005-	Scientific Advisory Board, Sirtris Pharmaceuticals Inc.
2006-	Expert Advisory Committee, Hotchkiss Brain Institute, University of Calgary
2006-	ASBMB Meetings Committee
2008	Academician, Academia Sinica
2008	Fellow, American Association for the Advancement of Science (AAAS)
2008-	Molecular and Cellular Cognition Society Council
2008-	Selection Advisory Board, Gruber Foundation
2008-2011	Program Committee Member, Society for Neuroscience Council
2008-2011	Reviewer, Smith Family New Investigator Awards Program
2008-	Member, Autism Consortium, Boston, MA

Keynote Session D1-W4-K1: System on Chip

Session Organizer & Chair

Sao-Jie Chen, PhD (陳少傑 教授)

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BIOGRAPHY

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

Since 1982, he has been a member of the faculty in the Department of Electrical Engineering, National Taiwan University, where he is currently a full professor. During the fall of 1999, he was a visiting professor in the Department of Computer Science and Engineering, University of California, San Diego, USA. During the fall of 2003, he held an academic visitor position in the Department of System Level Design, IBM Thomas J. Watson Research Center, Yorktown Heights, New York, USA. During the falls of 2004 to 2008, he was a visiting professor in the Department of Electrical and Computer Engineering, University of Wisconsin, Madison, USA. His current research interests include: VLSI physical design, SOC hardware/software co-design, and Wireless LAN and Bluetooth IC design.

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

Keynote Session D1-W4-K1: System on Chip

Mobile Phones and Multicores: Programming Nightmare or Architectural Renaissance

Arvind, PhD

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ABSTRACT

In the developing world a mobile phone is the only computer most people have. With countries like India getting seven million new mobile phone customers per month, mobile devices and the associated services infrastructure are going to be the main drivers for both industry and research. In this new world, power and cost constraints completely determine functionality. Meeting power and cost constraints for mobile devices and sensors is much easier through dedicated chips than via software programmability. This vision is counter to the steadily decreasing new chip-starts in industry driven by rising chip development costs. A fundamental shift is needed in the current design flow of systems-on-a-chip (SoCs) to fulfill this demand in a cost-efficient manner.

We will present a method of designing systems that facilitates synthesis of complex SoCs from reusable "IP" modules. The technical challenge is to provide a method for connecting modules in a parallel setting so that the functionality and the performance of the composite are predictable.

BIOGRAPHY

Arvind received his B.Tech degree in electrical engineering at Indian Institute of Technology, Kanpur, India, in 1969. He attended graduate school in computer science at the University of Minnesota, Minneapolis and received M.S. and Ph.D. degrees in 1972 and 1973, respectively. He was Assistant Professor of Computer Science in the University of California, Irvine from 1974-1978. After that he joint the EECS faculty at MIT as an Assistant Professor where is currently the Johnson Professor of Computer Science and Engineering.

Arvind's group, in collaboration with Motorola, built the Monsoon dataflow machines and its associated software in the late eighties. In 2000, Arvind started Sandburst which was sold to Broadcom in 2006. In

2003, Arvind co-founded Bluespec Inc., an EDA company to produce a set of tools for high-level synthesis. In 2001, Dr. R. S. Nikhil and Arvind published the book "Implicit parallel programming in pH". Arvind's current research focus is on enabling rapid development of embedded systems.

Professor Arvind is a Fellow of IEEE and ACM, and a member of the National Academy of Engineering.

Session D1-W1-T3: Fuel Cells

Session Organizer & Chair

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BIOGRAPHY

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Session D1-W1-T3: Fuel Cells

Molecular Quantum Mechanics and Multiscale Design of Fuel Cells and Photoelectrochemical Cells

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ABSTRACT

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BIOGRAPHY

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Session D1-W1-T3: Fuel Cells

Optimization of Proton Exchange Membrane Fuel Cells by Inverse Heat Transfer Theory

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ABSTRACT

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BIOGRAPHY

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Session D1-W1-T3: Fuel Cells

Characteristic and Findings of Hydrogen Literature and Full Cell Patents: 1965-2006

Ming-yueh Tsay, PhD (蔡明月 教授)

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Pao-hua Chen

Department of Information and Library Science
Tamkang University, Tamshui, Taiwan

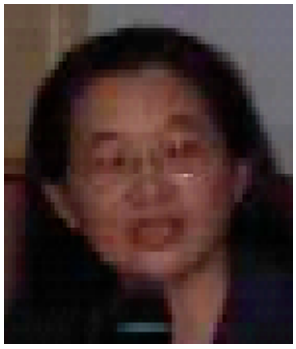
ABSTRACT

Using the scientometric techniques, the present study explores the characteristics and their implications of hydrogen energy literature and fuel cell patent from 1965 to 2008 based on the databases of Science Citation Index Expanded (SCIE) and Derwent Innovation Index. The results of this work reveal that both the published literature and patent on hydrogen energy and fuel cell grow exponentially with an annual growth rate of about 18% and 13.4%, respectively. USA, Japan and China are the three biggest contributing countries on hydrogen energy literature publishing, 21.2%, 10.9%, 10.5%, respectively. Taiwan contributes 2.4% hydrogen energy papers, ranked eleventh in the world. Most of the highly productive institutes are academic, among which the Chinese Academy of Sciences in China is the largest contributor publishing 795 papers. On the other hand, Japan, USA, and European Patent Office are the top three issuing-countries or organization on the patent of fuel cell with a percentage of 30.2, 16.4, 10.8, respectively. Taiwan, ranking 14, issued only 0.6% of fuel cell patent. In contrast to the published literature, the most productive institutes on fuel cell patent are industry. In fact, the most productive institutions on fuel cell patent are all Japanese automobile companies, namely, Toyota Jidosha KK, Nissan Motor Co Ltd and Honda Motor Co. Ltd., contributing 6.78%, 4.61% and 3.14% of total patents. This reflects the great efforts of Japanese automobile companies on developing fuel cell cars to welcome the hydrogen era. .

The journal literature on hydrogen energy does not confirm the typical S-shape for the Bradford-Zipf plot, but five core journals contributing about 43.6% can be identified. Journals with highly cited articles and most highly cited articles are also identified, in which the most highly cited article receives more than 1,000 citations. The most cited article is ³Storage of hydrogen in single-walled carbon nanotubes² by Dillon, AC, et al published in Nature, 1997 with a total cited times of 1803. .

Although Japan is the most productive country issuing fuel cell patent, USA's patent on fuel cell are cited most contributing 59% of total citation. Japanese patents are cited secondly in the list contributing 17.9%. European patent comes next contributing 7.6%. There are 22 patents cited more than 100 times. The patent entitled ³Solid electrolyte membrane for an aq. liq. feed organic fuel cell - comprising an anode and cathode, an electrolyte, a solid polymer, hydrogen ion conductor membrane, etc.)² patent number US5599638-A, published by the University of Southern California and California Institute of Technology in 1993 is the most cited patent with the total cited times of 169.

BIOGRAPHY



Dr. Ming-Yueh Tsay is a professor of the Graduate Institute of Library, Information and Archival Studies at National Chengchi University (NCU), Taipei, Taiwan. Before joining NCU in August 2004, Dr. Tsay had been a faculty member of the Department of Information and Library Science at Tamkang University, Taiwan for 15 years serving as lecturer, associate professor and professor. She served as the Chairperson of the Department from August 2003 to July 2004. Dr. Tsay was an associate researcher in the libraries of Industry Technology Research Institutes from July 1986 to July 1989. Dr. Tsay earned her MS, CAS and PhD degrees in Library and Information Science from University of Illinois at Urbana-Champaign in1983, 1986 and 1996, respectively. Dr. Tsay's research activities for the past twenty years have been in the areas of library science and bibliometrics.

Session D1-W2-T3: Systems Biology

Session Organizer & Chair

Jung-Hsien Chiang, PhD (蔣榮先 教授)

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BIOGRAPHY

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

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

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

Session D1-W2-T3: Systems Biology

Systems Approaches towards Brain Tumor Biology

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ABSTRACT

Glioblastoma multiforme (GBM), the most common and malignant primary brain tumour, is classified as a Grade IV tumour by the World Health Organization (WHO). The standard treatment for GBM consists of surgical resection followed by aggressive radio- and chemotherapy. Despite these efforts, the median survival time of GBM patients is nevertheless circa 14 months.

In this presentation, I will quickly review the approaches and findings of large scale cancer genome projects, mainly the Cancer Genome Atlas (TCGA) project conducted by the National Cancer Institute (NCI), and the search for brain tumour stem cells. I will discuss the pros and cons of these studies and the state-of-the-art approaches and technologies we are applying at the Institute for Systems Biology (ISB) to understand the aetiology of brain tumours, as well as our developmental strategy for personalised medication for brain tumour patients.

BIOGRAPHY

Leslie Chen was born in Taipei city in 1976. He got his first degree in life science from National Tsing-Hua University in Hsinchu city, Taiwan, in 1998, and obtained a Master's degree in life science in 2000 under the supervision of Professor Tse-Wen Chang (張子文). In 2008, he was awarded a PhD degree in pharmacogenomics from the University of Cambridge in Cambridge, United Kingdom, under the supervision of Dr Panos Deloukas.

He was serving in the military from 2000 till 2001; thereafter he was a RESEARCH ASSISTANT developing bioinformatics algorithms and databases until 2003 in the laboratory of Dr Ming-Jing Hwang, Research Fellow and Deputy Director of IBMS, Academia Sinica, in Taipei. After submitting his PhD thesis in 2007, he worked as a RESEARCH ASSOCIATE at the Wellcome Trust Sanger Institute in Cambridge until May 2008 to discover the genetic factors underlying bleeding complication of warfarin treatment. Now he works as a POSTDOCTOAL FELLOW to study systems network in cancer and to identify biomarkers for glioblastoma multiforme at the Institute for Systems Biology (ISB) in Seattle under

the supervision of Professor Leroy Hood, President and co-Founder of ISB, known for the invention of automatic DNA sequencer and a co-founder of Applied Biosystems and Amgen.

Dr Chen is a current member of the International Warfarin Pharmacogenetics Consortium (IWPC). He has been awarded the Wellcome Trust PhD fellowship (2003-2007), a travel award by the Joint 6th Human Genome Organization (HUGO) Pacific Meeting & 7th Asia-Pacific Human Genetics Conference (2006), and a travel award by the IBMS, Academia Sinica (2002). Meanwhile, Dr Chen's recent publication on BLOOD regarding the genetic forecasting of warfarin is selected as a 'Must Read' article by the Faculty of 1000 Medicine.

Session D1-W2-T3: Systems Biology

Runx1 is Required for the Endothelial to Haematopoietic Cell Transition but not Thereafter

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ABSTRACT

The first hematopoietic stem cells (HSCs), as defined by in vivo transplantation into adult mice, are found in the aorta-gonad-mesonephros (AGM) region, vitelline and umbilical arteries of 10.5 days post coitus (dpc) conceptuses, and one day later in the yolk sac and placenta. HSCs emerge from these sites through the formation of intra-aortic hematopoietic clusters. It has been proposed that Runx1 functions during the transition from a "hemogenic endothelium" to intra-aortic clusters and HSCs. We showed that Runx1 activity in vascular endothelial cadherin (VEC) positive cells is essential for intra-aortic cluster and HSC formation. Deletion of Runx1 in VEC+ cells depresses HSC formation, and those HSCs that do emerge have retained at least one functional Runx1 allele. On the other hand, Runx1 deletion in Vav+ cells does not prevent HSC emergence. Collectively these data indicate that Runx1 is absolutely required in VEC+ cells for intra-aortic cluster and HSC formation, but that requirement ends once or before HSCs express Vav.

Sca-1 expression, as assessed by a fluorescent marker driven by the Sca-1 (Ly6a) regulatory sequences marks a small subset of cells in the hemogenic endothelium in the aorta/gonad/mesonephros (AGM) region and placenta that contain hematopoietic stem cells (HSCs). Runx1 and CBFb, two subunits of the core-binding factors, are required for the onset of definitive hematopoiesis and the formation of HSCs. We previously showed that ectopic expression of a GFP/CBFb fusion protein driven by regulatory sequences from the Tek gene, which is expressed in endothelial cells and quiescent HSCs, is sufficient to rescue the formation of definitive hematopoietic progenitors in Cbfb-/- fetuses. Here we examined whether by expressing GFP/CBFb_from the Ly6a regulatory sequences we could also rescue the hematopoietic defects in Cbfb-/- mice. We successfully generated three independent lines of Ly6a-gfp/Cbfb transgenic mice expressing different levels of GFP/CBFb in the conceptus and adult. Although all three lines express GFP/CBFb in Sca-1+ cells, none can restore hematopoietic progenitor and HSC formation in Cbfb-/- fetuses. These data suggest that the temporal and/or spatial expression of Ly6a does not entirely overlap with the developmental window during which Runx1-CBFb specifics hematopoietic progenitors and HSCs from the endothelium.

BIOGRAPHY

Michael J. Chen was born in Taoyuan, Taiwan in 1969. He received a B.S. in Life Science from National Tsing Hua University, Hsinchu, Taiwan in 1995, a M.S. in Microbiology and Immunology from National Yang- Ming University, Taipei, Taiwan in 1999, and a Ph.D. in Genetics from Dartmouth College, Hanover, New Hampshire in 2008.

He served as a private in R.O.C. Taiwan Army from 1995 to 1997, experienced 1996 Missile Crisis and pig foot-mouth disease. He worked as a research assistant at Dr. Ying-Hui Lee's lab at Institute of Molecular Biology, Academia Sinica from 1999 to 2001. He is a post-doc fellow at Dr. Nancy Speck's lab at the University of Pennsylvania, Philadelphia, PA. His thesis work on the emergence of hematopoietic stem cells in developing mouse embryo is recently published in Nature in February 2009.

Dr. Chen is a member of the International Society for Stem Cell Research.

Session D1-W2-T3: Systems Biology

Role and Mechanism of Alpha-E-Catenin in Regulation of Intercellular Adhesion and Cell Proliferation

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ABSTRACT

Cell-cell adhesion is essential for construction and maintenance of all multicellular organisms. Intercellular adhesion of epithelial cells is mediated primarily by the adherens junctions (AJs). AJs are made by cadherin-catenin protein complexes, which contain cadherins, β-catenin and αE-catenin. During mammalian brain development neural progenitor cells divide to produce variety of brain cell types. Proliferation of progenitor cells is tightly controlled so that only appropriate number, but not too many or too few cells are produced during development. We hypothesize that cell-cell-adhesion structures may be directly involved in this function since they provide cells with information concerning the density of their immediate cellular neighborhood. To understand the role of AJ in developing neural progenitor cells, we specifically focused on understanding the functional significance of junctional protein, αE-catenin.

We have previously utilized a loss of function approach and generated mice with conditional knockout of αE-catenin in neural progenitor cells. We found that loss of αE-catenin led to severe cortical dysplasia and hyperplasia. Our analysis revealed that the hedgehog signaling pathway is hyperactive in αE-catenin$^{-/-}$ progenitors. In this study, we investigated whether activation of β-catenin signaling may be at least partially responsible for hyperplasia in αE-catenin$^{-/-}$ brains. To reveal potential quantitative or spatial changes in β-catenin signaling, we utilized mice carrying a β-catenin-signaling reporter transgene. In addition, we analyzed the expression of known endogenous targets of the β-catenin pathway and the amount and localization of β-catenin in mutant progenitor cells. We found that while loss of αE-catenin resulted in disruption of intercellular adhesion and hyperplasia in the developing brain, β-catenin signaling was unchanged. We conclude that endogenous αE-catenin has no impact on β-catenin transcriptional activities in the developing mammalian brain.

In parallel to *in vivo* studies, we also used biochemical approaches to determine the molecular mechanisms of αE-catenin in regulation of cell proliferation. For this purpose, we performed yeast two-hybrid screening to look for novel αE-catenin-binding proteins and reveal the biological significance of the interactions. In this study, we identified the novel αE-catenin-binding protein, dynamitin. Subsequent analyses uncovered the novel function of αE-catenin in regulation of intracellular traffic. Altogether, our studies reveal the role and significance of αE-catenin in normal development, and provide new knowledge about molecular mechanism of αE-catenin in regulation of cell proliferation and intracellular traffic.

BIOGRAPHY

Wen-Hui Lien was born in Taipei in 1978. She got her Bachelor degree in Biology from Kaohsiung Medical University in Kaohsiung city, Taiwan, in 2000, and then obtained a Master's degree in Molecular Medicine from National Chung Kung University in Tainan city, Taiwan, in 2002 under the supervision of Dr. Li-Wha Wu (吳梨華). In 2008, she was awarded a PhD degree in Molecular and Cellular Biology from the University of Washington in Seattle, USA, under supervision of Dr. Valeri Vasioukhin.

Dr. Lien started her undergraduate research under the supervision of Dr. Chung-Yee You (游仲逸) in Kaohsiung Medical University, and her research made her receive the Undergraduate Innovative Research Award from National Science Council in Taiwan in 2000. During her Master's graduate research in Taiwan, she studied the molecular mechanism of the angiogenic inhibitor. This work led to her first two publication of which she was second and first author, respectively. Before starting her PhD research, she worked as a research technician in the laboratory of Dr. Robert Eisenman at Fred Hutchinson Cancer Research Center in Seattle from 2003 to 2004. In her PhD studies, she has focused on understanding the underlying mechanisms and physiological significance of the cell adhesion protein, αE-catenin. Her works have leaded to her publication in the significant journal, *Science*. This important discovery was highlighted in *Cell*, the *Journal of Cell Biology*, and the Faculty of 1000. Her following studies also resulted in first authored publications in the *Journal of Cell Science* and *Journal of Cell Biology*. By the end of her PhD study, she was invited to give a talk in Gordon Research Conference on Signaling by Adhesion Receptors in 2008, and as well other invited presentations in Academia Sinica and Chung Shan Medical University in 2009. Adding to her accomplishment, she has recently received the prestigious 2009 Harold M. Weintraub Graduate Student Award for her outstanding achievement during her graduate studies.

Dr. Lien is currently a postdoctoral fellow in the laboratory of Dr. Elaine Fuchs at the Rockefeller University in New York City. She works on understanding the behaviors of epidermal stem cells. Specially, she is currently investigating the Wnt signaling pathway in regulation of epidermal homeostasis, hair follicle stem cell activation, wound healing, and tumorigenesis.

Session D1-W3-T3: Polymer Solar Cell

Session Organizer & Chair

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BIOGRAPHY

EDUCATION

1972-1976 B. S. in Physics, National Tsin-Hua University, Taiwan
1980-1984 Ph. D. in Physics, Purdue University, USA

WORK EXPERIENCE

1991-now Professor of Department of Physics, National Taiwan University
1986-1991 Associate Professor of Department of Physics, National Taiwan University
1984-1986 Post Doctoral Member of Division of Applied Science at Harvard University, USA

HONORS & AWARDS

Outstanding research award of National Science Council of Republic of China (1994, 1995, 1997)
Sun Yet-Sen Academic Prize (1994)
National Lecture Chair of Ministry of Education of Republic of China (2001)
Fellow of Chinese Physical Society (2002)
Fellow of World Innovation Foundation (2002)
Distinguished professor and chair professor of National Taiwan University (2006-2007).

PATENTS

Crystalline SiCN with a direct optical band gap of 3.8eV, U.S. Patent 53935705, Aug. 10,1999~2014

PUBLICATIONS

317 Scientific papers have been published in different scientific journals.

PROFESSIONAL MEMBERSHIP

Taiwan
Chinese Physical Society, Material Research Society
USA
American Physical Society

Session D1-W3-T3: Polymer Solar Cell

New Side-Chain Tethered Polythiophene for Heterojunction Solar Cell

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ABSTRACT

Conjugated polymers possessing extended arrays of delocalized π electrons are being investigated intensively for their potential use in organic optoelectronic devices, with some studies focused on solar cell devices incorporating bulk heterojunctions using conjugated polymers. For the past few years, first, we have successfully synthesized a series of regio-regular polythiophene copolymers that contain conjugated phenanthrenyl-imidazole moieties as side chains. The maximum power conversion efficiency improves to 2.80% (P82) from 1.52% (P3OT) (Advanced Functional Materials, 2007, 17, 3326). Second, We have introduced octylphenanthrenyl-imidazole moieties onto poly(3-hexylthiophene) chains and the electron transfer probability was at least twice than that of pure poly(3-hexylthiophene) when blended with [6,6]-phenyl-C61-butyric acid methyl ester. The maximum power conversion efficiency improves to 3.45% (P91) from 2.26% (P3HT) (Advanced Functional Materials, 2008, 18, 2356). Third, we have synthesized a new kind of intramolecular donor–acceptor side-chain-tethered hexylphenanthrenyl-imidazole polythiophene, PHPIT. The visible light absorption of the PHPIT/PCBM blend appears to be enhanced by the presence of the electron withdrawing hexylphenanthrenyl-imidazole. The more balanced electron and hole mobilities along with enhanced visible and internal light absorption in the device consisting of annealed PHPIT/PCBM blends contribute to a much higher short-circuit current density, which in turns lead to a power conversion efficiency of 4.1%, despite PHPIT having only 10 repeating units (Advanced Materials, 2009, in press). Additionally, we applied grazing-incidence small angle X-ray scattering (GISAXS) and grazing-incidence Wide angle X-ray diffraction (GIWAXD) simultaneously to study the nanophase separation of P3HT/PCBM active layers in bulk heterojunction solar cells annealed at various temperatures. This approach allowed us to investigate the effects of the sizes of the PCBM clusters and P3HT crystallites on the power conversion efficiencies of bulk heterojunction solar cells. It appears that improved power conversion efficiency requires the value of Rg of the PCBM clusters to be greater than 20 nm and the value of D100 of the P3HT crystallites to be greater than 16 nm for an active layer thickness of ca. 100nm (Advanced Materials, 2008, 20, 2573). The project is supported by National Science Council (NSC 97-2120-M-009-006).

Key words: solar cell, poly(thiophenes), polymers, nano-structured, angle X-ray scattering

BIOGRAPHY

EDUCATION

1976-1980	B.S., National Cheng Kung University
1987	Ph.D., Department of Chemical Engineering, University of Massachusetts, Amherst, Massachusetts, USA

WORK EXPERIENCE

May 2008 ~ date	Energy technology member, National Energy Project, Taiwan
Feb. 2008 ~ to date	Chairman, Dept. of Materials Science & Eng., National Chiao Tung Univ. Hsinchu, Taiwan
Oct. 2007 ~ to date	Chairman, Graduate Program for Science and Technology of Accelerator Light Source, National Chiao Tung Univ. Hsinchu, Taiwan
Oct. 2007 ~ July 2008	Chairman, Degree Program of Nano Science and Engineering, National Chiao Tung Univ. Hsinchu, Taiwan Chairperson, User Executive Committee members, National Synchrotron Radiation Reserach Center Vice Chairperson, Center for Nano Science and Technology, National Chiao Tung Univ. Hsinchu, Taiwan
Feb. 2001 – Aug. 2001	Visiting professor, Univ. of California, Berkeley, CA , Dept. of Chemistry
Aug. 1998~	Professor
Aug. 1993 – July 1998	Associate professor, Dept. of Materials Science & Eng., National Chiao Tung Univ. HsinChu, Taiwan
Dec. 1992 – July 1993	Manager, Polymer Division Industrial, Technology Research Institute, Taiwan
June 1989 – Nov. 1992	Research Associate, General Electric Company, Central Research Development
Apr. 1987 – May 1989	Visiting Scientist, Material Lab., Polymer Branch, Wright-Patterson Air Force Base, OH

HONORS

Outstanding Scholar Research Project, National Science Council, Taiwan (2008-2011)
3 SCI Journal papers received citations in the top 1% in the field of material science and chemistry since 2000, according to Essential Science Indications, Web. of Science.
1 SCI Journal paper was chosed as a highlight by Asia Materials and by Virtual Journal of Nanoscale Science & Technology in 2008.

AWARDS

Outstanding Research Award, National Science Council, Taiwan (2003)

PATENTS

4 R.O.C. patents, 6 pending patents (R.O.C. and USA)

PUBLICATIONS

Published peer-reviewed 82 SCI journal papers.

PROFESSIONAL MEMBERSHIP

Taiwan: Materials Research Society, Polymer Society
USA: American Chemical Society

Session D1-W3-T3: Polymer Solar Cell

ZnO Nanorod Hybrid Material for High Efficient Photovoltaic Device Fabrication of Submicron Optical Cavity by Using Laser Reformation Technique

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ABSTRACT

Polymer/nanorod hybrid solar cells are attractive for photovoltaic devices because of their advantages of light weight, low cost, high throughput using reel-to-reel deposition on flexible substrates. The performance of the polymer/ZnO nanorod hybrid solar cells based on poly(3-hexylthiophene) and methanofullerenes is improved increasing the thickness of the photoactive layer. The dependence of the optical absorption on the thickness of the photoactive layer is studied as a function of the spin-coating rate, which controls the time taken by the solvent to dry after the spin-coating process. The power conversion efficiency (PCE) is improved from 1.6 % to 2.7 % with the thickness of the photoactive layer from 240 nm to 350 nm by slowing the spin coating rate of the photoactive layer. With the slower spin-coating rate, the photoactive layer is thicker, and the polymer chains have longer time to self-organize and more effectively infiltrate into ZnO nanorod spacing, resulting in the higher crystallinity of the polymer and light harvesting without sacrificing the carrier transportation. In addition, device performance can be further improved by introducing a solution-processed fullerene interlayer between the photoactive layer and the ZnO nanorods to modify the ZnO nanorod surface. With this interlayer, the optical absorption of the photoactive layer increases due to the better infiltration of the organic film into the ZnO nanorods, compared to the photoactive layer without this interlayer. Our investigations show that the PCE is further improved to 3.2 % by this solution-processed interlayer. This work was supported by the National Science Council, Taiwan, Republic of China, with Grant Nos. NSC96-2221-E-002-277-MY3, NSC96-2218-E-002-025, and NSC97-2221-E-002-039-MY3.

Key words: Solar cell, polymer, nanorod, hybrid

BIOGRAPHY

EDUCATION
1989-1993 Ph.D., Cornell University, Ithaca, New York, USA

1986-1989 M.S., Cornell University, Ithaca, New York, USA
1979-1983 B.S., National Taiwan University, Taipei, Taiwan

WORK EXPERIENCE

1998-now Professor : Department of Electrical Engineering / Graduate Institute of Photonics and Optoelectronics / Graduate Institute of Electronics Engineering, National Taiwan University
1993-1997 Associate Professor : Department of Electrical Engineering / Graduate Institute of Photonics and Optoelectronics, National Taiwan University

HONORS

IEEE Lasers and Electro-Optical Society, senior member
Program Chair of EITC2005 Nanotechnology session, 2005
Board member of the 17th IEEE Taipei Section, 2008-2009

AWARDS

2003~2006	NSC Distinguished Research Award
1996/8/1~2001/7/31	NSC Class A Awards (five years)
1993/8/1~1994/7/31	NSC New Researcher Award
	18th Acer Research Golden Award
2000, 2004	14th and 18th Acer Research Excellent Award
1998,2001,2002,2004,2007	Collins Thesis Awards
2007, 2008	2007, 2008 Student paper award (Optics and photonics Taiwan)
2007	2007 Student paper award(Optical Engineering Society of the Republic of China)
2000	Li-Wei Innovation Paper Award
1986	Sage Graduate Fellowship
1986	College of Engineering Supplementary Fellowship

PATENTS

10 U.S. Patents; 22 Taiwan Patents

PUBLICATIONS

371 Scientific papers have been published in different scientific journals and conference proceedings. 1 books.

PROFESSIONAL MEMBERSHIP

IEEE Lasers and Electro-Optical Society, Optical Society of America, SPIE

Session D1-W3-T3: Polymer Solar Cell

Molecular Self-Assembly for Flexible Electronics

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ABSTRACT

Organic field-effect transistors (OFETs) based on π-conjugated materials are envisioned for a variety of large-area low-cost solution-processed/printed electronic applications, such as logic circuits, displays, sensors and electronic barcodes. The performance of pentacene-based OFETs is better than or comparable to that of amorphous Si in terms of charge carrier mobility and on/off current ratio. However, it is challenging to simultaneously achieve efficient manufacturing, high transistor performance and low power consumption in OFETs towards promising flexible electronics.

In this talk, our approach of molecular self-assembly will be highlighted to address these challenges. 1) Supramolecular self-organized organic semiconductors have been developed to realize both solution-processability and crystallinity (J. Am. Chem. Soc. 2006, 128, 5672. Appl. Phys. Lett. 2006, 88, 223112). 2) Self-assembled monolayer (SAM)/hafnium oxide (HfO2) hybrid nanodielectrics have been achieved to take the advantages of SAMs for control over the dielectric/semiconductor interface (surface roughness, surface energy, chemical compatibility, interfacial order and interfacial trap) with those of high-k metal oxides for low-voltage (<1.5 V) high-performance OFETs on rigid and flexible substrates (Adv. Mater. 2008, 20, 3697. Appl. Phys. Lett. 2008, 93, 083302. Appl. Phys. Lett. 2008, 92, 113303. Langmuir 2009, 25, 2140). 3) Thermally treated polymer nanolayer has been integrated as a buffer between organic semiconductor and dielectric to control interfacial molecular orientation and packing, affording a mobility of 4 cm2/V s and an on/off ratio of about 107-108 of pentacene-based OFETs.

Key words: Molecular self-assembly, organic field-effect transistor, flexible electronics

BIOGRAPHY

Hong Ma was born in Chongqing, P. R. China on July 17, 1970. He received a Ph.D. degree in Organic/Polymer Chemistry in 1997 from Nankai University, P. R. China, and a B.S. degree in Chemistry in 1992 from Nankai University, P. R. China.

He worked as a Postdoctoral Researcher from 1997 to 2001 and a Research Scientist from 2001 to 2006 in Prof. Alex Jen's group at Northeastern University and the University of Washington, Seattle. He is currently a Research Assistant Professor in the Department of Materials Science and Engineering, University of Washington, Seattle. His publications include 115 papers, 4 patents and 45 presentations on national and international conferences. His current research is focused on design, synthesis, processing and characterization of self-organized organic/polymer semiconductors/dielectrics, interface engineering via molecular self-assembly, and patterned/bio-enabled nanosystems for field-effect transistors, photovoltaics, plasmonics and biosensing.

Prof. Ma is a member of the American Chemical Society and Materials Research Society. He serves as a referee for many journals and proposals. He received awards and honors: Yang Shixian (Ex-chairman of the Chinese Chemical Society) Chemistry Scholarship, 1996, Nankai University Scholarship (Guanghua Funding), First Prize, 1993 and 1995, Honored with Outstanding Undergraduate Student at Nankai University, 1992 , Wang Kechang Scholarship at Nankai University, First Prize, 1990 and 1991, Freshman Scholarship at Nankai University, 1988.

Session D1-W4-T3: Design Automation

Session Organizer & Chair

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BIOGRAPHY

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Session D1-W4-T3: Design Automation

Manufacturing for Design

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ABSTRACT

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BIOGRAPHY

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Session D1-W4-T3: Design Automation

VLSI and LCD Process Variation Analysis and Cures

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ABSTRACT

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BIOGRAPHY

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Session D1-W4-T3: Design Automation

Scalable Hardware Synthesis and Verification with Craig Interpolation

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ABSTRACT

Recent advances in satisfiability (SAT) solving have been revolutionizing hardware/software synthesis and verification. Industrial-sized designs can be optimized and verified successfully. One of the most important enabling techniques is Craig interpolation, which was first applied in hardware model checking by McMillan in 2003. Since then, interpolation has been recognized and used in several different applications, e.g., hardware/software specification, abstraction/refinement in software model checking, type inference in program verification, hardware synthesis, and other areas. We show that interpolation can be useful in scalable exploration of functional dependency for designs with more than 200K gates and can be applied in scalable logic optimization and resynthesis for FPGA designs. Moreover, interpolation can be useful in logic bi-decmoposition and Ashenhurst decomposition for Boolean functions with more than 300 input variables. Also quantifier elimination for quantified Boolean formulas and determinization of large Boolean relations can also be done for constraint-based synthesis. We anticipate many more applications of Craig interpolation in the near future for scalable hardware/software synthesis and verification.

BIOGRAPHY

Jie-Hong R. Jiang received the B.S. and M.S. degrees in Electronics Engineering from National Chiao Tung University, Hsinchu, Taiwan, in 1996 and 1998, respectively. In 2004, he received the Ph.D. degree in Electrical Engineering and Computer Sciences from the University of California, Berkeley.

During his compulsory military service, from 1998 to 2000, he was a Second Lieutenant with the Air Force, R.O.C. Before joining National Taiwan University as an assistant professor in August 2005, he was with the University of California at Berkeley as a postdoctoral researcher. His current research interests include foundations of system construction, system analysis and verification, hardware synthesis and optimization, computation with quantum physics, and biological circuit analysis.

Dr. Jiang is a member of ACM, IEEE and the Phi Tau Phi Scholastic Honor Society.

Session D1-W1-T4: Green Energy

Session Organizer & Chair

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BIOGRAPHY

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Session D1-W1-T4: Green Energy

Biomass-Ethanol Conversion: A Renaissance of Fermentation Technologies

J. H. David Wu, PhD (吴政惠 教授)

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University of Rochester, 206 Gavett Hall, Rochester, NY 14627, USA
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ABSTRACT

Biomass conversion to ethanol as a liquid fuel offers a potential partial solution to the problem of the world's dependence on petroleum for energy.

Of the total gasoline usage in the U.S.A. as a transportation fuel and by industry, about half has to be imported. On a worldwide basis, terrestrial plants produce 1.3 x 1010 metric tons (dry weight basis) of wood per year, which is equivalent to about two-thirds of the world's energy requirement. Furthermore, tremendous amounts of cellulose are available as municipal and industrial wastes, which today contribute to our pollution problems. Thus, great interest exists in the use of cellulosic biomass as a renewable source of energy via breakdown to sugars that can then be converted to liquid fuel.

Neat (unblended) ethanol burns cleaner, has a higher octane rating, can be burned with greater efficiency, is thought to produce lower amounts of ozone precursors, thus decreasing urban air pollution, and is particularly beneficial with respect to low net CO2 put into the atmosphere. Furthermore, ethanol by fermentation offers a more favorable trade balance, enhanced energy security and a major new crop for a depressed agricultural economy. Ethanol is considerably less toxic to humans than is gasoline (or methanol). Ethanol also reduces smog formation because of low volatility; its photochemical reactivity and that of its combustion products are low. With the current and impending phase-out of methyl tert-butyl ether (MTBE) as an oxygenate in many states in the U.S.A., ethanol will fill the void.

The potential quantity of ethanol that could be produced from cellulose is over an order of magnitude larger than that can be produced from corn. In contrast to the corn to ethanol conversion, the cellulose to ethanol route involves little or no contribution to the greenhouse effect and has a clearly positive net energy balance (5 times better). As a result of such considerations, microorganisms that metabolize cellulose have gained prominence in recent year. The rate-limiting step in the conversion of cellulose to fuels is its hydrolysis, especially the initial attack on the highly-ordered, insoluble structure of crystalline cellulose

The presentation will review the need for a consolidated cellulosic ethanol fermentation process and discuss the industrial bioprocess of biomass-ethanol conversion.

BIOGRAPHY

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

He is a *Professor* of Chemical Engineering and of Biomedical Engineering at the University of Rochester in Rochester, NY. He is a leader in studying the biomass-degrading enzyme system of Clostridium thermocellum, a key bacterium in "Consolidated Processing" leading to bio-ethanol production. He directs a DOE-funded consortium to develop biomolecular strategies toward biofuel production employing this bacterium. His work has led to the discoveries of the modular structure of the now well-known cellulosomal scaffolding protein, the unique Family 48 of glycosyl hydrolases, the novel 3-D structure of the cellulosomal dockerin, and the first cellulase transcriptional regulator and operon in C. thermocellum. At the University of Rochester, he developed a novel 3-D bone marrow culture system conducive to multi-lineal blood cell differentiation. The 3-D culture system is being used as a model in three NIH- or BARDA-funded centers on developing countermeasures against bioterrorism, including vaccines and anti-radiation drugs. His research group continues to investigate the cellulosome mechanism, and transcription regulation concerning biomass degradation and bioethanol fermentation at the genome scale as well as molecular events governing blood cell formation.

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

Session D1-W1-T4: Green Energy

Smarter Energy

Jen-Yao Chung, PhD (鐘健堯 博士)

Senior Manager, Industry Technology and Solutions, IBM T. J. Watson Research Center
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ABSTRACT

Climate change, rising energy costs and resource constraints are increasing becoming global issues for government and business. The energy and environmental challenges that we face as a planet are daunting in their size and complexity. These global issues are driving new trends in the development of smart technologies. The emerging industry initiative applies information technology and services to reduce energy usage, energy costs, and carbon emissions, while embracing renewable forms of energy. In this talk, we will present strategies and solutions to address these challenges and enable energy and infrastructure transformation in the areas of smart cities, smart buildings, green IT and data centers, smart transportation systems, smart grids, advanced water management and renewable energy research that can lead to a more sustainable planet. We will conclude with our views on future trend, directions and research topics on smart energy.

BIOGRAPHY

Jen-Yao Chung received the M.S. and Ph.D. degrees in computer science from the University of Illinois at Urbana-Champaign. He is the senior manager for Industry Technology and Solutions, IBM T. J. Watson Research Center, responsible for identifying and creating emerging solutions with focus on "Green Computing and Business". Before that, he was Chief Technology Officer for IBM Global Electronics Industry. Before that, he was senior manager of the electronic commerce and supply chain department, and program director for the IBM Institute for Advanced Commerce Technology office. Dr. Chung is co-Editor in Chief of the International Journal of Service Oriented Computing and Applications (published by Springer). Dr. Chung is the co-founder and co-chair of the IEEE technical committee on Electronic Commerce. He has served as general chairs and program chairs for many international conferences. He has authored or co-authored over 160 technical papers in published journals or conference proceedings. He is a Fellow of IEEE and a Distinguished Engineer of ACM.

Session D1-W1-T4: Green Energy

Accelerate the Path to Renewable Energy by Business Model Innovation

Sean Shao-Hwa Wang, PhD (王韶華 博士)

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ABSTRACT

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BIOGRAPHY

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Session D1-W1-T4: Green Energy

Impact of Green Building on Global Warming
Global Green Building Code

Jeffrey S. Seigel, BS, JD, LEED AP

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ABSTRACT

This presentation focuses on the "Impact of Green Building on Global Warming" and discusses Fossil Fuels, Green House Gases, Global Warming, Sustainability, Green Building Technologies, LEED, EEWH and the Global Green Building Code. Professor Seigel would like to create and promote a "Global Green Building Code", as he believes doing so will provide an affordable, practical and immediate solution to exponentially reduce Global Warming.

In the United States, buildings account for 38% of CO2 Emissions, 72% of Electricity Consumption, 39% of Energy Use, 40% of Raw Materials Use, 30% of Waste Output and 14% of Potable Water Consumption. However, Green Buildings have accounted for 35% reduction of CO2 Emissions, 30% reduction of Energy Use, 50% reduction of Construction Waste and 50% reduction of Potable Water Consumption. As Green Building technology advances, buildings should endeavor to become carbon neutral.

BIOGRAPHY

Jeffrey Seigel earned his Doctorate in Law from Pace University School of Law in White Plains, NY. He studied International Law at the University of London and has Certifications in International Trade and Public International Law. He was a member of the International Law Review and interned in Barristers Chambers, London.

He is an Adjunct Professor in the Department of Civil Engineering, Polytechnic Institute of NYU; prior he has taught in the NYU Real Estate Program. Since 2002, he has been the Director of Marketing & Business Development for Pavarini Construction located in Stamford, CT; Pavarini is a member of the international Structure Tone Organization.
He is a LEED AP and actively lectures on Sustainability Issues. In February 2009, he lectured at the Rotary Club of Darien (Sustainability); March 2009, he lectured at the Taiwan Embassy (Green Building); August 2009, he will lecture at MIT (Impact of Green Building on Global Warming); October 2009, he will

participate on a United Nations GreenTech & Sustainability Panel and was asked to participate in the upcoming UN Homeland Security and Diversity Conferences. In Fall 2009, he will be lecturing at the University of Connecticut (Sustainability) and in October 2009, he will be lecturing at the Chinese Institute of Engineers Convention (Green Technologies).

Jeffrey Seigel participates on the Alumni Board at Pace University School of Law, the NYU-POLY Advisory Board and the Center for Emerging Technologies, Sustainable Stamford Corporate Energy Initiative, Co-Chair NAIOP Green/Energy Committee, Real Estate Committee of the March of Dimes and was asked by the University of Connecticut to help develop their Sustainability Certification Program. He would like to help create and promote a "Global Green Building Code", as he believes doing so will provide an affordable, practical and immediate solution to exponentially reduce Global Warming. He is also interested in Green IT, CleanTech, Corporate Sustainability, Nanotechnology, Biomimicry, Carbon Sequestration, Alternative Energy, Potable Water, Carbon Trading, National Grid, etc.

Session D1-W2-T4: Medicine and Public Health

Session Organizer & Chair

Hong-Yo Kang, PhD (康宏佑 教授)

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Chang Gung Memorial Hospital at Kaohsiung Medical Center,
Chang Gung University, Taiwan
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Email: hkang3@mail.cgu.edu.tw

BIOGRAPHY

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

In 2001, he was was recruited to Chang Gung University, Taiwan, where he is currently an Associate Professor of the Graduate Institute of Clinical Medical Sciences and the Director of the Center for Menopausal and Reproductive Researcher, Chang Gung Memorial Hospital at Kaohsiung Medical Center. He also serves as an Adjunct Associate Professor in the Department of Biological Sciences, National Sun Yat-Sen University. He has conducted many medical research projects in several major human diseases such as infertility, menopause, osteoporosis, rheumatoid arthritis, prostate cancer and androgenic alopecia by analyzing human sample biopsies. His primary research interests are focusing on studying the roles of both sex steroid hormones such as androgens and gonadal peptide hormones such as activins in both normal and abnormal reproductive, bone and cancer development by combining molecular biology and genomics tools with animal models and advanced in vivo imaging technologies. He has published more than thirty five (35) papers with and more than seventy five (75) papers presented at conferences and symposia. He has also served as the primary investigator (PI) of seven (7) research grants and Co-PI of thirty (30) funded research projects over 2.0 million US dollars in Taiwan for the past three years.

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

Investigator Award for 2006 International Osteoporosis Foundation of World Congress on Osteoporosis, intended for exceptionally talented, young scientists with exceptional creativity, vision, and productivity.

Session D1-W2-T4: Medicine and Public Health

Ubiquitination in Signal Transduction and Cancer

Hui-Kuan Lin, PhD (林慧觀 教授)

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Department of Molecular and Cellular Oncology
University of Texas M.D. Anderson Cancer Center, unit 108, Y7.6079
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ABSTRACT

Protein ubiquitination plays a critical role in numerous biological functions including cell cycle control, cell growth, apoptosis, DNA damage repair, immune functions, as well as neuron degeneration. Protein ubiquitination is originally thought to target proteins for 26S proteasome-dependent degradation. Very recently, protein ubiquitination is also found to play a non-proteolytic functions including protein trafficking, DNA damage repair, signaling activation. The aberrant ubiquitination signal has recently emerged to link to human cancers. The phosphophatidylinositol (PI) 3(OH)-kinase (PI3K)/Akt signal regulates many aspects of biological functions including cell proliferation, survival, metabolism, tumorigenesis an dmetastasis. Importantly, the deregulated PI3K/Akt pathway through the loss of PTEN tumor suppressor is associated with a verity of human cancers, and several mouse models with activated PI3K/Akt pathway support the role of PI3K/Akt pathway in cancer development. Here, I will discuss how E3 ligases coordinate with PTEN/PI3K/Akt signal to regulate the signaling transduction pathways and tumorigenesis.

BIOGRAPHY

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

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

Dr. Lin, an assistant professor at M.D. Anderson cancer center, received numerous awards including Gordon Research Travel Award in 1999, The GSS Travel award with Honorable Mention for Outstanding Quality from University of Rochester in 2000, the Travel Award in 2004 from Annual Meeting of the American Society of Hematology, the first author student award in 2004 from Molecular Endocrinology Journal, as well as the Research Trust Scholar Award in 2007 from M.D. Anderson Cancer Center. He has served a review panel in cell biology and genetic study section from Department of Defense. He has published more than 25 peer-reviewed articles in leading journals such as Nature, Science, and Nat. Cell Biol.,Mol.Cell, Science Signaling, and EMBOJ.

Session D1-W2-T4: Medicine and Public Health

Molecular Mechanisms and Clinical Relevance of Androgen and Androgen Receptor Actions

Hong-Yo Kang, PhD (康宏佑 教授)

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Chang Gung Memorial Hospital at Kaohsiung Medical Center,
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ABSTRACT

Androgens, principally testosterone and 5a-dihydrotestosterone, affect a number of diverse responses in a variety of peripheral target tissues. Their biological actions are mediated by an androgen-dependent nuclear transcription factor, the androgen receptor (AR). The AR is a member of the steroid hormone receptor family, which is necessary for proper function from sex differentiation during fetal, neonatal and postnatal development to the onset and the maintenance of reproductive capacity in sexual maturity and changes throughout aging and malignant transformation. The AR appears to play important mediators in multiple tissues for several androgens-related diseases that the coordinated interactions of multiple molecular networks are disturbed during both embryonic and adult development. In spite of the intensity of research activity in this area, many interesting questions regarding the fundamental mechanism of AR actions on androgen-related diseases, such as androgen insensitive syndrome, prostate cancer, male infertility and osteoporosis remain elusive. To characterize the roles of androgens/AR in these androgens-related diseases and AR-physiological functions, we have taken a systematic approach by combining molecular biology, genomics tools and animal models with advanced in vivo micro-CT imaging technologies. We also use gene targeting and embryonic stem (ES) cell technology to study "knock-out" mice deficient in the AR. Here we will provide a brief overview of androgens/AR actions on bone mineralization and prostate cancer metastasis, as well as the update progress of androgen treatment in elderly men and women. We will also present the evaluation and treatment of androgens in adult men with androgen-deficiency syndromes and postmenopausal women.

BIOGRAPHY

Hong-Yo Kang received his B.S. (1991) in Pharmacy and M.S. (1993) in Microbiology from the National Taiwan University. He received his Ph.D. (1999) from the University of Wisconsin, Madison in

Endocrinology and Reproductive Physiology, and was a postdoctoral fellow at the University of Rochester till 2000.

In 2001, he was was recruited to Chang Gung University, Taiwan, where he is currently an Associate Professor of the Graduate Institute of Clinical Medical Sciences and the Director of the Center for Menopausal and Reproductive Researcher, Chang Gung Memorial Hospital at Kaohsiung Medical Center. He also serves as an Adjunct Associate Professor in the Department of Biological Sciences, National Sun Yat-Sen University. He has conducted many medical research projects in several major human diseases such as infertility, menopause, osteoporosis, rheumatoid arthritis, prostate cancer and androgenic alopecia by analyzing human sample biopsies. His primary research interests are focusing on studying the roles of both sex steroid hormones such as androgens and gonadal peptide hormones such as activins in both normal and abnormal reproductive, bone and cancer development by combining molecular biology and genomics tools with animal models and advanced in vivo imaging technologies. He has published more than thirty five (35) papers with and more than seventy five (75) papers presented at conferences and symposia. He has also served as the primary investigator (PI) of seven (7) research grants and Co-PI of thirty (30) funded research projects over 2.0 million US dollars in Taiwan for the past three years.

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

Session D1-W2-T4: Medicine and Public Health

Vitamin D Metabolism and Its Role on the Natural History of Prostate Cancer

Tai Cheng Chen, PhD (陳泰成 教授)

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ABSTRACT

Seroepidemiologic and sunlight exposure studies support the hypothesis that vitamin D insufficiency is causally related to prostate cancer. The active form of vitamin D, 1α,25-dihydroxyvitamin D (1α,25$(OH)_2$D), exerts pro-differentiating, anti-proliferative, anti-invasive and anti-metastatic effects on prostate cells. The discovery that 1α,25$(OH)_2$D is an autocrine hormone in the prostate provides a link between the epidemiologic and experimental data and has opened a new window on the prostate cell. The recognition of an expanded role for vitamin D in the prostate suggests roles for vitamin D in many stages of the natural history of prostate cancer. For examples, men with clinical disease, especially those with disease that no longer responds to androgen withdrawal, may be candidates for using the active hormonal form of vitamin D or its less calcemic analogues, because the cancerous cells appear to have less ability to synthesize 1α,25$(OH)_2$D. Conversely, men at increased risk for prostate cancer, such as men with a positive family history or African-American men, may consider supplementation with 25-hydroxyvitamin D or vitamin D, as these drugs should be converted to 1α,25$(OH)_2$D intra-prostatically. Finally, all other men, especially those who live at extreme latitudes and who spend little time outdoors, may consider prophylactic supplementation with vitamin D. As vitamin D supplementation virtually eliminated rickets in the 20th century, whether vitamin D can reduce the burden of prostate cancer and other cancers is an exciting public health issue in the 21st century.

BIOGRAPHY

EDUCATION AND TRAINING
1964, B.S. Agricultural Chemistry, Chung-Hsing University, Taiwan
1968, M.S. Biochemistry, University of Missouri, Columbia, Missouri
1972, Ph.D. Biochemistry, University of Wisconsin, Madison, Wisconsin

Post-Graduate:
1972-1973 Biochemistry, University of Wisconsin, Madison, Wisconsin

1973-1974 Endocrinology, University of California, San Diego, California

Visiting Scientist/Guest Worker:
1977-1979 Neuropharmacology, National Institutes of Health, Bethesda, Maryland

EMPLOYMENTS AND PROFESSIONAL EXPERIENCES

1974-1979	University of Louisville, Department of Psychiatry
1979-1980	University of Arkansas, Department of Medicine
1980-1988	University of Pittsburgh, Director of Renal Research Laboratory
1988-Present	Boston University School of Medicine, Director of Core Laboratory,Clinical Translational Research Institute.
1990-1996	Consultant, Nichols Institutes Diagnostic, San Juan Capistrano, CA
1996-Present	Consultant, Quest Diagnostics, San Juan Capistrano, CA.

National and International Scientific Meeting Committee

A. Organizing Committee Member
   1. Oct. 1995 International Symposium on Biologic Effects of Light, Atlanta, GA
   2. Nov. 1998 International Symposium on Biologic Effects of Light, Basal, Switzerland
   3. Jun. 2001 International Symposium on Biologic Effects of Light, Boston MA
   4. Sep. 2004 Brown University Symposium on Vitamin D Research, Providence, Rhode Island
   5. Sep. 2005 Brown University Symposium on Vitamin D Research, Providence, Rhode Island

B. Symposium Section Chairperson
   1. Jun. 2001 International Symposium on Biologic Effects of Light, Boston MA
   2. Oct. 2001 6th World Congress on Advances in Oncology and 4th International Symposium on Molecular Medicine, Hersonissos, Crete, Greece, October 19, 2001.

C. Scientific Journal Reviewer
   Journal of Bone and Mineral Research,
   Carcinogenesis,
   Clinical Cancer Research,
   Oncogene,
   Endocrinology,
   Journal of Cellular Biochemistry,
   Future Oncology,
   Cancer Letters,
   Journal of Nutritional Biochemistry,
   Journal of Clinical Endocrinology and Metabolism,
   Journal of Molecular Endocrinology

MEMBERSHIPS IN PROFESSIONAL AND SCIENTIFIC SOCIETIES

1976	American Federation for University Professors
1981	American Society of Nephrology
1994	American Society of Bone and Mineral Research
1997	The Society for Investigative Dermatology, U.S.
2004	Endocrinology Society, US
2006	American Cancer Society

Session D1-W3-T4: NEMS and MEMS

Session Organizer & Chair

Jeff Tza-Huei Wang, PhD (王澤輝 教授)

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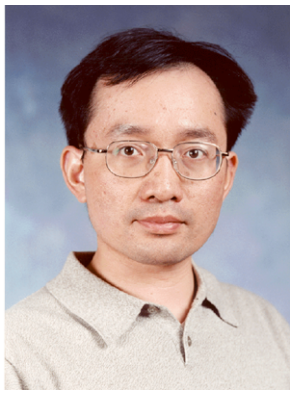
BIOGRAPHY



Dr. Wang received his B.S. and M.S. in Mechanical Engineering from National Taiwan University in 1988 and 1994. He served in the R.O.C. military service from 1994 to 1996 and then worked in Taiwan Semiconductor Manufacturing Company (TSMC) from 1996 to 1998. He received his Ph.D. in Mechanical Engineering from University of California, Los Angeles in 2002. After graduation, Dr. Wang joined The Johns Hopkins University as an Assistant Professor in the departments Mechanical Engineering and Biomedical Engineering, and was promoted to Associate Professor in 2006. He has published more than 50 peer-reviewed research manuscripts and filed 4 US patents. Dr. Wang received the NSF CAREER award in 2006, and the Jorge Heller Award for Outstanding Paper from the Control Release Society in 2007. The major research focus of his laboratory involves technology development in microfluidic single-molecule detection and nanobiosensors for molecular and cellular analysis of diseases.

Session D1-W3-T4: NEMS and MEMS

Creating the Next-Generation Small-Scale Machines for Precision Engineering, Microscopy and Biomedical Applications

Shih-Chi Chen, PhD (陳世祈 博士)

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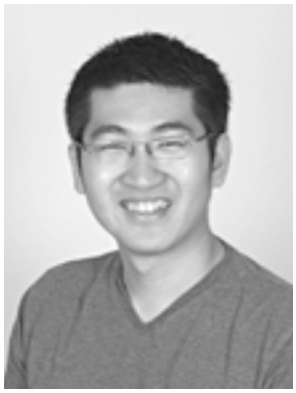
ABSTRACT

Study of nanoscale phenomena and biological systems has been the focus of researchers across different fields in recent years. Accordingly, small-scale machines such as biological imaging equipment, equipment for nanomanufacturing and instruments for nanoscale research are increasingly needed. These machines/positioning systems must be of small scale in order to achieve viable bandwidth (kHz), high resolution (nanometers), low cost ($10s/device) and high thermal stability (Å/min). Miniaturized precision machines require an integrated structure, powerful and efficient small-scale actuators, well-designed flexural bearings, and control systems. Unfortunately, the current state-of-the-art is not capable of simultaneously satisfying all of these requirements. For example, the design of an endoscopic scanner requires a micro-actuator to simultaneously generate high force (~10mN), stroke (~100 μ m) and bandwidth (~1kHz).

This talk will address these issues with examples from two projects: (1) Development of two-photon endomicroscope with sub-cellular volumetric imaging capability. The heart of the instrument is a thermally actuated 3-D micro-scanner that runs at 3.5kHz x 100Hz x 30Hz throughout a 125x200x200 μ m3 volume. This performance can be achieved by thermomechanical actuators (TMAs) through the use of two new design techniques that I developed—Geometric Contouring and Mechanical Frequency Multiplication. (2) Development of the μHexFlex, the first microscale six-axis nanopositioner that provides 0.6 nanometer repeatability and angstrom level resolution. The μHexFlex, which has a 2.5-mm device envelope, sandwiches a layer of silicon dioxide between two layers of silicon. The integrated TMAs can exert both in-plane and out-of-plane forces on the central stage and flexure bearings, and thus enable six-axis positioning.

The presentation will be concluded with future research directions, including the development of the next-generation small-scale biomedical devices/machine elements, and issues relating to light microscopy and endoscopy for minimally-invasive imaging.

BIOGRAPHY



Dr. Shih-Chi Chen received his B.S. degree in power mechanical engineering from the National Tsing Hua University, Taiwan, in 1999. Subsequently he received his S.M. and Ph.D. degrees in mechanical engineering from the Massachusetts Institute of Technology, Cambridge, in 2003 and 2007, respectively. He is currently a joint Research Fellow at the Laboratory for Manufacturing and Productivity of MIT and Wellman Center for Photomedicine of Massachusetts General Hospital, Harvard Medical School. He was also the recipient of a 2003 R&D 100 Award for the design of a microscale six-axis nanopositioner. His research is focused on the design and development of next-generation micro- to meso-scale electromechanical devices and optical systems for precision and biomedical applications.

Session D1-W3-T4: NEMS and MEMS

General Electric Manipulations of Microfluids

Shih-Kang Fan, PhD (范士岡 教授)

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ABSTRACT

Manipulating liquids and particles therein is an essential task in microfluidics. Among all the manipulations, the electric means is a promising one with the features of compact system size, simple device fabrication and packaging, etc. It is because, in such a device, external liquid pumps and physical microchannels are not necessary. In this presentation, two important electric manipulations are introduced, including electrowetting-on-dielectric (EWOD) and Dielectrophoresis (DEP).

On the one hand, EWOD describes a change of surface wettability caused by voltage application across a dielectric layer between an electrode and liquid. It has been widely studied in droplet actuations for the applications of droplet-based lab-on-a-chip, liquid lenses, and displays. However, liquids driven by EWOD efficiently are usually aqueous in a droplet form. Pumping dielectric droplets or pumping aqueous liquids continuously is not feasible. On the other hand, DEP drives polarizable particles suspended in a liquid medium by non-uniform electric fields. Not only polymer microspheres, biological objects including cells, proteins, and DNA, have been successfully actuated by DEP. Moreover, DEP would generate a surface force exerting on liquids to drive a liquid of a high permittivity toward the high electric field regions of a low permittivity.

Based on the integration of EWOD and DEP, we have recently developed several functions demonstrating the electric manipulations are general for microfluidics. In the presented devices, electric manipulations would be applied to (1) objects of different scales (droplets and particles), (2) droplets of different conductivities (water and oil droplets), and (3) different formation of microufluids (droplets and virtual microchannels). Firstly, by altering the frequency of the applied signal, voltage would drop in the dielectric layer to cause EWOD or in the liquid generate DEP. With the proper electrode designs, cells and particles suspended in a droplet would be concentrated by DEP. By splitting the concentrated droplet, two droplets of different concentrations were achieved. Secondly, the DEP force exerting on liquid would drive dielectric (oil) droplets. A device actuating oil and water droplets concurrently were reported. Thirdly, continuous liquid pumping in an electric-field-formed virtual microchannel has been investigated by using DEP. In such a device, liquid would be pumped in a droplet form or in a continuous virtual microchannel by frequency modulations.

BIOGRAPHY

Shih-Kang Fan received the Ph.D. degree in mechanical and aerospace engineering from the University of California at Los Angeles in 2003. He joined the faculty at National Chiao Tung University in 2004 and is an Assistant Professor at the Institute of Nanotechnology. His research is in microfluidics by electrokinetics.

Session D1-W3-T4: NEMS and MEMS

Industrial Applications of MEMS - From Implantable Silicon Probe to Optical Switch

Pinyen Lin, PhD (林斌彥 博士)[1], Jingkuang Chen, PhD[2]

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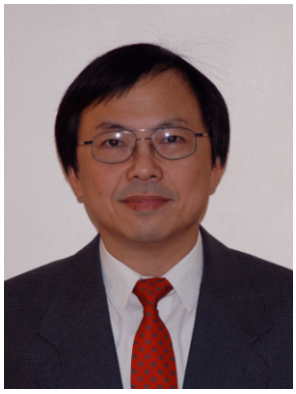
[2]Department of Electrical and Computer Engineering, University of New Mexico
Albuquerque, New Mexico 87131, USA

ABSTRACT

In recent years, MEMS devices have been applied to many industrial applications. The projected growth rate would be 15% annually for the next five years. In this talk, the author will discuss the MEMS design, fabrication, and issues of several industrial applications. The first example is the implantable silicon probe. Many biomedical applications such as ultrasonic imaging and drug delivery can be built with this device. The second example is the thermal ink jet printhead, which is considered as the largest MEMS production in industry. As the ink fluid runs through the electronics, the packaging and process integration are keys to the success of the design. The third example is the optical switches and multiplexers for optical network. The active MEMS structures are made of single crystal silicon on SOI wafer to significantly improve the optical quality of the planar waveguides.

BIOGRAPHY



Dr. Pinyen Lin has been involved in the development of microfabrication process and material characterization for MEMS (Microelectro mechanical systems) for more than 17 years. He received his Ph.D. degree in Materials Science and Engineering at M.I.T. in 1990 and B.S. degree from National Taiwan University in 1982. Dr. Lin is currently a senior member of research staff at Xerox Research Center Webster. He has worked on various R&D projects in design, simulation, fabrication, and packaging of microsystem devices such as microfluidic dispensers, ink jet print heads, implantable ultrasonic image array, hyperspectral imager, and optical switches. His recent interests include nanotechnology for surface treatment, bioMEMS, CMOS-MEMS process integration, and MEMS technology transfer at Infotonics Technology Center (a government-sponsored MEMS foundry). Dr. Lin has extensive collaboration experience with NSF, Department of Defense, and New York State Technology Council. Currently he serves as Chairman of the User Committee at Cornell NanoScale Facility. He has received the Xerox Excellence Award in 1998 and has more than 50 U.S. patents and patent applications.

Session D1-W3-T4: NEMS and MEMS

Convergence of Quantum Dot Biosensors and Microfluidic Single Molecule Spectroscopy for Molecular Analysis of Diseases

Jeff Tza-Huei Wang, PhD (王澤輝 教授)

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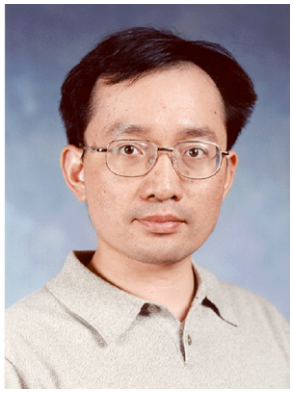
ABSTRACT

Genomic analysis of biomarkers, including genetic markers such as point mutations and epigenetic markers such as DNA methylation, has become a central theme in modern disease diagnosis and prognosis. Recently there is an increasing interest in using single-molecule detection (SMD) for genomic detection. The driving force not only comes from its ultrahigh sensitivity that can allow the detection of low-abundance nucleic acids with reduced or without the need of amplification but also from its potential in achieving high-accuracy quantification of rare targets via single-molecule sorting. We have developed highly sensitive, quantitative and clinically relevant technologies for analysis of genomic markers based on the convergence of SMD, microfluidic manipulations, and quantum dot fluorescence resonance energy transfer technology (QD-FRET). Extraordinary performances of these new technologies have been exemplified by analysis of a variety of biomarkers including point mutations, DNA integrity and DNA methylation in clinical samples.

BIOGRAPHY



Dr. Wang received his B.S. and M.S. in Mechanical Engineering from National Taiwan University in 1988 and 1994. He served in the R.O.C. military service from 1994 to 1996 and then worked in Taiwan Semiconductor Manufacturing Company (TSMC) from 1996 to 1998. He received his Ph.D. in Mechanical Engineering from University of California, Los Angeles in 2002. After graduation, Dr. Wang joined The Johns Hopkins University as an Assistant Professor in the departments Mechanical Engineering and Biomedical Engineering, and was promoted to Associate Professor in 2006. He has published more than 50 peer-reviewed research manuscripts and filed 4 US patents. Dr. Wang received the NSF CAREER award in 2006, and the Jorge Heller Award for Outstanding Paper from the Control Release Society in 2007. The major research focus of his laboratory involves technology development in microfluidic single-molecule detection and nanobiosensors for molecular and cellular analysis of diseases.

Session D1-W4-T4: C4I

Session Organizer & Chair

Chen-Mou Cheng, PhD (鄭振牟 教授)

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BIOGRAPHY

Chen-Mou Cheng received his BS and MS in Electrical Engineering from National Taiwan University in 1996 and 1998, respectively, and PhD in Computer Science from Harvard University in 2007. He joined the Department of Electrical Engineering at National Taiwan University in 2007, where he is currently an Assistant Professor.

His research interest spans cryptology and cryptanalysis, information security and privacy enhancement technologies, computer and wireless communication networks, and high-performance embedded computing. He currently works in the area of high-performance cryptographic computing.

Session D1-W4-T4: C4I

Low Power Wireless Communication Makes the World Freedom of Connect

Z.K. Cheng (鄭志剛) - VP/Chief Architect
Peter C Mei (梅家駒) - CEO/President

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ABSTRACT

The new wireless could transform not only the way we communicate but also how we pay for it. Some analysts think today's cell phone model - a private network of towers that charges for access - is looking a little dated in the face of "infrastructure-free" networks where devices would talk directly among themselves. Not everyone believes Wi-Fi will go that direction, and the technology faces big obstacles. But if it does reach critical mass, it could storm the cell phone industry with the same momentum that carried cheap IBM clones past Apple personal computers two decades ago. An opportunity driven Open Wireless Architecture will be the stimulus en-power the wireless connections anytime, anywhere and anyone available.

In order to achieve the above-mentioned eco-friendly world, ODMA(Opportunity Driven Multiple Access) technology has been evaluated, tested and demonstrated with latest 802.11n technology.

BIOGRAPHY

Z.K. Cheng – VP, Chief Architect

Z.K. Cheng Born in Taipei Taiwan 1950,
• President, US Solar Silicon, Inc., Carrollton, Texas
• Over 25 years experience on telecommunications
• Senior Manager, Nortel Corp., Richardson, Texas
• Director, NetRake Networks, Texas
• VP of Product Development, Point Reyes Networks, California
• Co-Founder and General Manager, AIP Communications, Texas

OVERVIEW:

Over the 30 years telecom experiences of system engineering and network architecture. Feasibility Analysis, technical strategic planning, generation and maintenance of business and technical/software requirements, design, development & testing including disaster recovery plan. Product delivered to customer and put in services for multiple companies.

- Collaborate very well with business analysts, product development and architecture teams on developing and deploying new capabilities, integrating various products and services and defining/driving Service improvement initiatives
- Negotiates & Works very well with vendors, with multiple inter-organizations to achieve project deliverables on schedule effectively and efficiently
- End to End Systems engineering, Project Management & Strategic Planning with Risk Management analysis
- Strong technical expertise on Telecom, IP Networks & Signaling protocols specialized in wireline and wireless integration.
- Adherence to appropriate standards and best practices (RFC's, IEEE,s 3GPP etc)
- Ability to adapt quickly to new technologies and areas.

PATENTS:

- US patent 1987 granted, network equal access device
- US patent 1996 granted, Indoor wireless base station RF propagation model
- US patent 2000 granted, Wireless network inter-working algorithm
- US patent 2006 pending, VoIP conference packet stream mixing algorithm
- US patent 2007 pending, PSTN and VoIP gateway apparatus

Session D1-W4-T4: C4I

Telecom Transformation and Business Model Required for Future Telematics Services

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ABSTRACT

The research topic titled with "Telecom Transformation and Business Model Required for Future Telematics Services" is a Customer-based model to implement and manage Next generation Technology. The case of Telematics Services has a lot of annotated technologies to support to them. The overview of customer-based to implement and manage next generation technology has mainly concerned with the following topics:

- Telecom transformation
- Business Model exploratory
- Performance evaluation and Strategy study on Network Value growth.

The values of a broadcast network are proportional to the number of viewers stated by Sarnoff's law (2005). The broadcast TV network is a standard example of Sarnoff's law. The observation on Odlyzko's law is that amusing business compared with other business is a small business and is also a little business when it is compared with Telecom business. People regarded as communication is more interesting than amusement. Therefore, "amusement contents" is NOT the killer application in the worldwide web and just one kind of major application. However, we found that

- If the Sarnoff's law is valid, then TV program is the King.
- If the Metcalfe's law is valid, then transaction is the King.
- If the Reed's law is valid, the Social group is the King.

BIOGRAPHY

Shing Tenqchen was born in Chia-Yi, Taiwan, R.O.C. in 1955. He received the Bachelor Science (B.S.) degree in from Tamkang University, Tamsui, Taiwan, R.O.C. in 1977 and Master Science (M.S.) degree from Tennessee Technology University (TTU), Cookeville, Tennessee, USA in 1983, all in Mechanical Engineering. He obtained his Ph.D. degree from the department of Electrical Engineering of National Taiwan University (NTU) in 2005. He is an assistant professor at National Taipei University Technology

for the department of Industrial Engineering & Management. From 1983 to 1989, and from 1989 to 1994, he served as an assistant researcher and associate researcher, at Chunghwa Telecom Telecommunication Laboratories (CHTTL), respectively. From 1994 to 2000, he became a researcher, and now is a senior researcher in the CHTTL.

Dr. Tenqchen was a recipient a Best paper award of 7th International Conference Exhibition on Multichip Modulus and High Density Packaging (MCM). He has been a director of VLSI/ATE center in 1989 to 1997 at CHTTL. He also joined the testing program of Electronic Toll Collection in Taiwan from 1997 to 2003. He was a key member in the research topics given by the Institute of Transportation in MOTC, called "Helping the Collection Traffic Information by RFID System" from 2004 to 2006. Right now, he is the chief executor of Intelligent Transportation System project given by the Institute of Transportation in MOTC, called "The Integration of Traffic Information on the platform of On-Board Unit and set-up the Traffic Value-Chain Research" from 2007 to 2010.

Dr. Tenqchen was a senior member of IEEE/IEICE. He was a book chapter author of RFID System integration Design with Existing Websites via EPCglobal-like Architecture for Expensive Material Handling, titled with Development and Implementation of RFID Technology in 2009. His interests are in VLSI architecture, algorithms, and chip design for digital signal processing (DSP), wireless broadband communication systems. It includes the robust control design, H∞ (H-infinity) Control, nonlinear system design, digital filter design, and management theories. He obtained the golden prize of Taipei International Invention and Technology in 2005.

Session D1-W4-T4: C4I

Cryptographic Computing on Graphics Cards

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ABSTRACT

Modern graphics cards achieve high-throughput general-purpose computation via massive parallelism. After decades of remarkable growth, the performance of single-thread processors has slowed down, hitting both the power and ILP walls. To respond, the entire industry is now moving to the massive parallelism paradigm to exploit the increasing transistor budget offered by the Moore's law in semiconductor fabrication technologies. The graphics processing units (GPUs) on graphics cards are an example of computing devices with many simple cores. So far, they have been considered for cryptographic applications mainly for symmetric cryptography and more recently also for public-key cryptography. In this talk, we will demonstrate that they are useful and cost-effective for general cryptographic computing. To illustrate, we will report and compare state-of-the-art performance of integer factorization, an important cryptanalysis technique, using various computing devices including GPU (NVIDIA CUDA), Cell (both Playstation 3 and the newer QS 22), and the latest 64-bit x86 processors (Intel Core 2 and AMD Phenom II).

BIOGRAPHY

Chen-Mou Cheng received his BS and MS in Electrical Engineering from National Taiwan University in 1996 and 1998, respectively, and PhD in Computer Science from Harvard University in 2007. He joined the Department of Electrical Engineering at National Taiwan University in 2007, where he is currently an Assistant Professor.

His research interest spans cryptology and cryptanalysis, information security and privacy enhancement technologies, computer and wireless communication networks, and high-performance embedded computing. He currently works in the area of high-performance cryptographic computing.

Conference Dinner (By Invitation)

Hosted by

Lou-Chuang Lee, PhD (李羅權 博士)

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BIOGRAPHY

Dr. Lee graduated from National Taiwan University and earned his Ph.D. in physics from the California Institute of Technology. From 1978 to 1995, he was a professor in physics department of University of Alaska. After returning to Taiwan, he became Dean of National Cheng Kung University's College of Science (1995-2001), President of the National Space Organization (2001-2004), President of the National Applied Research Lab. (2003-2006), President of the National Central University (2006-2008) and in May 2008 was appointed Minister of the National Science Council.

Session D2-W1-T1: Nuclear and Hydrogen Energy

Session Organizer & Chair

Minking K. Chyu, PhD (邱民京 教授)

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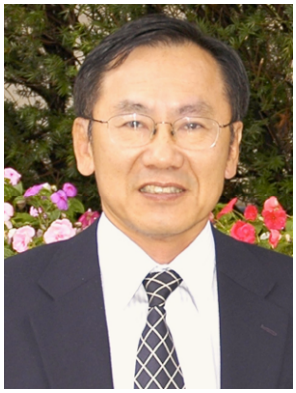
BIOGRAPHY



Dr. Minking K. Chyu is presently the Leighton Orr Chair Professor and Chairman of Mechanical Engineering and Materials Science Department at the University of Pittsburgh. He received his Ph.D. degree in Mechanical Engineering from the University of Minnesota in 1986. He was a faculty member at Carnegie Mellon University for 14 years before joining the University of Pittsburgh in 2000. His primary research activity lies in thermal issues relating to power and propulsion systems, which has been funded by several national turbine programs, e.g. HOST, IHPTET, and DOE-UTSR, and turbine industry, e.g. Pratt and Whitney, Siemens, and Solar Turbines. Professor Chyu is a recipient of NASA Certificates of Recognition for his contribution on space shuttle program, Air Force Summer Research Fellow, Department of Energy Oak Ridge Research Fellow, and DOE Advanced-Turbine-System Faculty Fellow. He is a Fellow of the American Society of Mechanical Engineers (ASME), Associate Fellow of American Institute of Aerospace and Aeronautics (AIAA), and a US delegate to the Scientific Council of the International Centre of Heat and Mass Transfer (ICHMT). He was named the Engineer of The Year by the ASME Pittsburgh Chapter in 2002. In 2007, he was elected as Institute-of-Advanced-Energy-System (IAES) Fellow by the National Energy Technology Laboratory (NETL), Department of Energy. He serves as an Associate Editor for the Journal of Heat Transfer, ASME, a Guest Editor for AIAA Journal of Propulsion and Power in Turbine Science and Technology, and an Advisory Board Member, International Journal of Fluid Machinery and Systems. He has published more than 200 technical papers in archive journals and conference proceedings.

Session D2-W1-T1: Nuclear and Hydrogen Energy

A Preliminary Study of High Temperature Gas Cooled Reactor and Hydrogen Production in Taiwan

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ABSTRACT

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BIOGRAPHY

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Session D2-W1-T1: Nuclear and Hydrogen Energy

A View of Nuclear Hydrogen Production in Large Scale Power Generation System

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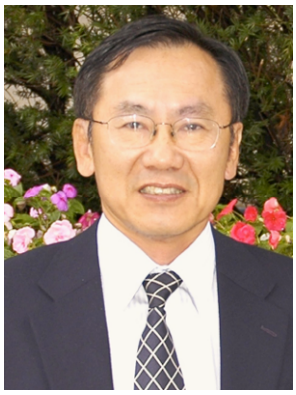
ABSTRACT

Striving for independence of scareced oil and gas supply and alleviation of global environment/climate change, hyrdogen economy is being proposed as an enery roadmap toward the future. To realize hydrogen economy will require overcoming many technical, social, and policy chanllenges. Proponents of hydrogen economy argue that hydrogen has the potential for replacing essential all gasoline and elimiating almost all CO_2 from vehical emission over the next 50 years. Research and development programs pertaining to hydrogen economy has been gaining significant momentum since the new mellenium. While success of hydrogen economy is somewhat uncertain, there are four fundatmental technological and technical challenges: to develop (1) effective and low-cost hydrogen production processes, (2) infrastructure of hydrogen storage and transportation for light vehicles, (3) economic and durable fuel cell technology, and (4) technology to capture and sequester CO_2 byproduct of hydrogen production from coal. This presentation will begin with an overview of the worldwide energy landscape and growth in demand versus supply. The significance of large-scale power generation systems and their contributing roles in the future hydrogen economy will be elaborated. This includes the novel concepts of coal-hydrogen hybrid systems with substantially elevated cycle efficiency. This will be followed by examining various hydrogen production technologies and relevant issues pertaining to storage and transportation. Particular emphasis will be directed to high-temperature steam electrolysis and thermochemical decomposition processes in association with advanced nuclear reactors. Potential design options and technical challenges in the development of thermochemical reactors for a hybrid sulfur process in conjunction with advanced nuclear reactor will be discussed.

BIOGRAPHY



Dr. Minking K. Chyu is presently the Leighton Orr Chair Professor and Chairman of Mechanical Engineering and Materials Science Department at the University of Pittsburgh. He received his Ph.D. degree in Mechanical Engineering from the University of Minnesota in 1986. He was a faculty member at Carnegie Mellon University for 14 years before joining the University of Pittsburgh in 2000. His primary research activity lies in thermal issues relating to power and propulsion systems, which has been funded by several national turbine programs, e.g. HOST, IHPTET, and DOE-UTSR, and turbine industry, e.g. Pratt and Whitney, Siemens, and Solar Turbines. Professor Chyu is a recipient of NASA Certificates of Recognition for his contribution on space shuttle program, Air Force Summer Research Fellow, Department of Energy Oak Ridge Research Fellow, and DOE Advanced-Turbine-System Faculty Fellow. He is a Fellow of the American Society of Mechanical Engineers (ASME), Associate Fellow of American Institute of Aerospace and Aeronautics (AIAA), and a US delegate to the Scientific Council of the International Centre of Heat and Mass Transfer (ICHMT). He was named the Engineer of The Year by the ASME Pittsburgh Chapter in 2002. In 2007, he was elected as Institute-of-Advanced-Energy-System (IAES) Fellow by the National Energy Technology Laboratory (NETL), Department of Energy. He serves as an Associate Editor for the Journal of Heat Transfer, ASME, a Guest Editor for AIAA Journal of Propulsion and Power in Turbine Science and Technology, and an Advisory Board Member, International Journal of Fluid Machinery and Systems. He has published more than 250 technical papers in archive journals and conference proceedings.

Session D2-W1-T1: Nuclear and Hydrogen Energy

Boiling Heat Transfer Enhancement of Nanoparticle Thin Film Coatings

Lin-Wen Hu, PhD (胡玲文 博士)

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ABSTRACT

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BIOGRAPHY

Lin-wen Hu (Nuc Eng PhD, 1996; MS, 1993; MIT; Nuc Eng MS, 1991; BS, 1989, National Tsing-Hua University) is the Associate Director for Research Development and Utilization at the MIT Nuclear Reactor Laboratory (NRL). She directs NRL's research program, irradiation services, and outreach activities and is responsible for the development, design, and safety reviews of major reactor experiments. Her research interests include fluid dynamics and heat transfer, computational fluid dynamics simulations, fission reactor design and safety analysis, and research reactor applications.

Dr. Hu holds a Senior Reactor Operator license for the 5MW MIT Research Reactor issued by the US Nuclear Regulatory Commission, and is a licensed Professional Engineer in the State of Massachusetts. Among other professional activities, she served as the Chairperson of the Isotope and Radiation Division of the American Nuclear Society (ANS) and recently as a member of the National Academies study committee on "State of the Science of Nuclear Medicine". The research projects she is currently working on include transport phenomena and two-phase heat transfer properties of nanoparticles colloids (nanofluids) and enhancement of boiling heat transfer with nanoparticle coatings funded by DOE's Infrastructure in Nuclear Innovations and Education (INIE) program, Electric Power Research Institute (EPRI), AREVA, ABB Corporate Research; and MIT Research reactor conversion feasibility study supported by DOE's Reduced Enrichment Research and Test Reactor (RERTR) program. Dr. Hu is also a Principal Investigator of the Advanced Test Reactor National Scientific User Facility (ATR-NSUF).

Dr. Hu is a member of the American Nuclear Society and American Society of Mechanical Engineers, and has authored more than 90 peer-reviewed papers and technical reports.

Session D2-W2-T1: Biomedical Imaging Technology

Session Organizer & Chair

Yin-Ching Iris Chen, PhD (陳盈靜 博士)

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BIOGRAPHY

Dr. Chen (Radiology Science & Health Science and Technologies PhD, 19997, MIT, Cambridge, MA, USA; Biomedical Engineering, MS, 1991, YangMing Medical College, Taipei Taiwan; Electrical Eng, BS, 1989, National Taiwan University, Taipei, Taiwan) is a senior research faculty at Athinoula A. Martinos Center for Biomedical Imaging, Massachusetts General Hospital, Boston, MA, USA. Her research focuses on neuroscience using functional magnetic resonance imaging (fMRI) to study brain function, both in humans and animals. She is one of the pioneers in brain fMRI with pharmacological intervention (phMRI), particularly in the field of neurotransmitter-mediated neuromodulation such as the dopaminergic system. This work has served as a new drug-discovery and validation tool in the pharmaceutical industry. Her research interests include neuro-degeneration, neuro-regeneration, drug abuse, neuronal ontogeny, satiation perceptions, acupuncture. Dr. Chen is a member of the Society of Neuroscience.

Session D2-W2-T1: Biomedical Imaging Technology

Constructing a Rich Internet Application (RIA) framework for PACS

Chia-Hung Hsiao, PhD (蕭嘉宏 教授)

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ABSTRACT

Many modern hospitals have constructed PACS (Picture Archiving and Communication System) for performing digitalized and integrating image exam processes. Currently, PACS is based on DICOM (Digital Imaging and Communications in Medicine) standard for integration. DICOM is a successful and wildly accepted standard in the domain of radiography. However, current PACS architecture has the limitation for handling more sophisticated image viewing requirements; A general purpose DICOM viewer can handle most of 2D images (CT, MR, CR, ultrasound, etc.). Few of DICOM viewers can handle overlaps and waveforms (such as radiotherapy planning results and ECG waveform) properly. And lots of examinations (cardiology, dental, ophthalmology, and mammography etc.) have domain specified image viewing and measurement requirements. Currently, we do not have a DICOM image viewing system that can handle all the image related objects defined in DICOM standard. However, the need for viewing all the healthcare information is the foundation for physicians to perform proper judgment for better healthcare. Integrating and viewing all medical exams data would be the first step of patient oriented healthcare. For viewing all clinical exam reports in a single user interface, IHE (Integration the Healthcare Enterprise) had addressed a simple profile (RID: Retrieve Information for Display) for accessing clinical reports that generated from different departments. And physician can utilize browser for accessing and navigating all the reports. Clinical documents could be HTML, HL7 CDA, or PDF formats that be displayed on browser. RID like wed solution would be a proper architecture for next generation of medical information systems. The only shortage is that web solution usually has limited functionalities comparing with conventional window applications. However, the shortage has gradually overcome by more powerful web technologies (RIA: Rich Internet Application). Browser with RIA web pages could be a powerful and unique user interface for handling sophisticated data and applications. We will use a RIA technology (Microsoft Silverlight) for handling multimedia clinical data. We will demo how to use the RIA solution to present 2D medical images, ECG waveform, pathology microscope image, and RT planning result on browser. We will follow the framework of IHE RID for integrating clinical data generated from different departments. Consequently, clinicians can use browser as a unique user interface for acquiring all the clinical data located in different departments. And the data could be presented appropriately and processed freely by adopting the RIA technologies in the web based framework. We will show the power of the RIA solution. The limitation and drawback of the RIA solution will also be addressed in the study. Finally, some considerations for bringing the RIA solution into real usage will also be discussion in this research.

BIOGRAPHY

Chia-Hung Hsiao was born in Taiwan 1965. He got Ph.D. degree in biomedical engineering department, NYMU (National Yamg Ming University), Taipei, Taiwan, in 2000. His Ph.D. research topic is about computer simulation of Cardiac depolarization and ECG. And he interested in computer graphics, medical image processing, and artificial intelligent at that time.
After graduated, he had been working in research department of THESE Corp. for developing LIS (Laboratory Information System) and PACS (Archiving and Communication System). After that, he was the chief of System Administration Section, in Computer and Communication Center of NYMU for more than 6 years. The major work at this time was developing and handling e-campus and e-learning solution. And many advance PACS research projects had been investigated in cooperated with BME department of NYMU and Cancer center of Taipei VGH Taipei (Veterans General Hospital) at the time. In 2007, he left NYMU and joined department of medical informatics of Tzu Chi University as an Assistant Professor till now.

Since he was study in NYMU, he paid lots of attention for DICOM standard. And in 1999, he assisted CSIST (Chungshan Institute of Science and Technology) for developing DICOM viewer and server. He and CSIST joined the IHE (Integrating the Healthcare Enterprise) first and second years (1999, 2000) connectathon testing and demonstration. The information of IHE project had been feed back to DOH (Department of Health) of Taiwan after 1999 demonstration in Chicago (RSNA). And the information brought Taiwan paid attention to healthcare standard and promoted Taiwan joining HL7 and DICOM organizations in 2001 and 2002. He has been committee member of MISAT (Medical Image Standards Association of Taiwan) for many years. And he has focused on the solution of healthcare system integration and standardization for more than 10 years.

Session D2-W2-T1: Biomedical Imaging Technology

Clinical Application of Diffusion MRI

J.-Y. George Chiou, PhD (邱志遠 博士)

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ABSTRACT

Diffusion MR imaging provides a novel way to characterize tissues based on sensitivity to the microscope molecular motion of water. The success of diffusion MRI, which was introduced in the mid 1980s, is deeply rooted in the powerful concept that during their random, diffusion-driven movements water molecules probe tissue structure at a microscopic scale well beyond the usual image resolution. The diffusion techniques are increasingly varied, from the simplest and most commonly used technique-the mapping of apparent diffusion coefficient values-to the more complex, such as diffusion tensor imaging, q-ball imaging, diffusion spectrum imaging, and tractography. The type of structural information obtained differs according to the technique used.

Diffusion-weighted MR imaging is particularly sensitive for detection of acute ischemic stroke and differentiation of acute stroke from other processes that manifest with sudden neurologic deficits. Furthermore, it also provides adjunctive information for other cerebral diseases including neoplasms, intracranial infections, traumatic brain injury, and demyelinating processes.

Diffusion tensor imaging characterizes directional nature of water motion in directionally-ordered cellular structures and thereby provides structural information that cannot be obtained by standard anatomic imaging. Quantitative apparent diffusion coefficients and fractional anisotropy have emerged from being primarily research tools to methods enabling valuable clinical applications. This talk will review some of its commoner clinical applications, such as cerebral ischemia, brain maturation and traumatic brain injury, as well as its potential use in diseases such as epilepsy, multiple sclerosis, and Alzheimer's disease.

BIOGRAPHY

George is a Visiting Assistant Professor of Radiology at Brigham and Women's Hospital, Harvard Medical School. He received his Ph.D. from Department of Electrical and Computer Engineering, University of California, Irvine. During his Ph.D. study, he worked in distortion correction of EPI images due to different sources, such as B0 inhomogeneity and gradient field imbalance between different polarities. His current

research interests include functional MRI, diffusion MRI, and corresponding post-processing. For example, he currently is working on a 3D phase-encoded diffusion EPI sequence with navigator, which will yield high SNR of diffusion weighted images with high b-value, but with limited motion artifacts.

Session D2-W2-T1: Biomedical Imaging Technology

Using High-Resolution Multi-Sliced CT for Coronary Angiography

Chun-Shan Sam Yam, PhD (任鎮山 博士)

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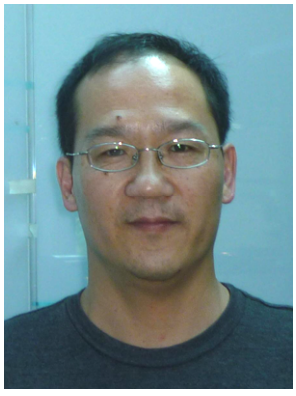
ABSTRACT

Multi-sliced CT (MSCT) is now a common system for diagnostic medical imaging. Although the fundamental configuration of MSCT is similar to that of the conventional single-sliced CT, the much wider imaging range (5 - 10 cm compared to 5 mm) provides a variety of new clinical and research applications. One of these new applications is high resolution coronary angiography, a special clinical examination for detecting heart disease. Based on the clinical results reported from many medical institutions, this CT based angiography is a promising alternative to conventional fluoroscopic angiogram. There are two main advantages of using CT angiography: non-invasive and high resolution. CT angiography is conducted the same way as regular CT examination which does not require catheter insertion into the heart chambers. Therefore, it eliminates the risk of puncturing the coronary structures - a common side effect in conventional angiogram. Also, because of the nature of three-dimensional (3D) reconstruction, MSCT provides 3D images of the heart anatomy in high pixel resolutions (<0.5mm). Furthermore, many researchers are taking the advantage of the real time imaging of MSCT to study functional behaviors of heart as well. This presentation will provide a technical review of this new clinical CT application with typical results obtained at the Beth Israel Deaconess Medical Center, a major teaching hospital of Harvard Medical School.

BIOGRAPHY



Dr. Chun-Shan Yam received his Ph.D. degree from MIT Nuclear Engineering department in 1995. He is now serving as the director of clinical and academic computing of radiology at the Beth Israel Deaconess Medical Center in Boston. He is also the assistant professor of radiology of the Harvard Medical School. Dr. Yam's research is focused on medical informatics research and development.

Session D2-W2-T1: Biomedical Imaging Technology

Pharmacological MRI, Neuroscience, Neurodegeneration, and Drug Discovery

Yin-Ching Iris Chen, PhD (陳盈靜 博士)

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ABSTRACT

Brain is like a complex machine which requires different brain parts and units to perform synergetically for functional execution. Neurotransmitters are among the key factors that transduce neuronal signal and modulate brain performance. In general, action of neurotransmitter involves the release of neurotransmitter to synaptic cleft, binding to designated receptors on the target neurons to initiate cascading chemico-geno reactions in the functional pathway. Status and function of a neurotransmitter system can be probed using pharmacological ligand designated for the selected receptors. Such pharmacological induced neuronal activities can be detected by functional MRI (fMRI), dubbed as pharmacological MRI (phMRI). Examples of phMRI probing dopaminergic function in the brain will be discussed. With the challenge of D-amphetamine, a dopamine releasing ligand, phMRI maps brain areas with high dopaminergic activity and exposes the associate functional circuitry. Abnormality of dopaminergic function, present in conditions such as Parkinson's disease and substance addiction, can be detected readily by phMRI. Similarly, phMRI can be used to evaluate the therapeutic efficacy of targeted intervention, such as stem-cell transplantation in Parkinson's disease. Effect of acupuncture in the dopaminergic system will also be discussed. In summary, whole brain mapping of neurotransmitter function with phMRI reveals neuronal activity at the neurotransmitter action sites, and also the systematic activity over the functional pathway --- a great gateway for drug discovery.

BIOGRAPHY

Dr. Chen (Radiology Science & Health Science and Technologies PhD, 19997, MIT, Cambridge, MA, USA; Biomedical Engineering, MS, 1991, YangMing Medical College, Taipei Taiwan; Electrical Eng, BS, 1989, National Taiwan University, Taipei, Taiwan) is a senior research faculty at Athinoula A. Martinos Center for Biomedical Imaging, Massachusetts General Hospital, Boston, MA, USA. Her research focuses on neuroscience using functional magnetic resonance imaging (fMRI) to study brain function, both in humans and animals. She is one of the pioneers in brain fMRI with pharmacological intervention (phMRI), particularly in the field of neurotransmitter-mediated neuromodulation such as the dopaminergic system. This work has served as a new drug-discovery and validation tool in the pharmaceutical industry. Her

research interests include neuro-degeneration, neuro-regeneration, drug abuse, neuronal ontogeny, satiation perceptions, acupuncture. Dr. Chen is a member of the Society of Neuroscience.

Session D2-W3-T1: Nanotechnology - Fuel Cell

Session Organizer & Chair

Kung-Hwa Wei, PhD (韋光華 教授)

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BIOGRAPHY

EDUCATION

1976-1980	B.S., National Cheng Kung University
1987	Ph.D., Department of Chemical Engineering, University of Massachusetts, Amherst, Massachusetts, USA

WORK EXPERIENCE

May 2008 ~ date	Energy technology member, National Energy Project, Taiwan
Feb. 2008 ~ to date	Chairman, Dept. of Materials Science & Eng., National Chiao Tung Univ. Hsinchu, Taiwan
Oct. 2007 ~ to date	Chairman, Graduate Program for Science and Technology of Accelerator Light Source, National Chiao Tung Univ. Hsinchu, Taiwan
Oct. 2007 ~ July 2008	Chairman, Degree Program of Nano Science and Engineering, National Chiao Tung Univ. Hsinchu, Taiwan Chairperson, User Executive Committee members, National Synchrotron Radiation Reserach Center Vice Chairperson, Center for Nano Science and Technology, National Chiao Tung Univ. Hsinchu, Taiwan
Feb. 2001 – Aug. 2001	Visiting professor, Univ. of California, Berkeley, CA , Dept. of Chemistry
Aug. 1998~	Professor
Aug. 1993 – July 1998	Associate professor, Dept. of Materials Science & Eng., National Chiao Tung Univ. HsinChu, Taiwan
Dec. 1992 – July 1993	Manager, Polymer Division Industrial, Technology Research Institute, Taiwan
June 1989 – Nov. 1992	Research Associate, General Electric Company, Central Research Development
Apr. 1987 – May 1989	Visiting Scientist, Material Lab., Polymer Branch, Wright-Patterson Air Force Base, OH

HONORS

Outstanding Scholar Research Project, National Science Council, Taiwan (2008-2011)
3 SCI Journal papers received citations in the top 1% in the field of material science and chemistry since 2000, according to Essential Science Indications, Web. of Science.

1 SCI Journal paper was chosed as a highlight by Asia Materials and by Virtual Journal of Nanoscale Science & Technology in 2008.

AWARDS
Outstanding Research Award, National Science Council, Taiwan (2003)

PATENTS
4 R.O.C. patents, 6 pending patents (R.O.C. and USA)

PUBLICATIONS
Published peer-reviewed 82 SCI journal papers.

PROFESSIONAL MEMBERSHIP
Taiwan: Materials Research Society, Polymer Society
USA: American Chemical Society

Session D2-W3-T1: Nanotechnology - Fuel Cell

Carbon Nanotubes for Energy Storage and Conversion Devices

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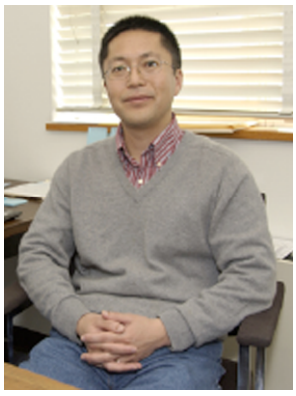
ABSTRACT

Research in the development of new materials for energy storage and conversion applications is an ongoing pursuit in the development of high energy and power density power sources. Carbon nanotubes (CNTs) have been full of surprises since their discovery and this trend continues. Utilizing CNTs and their composites for various energy storage and conversion applications such as electrodes in lithium ion batteries and supercapacitors and as catalyst supports in fuel cells are under close scrutiny because of the promising electrochemical performance of such materials. In this presentation, I will report our research efforts in assembling CNT composites using chemical vapor deposition and wet chemistry methods. A simple method for forming a homogenous composite of a-MnO2 and SWNTs has been demonstrated and a long cycle performance study at a high current for the composites has been studied. An in-situ formation of a sandwich composite structure involving copper oxide, CNTs and copper, lead to an improved electrochemical performance with a reversible capacity of 220 mAh/g at high cycling rate of 50 C. The improvement in electrochemical performance has been addressed with a model involving a sandwiched composite structure, which can be extended to other metal oxides/CNT composites. I will also discuss their electrochemical properties as electrode materials for energy conversion devices.

Key words: Carbon Nanotubes, Nanocpmposites, Li-ion battery, Supercapacitor, Solar energy, Hydrogen production.

BIOGRAPHY



Dr. Bingqing Wei (B. Q. Wei) received his Bachelors degree (1987), M.S (1989), and Ph.D. (1992) in Mechanical Engineering from Tsinghua University, Beijing, China. His research expertise lies in nanomaterials and nanotechnology.

He is currently an Associate Professor in the Department of Mechanical Engineering at the University of Delaware, USA. He was an Assistant Professor in the Department of Electrical & Computer Engineering and Center for Computation & Technology at Louisiana State University from 2003 to 2007. He had

worked as a Post-doctorate Research Associate at Rensselaer Polytechnic Institute, Department of Materials Science and Engineering and Rensselaer Nanotechnology Center from 2000 to 2003. Dr. Wei was a visiting scientist for Max-Planck Institut für Metallforschung, Stuttgart, Germany in 1998 and 1999. He was a faculty at Tsinghua University in Beijing from 1992 to 2001.

Prof. Wei is a member of The Materials Research Society (MRS), The Electrochemical Society (ECS), The International Society for Optical Engineering (SPIE), and The American Society of Mechanical Engineering (ASME). His scholarly achievements in the field of nanomaterials and nanotechnology and, particularly in the research of carbon nanotubes are fully reflected from his 160 papers published in refereed international journals, including Nature and Science, more than 85 scientific conference presentations and 65 plus invited talks and seminars in academia and industry worldwide. His research work has been cited more than 5000 times by peer scientists and has also been highlighted many times in scientific journals, web journals and public media. His recent research focuses on controllable synthesis of macroscale nanotube architectures with 1-, 2-, and 3-dimensions; physical, chemical, electrochemical and mechanical property characterizations of nanotubes; and nanotube device applications.

Session D2-W3-T1: Nanotechnology - Fuel Cell

Microphase Seperation Nanostructure and Nanoparticles for Proton Exchange Membranes Used in Fuel Cells

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ABSTRACT

Fuel cells based on proton exchange membranes including PEMFC (proton exchange membrane fuel cell, with H2 as fuel) and DMFC (direct methanol fuel cell, with methanol as fuel) have drawn dramatically increasing attention in the past decade as an environmental benign power source for their low operation temperatures used in a variety of applications. Perfluorosulfonic acid (PFSA) membranes (e.g. Nafion) are the mostly used material for PEM; however, the major drawbacks of these membranes are the loss of water at elevated temperature and high methanol crossover so that the power conversion efficiency of the devices is limited. Extensive researches have been conducted to develop new membranes to achieve high proton conductivity at elevated temperature and low relative humidity as well as low methanol permeability. One approach to enhance the proton conductivity is to construct a nanostructure containing well-organized proton conducting channels so that the ion-exchanging functional groups can be utilized effectively. For the past two years, we developed a series of new sulfonated block copolymers which are able to self-assemble into microphase separation structures to achieve high proton conductivity. The effect of molecular weight, composition, and preparation conditions on the nanostructure and the properties of the membranes were also investigated. Composite membranes are another favorite approach to enhance methanol blocking and water retention of PEMs. The composition, size and distribution of inorganic fillers are critical to the transport properties of the composite membranes. We synthesized sulfonated zirconium phosphonates (ZrSPP) nanoparticles with various compositions, crystal sizes and particle sizes by controlling the reaction parameters. The obtained ZrSPP nanoparticles exhibited high intrinsic proton conductivity and the resulted composite membranes with Nafion as the ionomer showed a much improved selectivity (proton conductivity/methanol permeability) by 4 times without sacrificing proton conductivity. These membranes also showed high proton conductivity (0.1 S/cm) at 120oC and 50% RH. To further improve homogeneous dispersion of the ZrSPP nanoparticles, we synthesized novel core-shell nanoparticles with ZrP (zirconium phosphate) as the core and sulfonated polystyrene as the shell. These new particles were prepared from surface modified ZrP with TEMPO initiator and grafting-from polymerization. The observed particle size was around 20~50nm without aggregation. The project is supported by National Science Council (95-2623-7-002-018 and 97-2623-7-002-015-ET).

Key words: Fuel cell, block copolymer, self-assembly, proton exchange membrane, PEMFC, DMFC, composite membrane, nanoparticle, core-shell

BIOGRAPHY

EDUCATION

2003-2005	Postdoctoral Research Associate, Northwestern University, Evanston, IL, USA
1999-2003	Ph.D., Materials Science and Engineering, Cornell University, Ithaca, NY, USA
1997-1999	M.S., Materials Science and Engineering, Cornell University, Ithaca, NY, USA

WORK EXPERIENCE

2006-now	Assistant Professor of Materials Science and Engineering, National Taiwan University
2005-2006	Researcher, Materials and Chemical Research Laboratory, Industrial Technology Research Institute, Hsin-chu, Taiwan

RESEARCH INTERESTS

Design and synthesis of multifunctional polymer/soft materials/composite materials and their self-assembly behavior for applications in nanotechnology, organic solar cells, fuel cells and biomedical engineering.

SELECTED PUBLICATIONS

1. Chao, C.-Y.; Carvajal, D.; Szleifer, I.; Shull, K. “Drop Shape Analysis of Receptor-Ligand Binding at the Oil/Water Interface”, Langmuir 2008, 24(6), 2474.
2. Osuji, C. O.; Chao, C.-Y., Ober, C. K.; and Thomas, E. L., "Supramolecular Microphase Separation in a Hydrogen-Bonded Liquid Crystalline Comb Copolymer in the Melt State," Macromolecules 2006, 39, 3114.
3. Lee, B. P.; Chao, C.-Y.; Nunalee, F. N.; Motan, E., Shull, K. R., and Messersmith, P. B. "Rapid Gel Formation and Adhesion in Photocurable and Biodegradable Block Copolymers with High DOPA Content," Macromolecules 2006, 39, 1740.
4. Chao, C.-Y., Li, X., Ober, C. K., Osuji, C.-Y., and Thomas, E. L., "Orientational switching of mesogens and microdomains in hydrogen-bonded side chain liquid crystalline block copolymers using AC Electric Fields," Advanced Functional Materials 2004, 14(4), 364.
5. Chao, C.-Y., Li, X., and Ober, C. K., "Directing Self-assembly in Macromolecular Systems: Hydrogen Bonding in Ordered Polymers," Pure and Applied Chemistry 2004, 76(7/8), 1337.
Over 20 scientific papers have been published in different SCI journals, including Advanced Functional Materials and Macromolecules, and conference proceedings, such as ACS, MRS national meetings and World Polymer Congress, related to materials science and nanotechnology.

PROFESSIONAL MEMBERSHIP

Taiwan: Materials Research Society, Polymer Society
USA: American Chemical Society, Materials Research Society

Session D2-W3-T1: Nanotechnology - Fuel Cell

Converting an Inconvenient Truth into a Convenient Business

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ABSTRACT

The object of this project is to work out a pathway to "bootstrap" into financial success such that **The Inconvenient Truth** can be converted into **Convenient Business** that creates worldwide opportunities for many decades to come. This proposal present a far superior competing technology than those described in page 9 through page 14 of Carbon Sequestration Technology Roadmap and Program plan, 2007.

The basic technology that this proposal is based on is the Solvay Soda Ash Process that has been in the mainstream of chemical industry for more than a century. American Chemical Society has published monograph series No. 65 in 1942 (2nd ed.) authored by Te-Pang Hou titled "Manufacture of soda, with special reference to the ammonia process; a practical treatise" describing all aspects of the industry including design details. By adapting Solvay Process, carbon capture is depending on a proven technology that has reasonably low financial risk with carbon dioxide capture capability **far exceeding** the 90% capture goal as specified in the 2007 Carbon Sequestration Roadmap. What we proposed here is based on sound scientific and engineering principles beyond feasibility issue as proven by Solvay Process' successful historical record. In Solvay Process, sodium bicarbonate is less water-soluble than sodium chloride in the basic buffered solution, and precipitate from the mother liquid which contains ammonium chloride, sold in liquid form to sugar-cane farmers to produce sugar-ethanol.

The objectives of this project are to achieve the objectives set in 2008 Carbon Sequestration Technology Roadmap page 9, namely:
90 percent carbon dioxide capture;
99 percent storage performance; And
10 percent increase in the cost of energy services.

The last objective is beyond the 20 percent increase in COE (cost of electricity) as required by this solicitation. (Page 5)
Our approach is based on the successful Amine carbon-capture technology, now adding 40% in COE services, with the following alternations:
Use the simplest form of amine, namely ammonia instead of methyl amine or ethyl amine, etc;
Employ Solvay Process as sequestration means without recycling ammonia;
Use the ammonium chloride so obtained as fertilizer for sugarcane subsequently producing sugar-ethanol for revenue; Produce and sale sodium bicarbonate, the other product of Solvay Process, at small enough quantity not to upset the market, and later, channel sodium bicarbonate into construction material usage;
Apply cash flow management on revenue so generated to achieve 10 percent increase in cost of energy services. Details will be presented in sections following.

This proposal intends to establish an economic/financial showcase to demonstrate a **profitable** project for CO_2 capture by ramping up the capacity at a rate not to exceed that permitted by market conditions for profitable operations since Carbon Capture and Storage (CCS) is a huge worldwide project that its impact on economy **must be dealt with first** for long term success.

BIOGRAPHY

Peter C. Mei – Chairman/CEO

Mr. Mei was born June 4th, 1955 in Saigon/VN. After finished his high school in Vietnam, he fled out of Saigon by ship and arrived Taiwan in 1972. He earned a BSEE from National Taiwan U. in 1977 and MSEE in Solid State Electronics from Rutgers University in 1983.

During his tenure at TI from ’84 to ‘97, he worked in process control on 0.8-1.2um CMOS fab. 0.8-0.5um Radiation-hardened SOI SRAM development. 0.25, 0.18 and 0.13um CMOS device and isolation technology development for logic DSP. Later, he worked as a member of Technical Staff for TI Corporate R&D on Power Device & Analog/Mix-signal ICs.

Currently, Mr. Mei is Chairman/CEO of 21-Century Silicon, Inc. in Garland, Texas, a silicon material solution company to develop innovative, low-cost Si-material for renewable energy and solar-cell since May’06. President/CEO of iCHIPdesign International, Inc., An innovation materials & technology solutions, Fabless IC “Design+Technology”, Before that, he was Exec.VP of Energy Saving Technology Co. and VP, Technical Marketing & Sales(Asia) of GlobiTech Inc. Responsible for develop company’s Epitaxy foundry business, Discrete/Power Epi products promotion and value-added IPs. Promoting value-added epitaxy Si material solution, Strained-Si/SiGe, sSOI, GOI and low cost 300mm. As project manager of Infineon International Technology Transfer Management team to transfer 64M/256M DRAM to Taiwan ProMOS startup and harmonization to Infineon Dresden fab., and 0.18/0.13um Core Logic/eDRAM technology to Essonne, France.

Mr. Mei had 25 years of technology R&D, engineering, IC design, and semi & solar material marketing experience. He holds eight patents (6 on LCD HV CMOS devices, 2 on Silicon material) and has published 28 technical papers. He is a Senior Member of IEEE.

Peter and his wife Agnes reside in Plano, Texas since ’84, raising two college kids and a ten year old daughter, who keep him from empty nest too soon before he can even thinking of retirement.

Session D2-W4-T1: Multi-Processor

Session Organizer & Chair

Wei Hwang, PhD (黃威 教授)

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BIOGRAPHY

Professor Wei Hwang received the M. Sc and Ph.D. degrees in electrical engineering from the University of Manitoba, Canada in 1970 and 1974, respectively.

From 1975 to 1978, he was Assistant Professor of Electrical Engineering at Concordia University in Montreal., Canada. From 1979 to 1984, he was Associate Professor of Electrical Engineering at Columbia University in New York, NY, USA. From 1984 to 2002, he was a Research Staff Member at the IBM Thomas J. Watson Research Center, Yorktown Heights, NY, USA, where he worked on high performance DRAM and microprocessor design. In 2002, he joined National Chiao Tung University (NCTU) in Hsinchu, Taiwan, where he holds a Chair Professor of Electronics Engineering. During 2002-2008, he served as Director of Microelectronics and Information Systems Research Center. During 2003-2007, he also served as Co-Principal Investigator of National System-on-Chip (NSoC) Program in Taiwan. From 2005 to 2007, he was Vice President and Acting President of NCTU.

He has received several IBM Awards, including sixteen IBM Invention Plateau Invention Achievement Awards, four IBM Research Division Technical Awards, was named an IBM Master Inventor. He has also received the CIEE Outstanding Electrical Engineering Professor Award in 2004 and Outstanding Scholar Award from the Foundation for the advancement of Outstanding Scholarship for 2005 to 2010. Dr. Hwang is the coauthor of the book "Electrical Transports in Solids-with particular reference to organic semiconductors", which has been translated into Russian and Chinese. He has authored or coauthored over 180 technical papers in renowned international journals and conferences, and holds over 150 international patents (including 65 U.S. patents). He has presented numerous plenary, invited or tutorial papers/talks at international conferences. He has served as the General Chair of 2007 IEEE SoC Conference (SOCC 2007) and the General Chair of 2007 IEEE International Workshop on Memory Technology, Design and Testing (MTDT 2007). He is severing as a Supervisor of IEEE Taipei Section for 2007 to 2010. He is a Life Fellow of IEEE.

Session D2-W4-T1: Multi-Processor

H.264 Video CODEC

Kenneth Hsu, PhD (許根旺 教授)

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ABSTRACT

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BIOGRAPHY

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Session D2-W4-T1: Multi-Processor

Microdisplay for Mobile Video Revolution

Bor-Yeu Tsaur, PhD (曹伯禹 博士)

Executive Vice President and General Manger, Kopin Corporation
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ABSTRACT

Microdisplays have been researched for over a decade, and are now emerging as enablers for many important applications. These include consumer products such as electronic viewfinders (EVF) for camcorders and digital cameras, video eyewear for entertainment and communication, as well as pocket or embedded pico-projector. In addition, microdisplays are used in military and surveillance arena as thermal and night vision imagers.

In this presentation, recent advances in microdisplays and their exciting applications will be reviewed. In particular, this presentation will highlight Cyberdisplay technology, a proprietary high-performance microdisplay technology pioneered by Kopin.

The CyberDisplay is the highest-pixel-density, full-color, transmissive AMLCD. The key behind this achievement is the use of IC-quality single-crystal Si TFT pixel transistors on glass for transmissive LCD displays. The use of single-crystal transistors allows the pixel size to be much smaller than those for LCD TVs, laptop computer screens, and projector displays. By use of innovated compact optics, however, the microdisplay can be magnified to yield a virtue image equivalent to a 50-60 inch TV viewed from 2 meter distance. Exciting mobile video products are now possible with Cyberdisplay that can be bundled with a wide range of portable devices such as smart phone, netbook, and iPod.

The CyberDisplay LCD is readily manufacturable and more than 30 millions CyberDisplay products have been shipped for consumer and military applications. The technology is very scalable, and a full range of resolutions and sizes are commercially available from 0.16-in diagonal displays (about the size of a grain of rice) to 0.77-in diagonal displays for full-color SXGA resolution. A further increase in pixel density is expected, resulting in continual reduction in size, power consumption, and cost.

Future is Bright for Microdisplays!

BIOGRAPHY

Bor-Yeu Tsaur received the B. S. Degree from the National Taiwan University in 1977 with top honor and the Ph. D. Degree in Electrical Engineering from the California Institute of Technology in 1980. His Ph. D. thesis on "Ion-Beam-Induced Modifications of Thin-Film Structures and Formation of Metastable Phases" was recognized as important pioneer research in the field of particle-solid interaction. He was invited to contribute an article on "Ion-Beam Mixing" in McGraw-Hill's Encyclopedia of Science and Technology.

Dr. Tsaur joined MIT Lincoln laboratory in 1980 and served as Director of the Electronic Material Group from 1985 to 1997. At Lincoln Laboratory, he was involved in advance research in many areas, including solar cell technology, silicon-on-insulator VLSI technology, radiation-hardened electronics, high-speed optical electronics, infrared imaging sensors, and flat panel displays. He joined Kopin in 1997 as Executive Vice President and General Manager of Display business unit. He led the development and commercialization of the award winning Kopin Cyberdisplay products. He also pioneered the newly announced breakthrough Digital iVision technology for the new generation of mobile video eyewear. Dr. Tsaur has published over 160 technical papers and has coauthored 30 patents.

Session D2-W4-T1: Multi-Processor

Sense and Avoid Technology for Unmanned Aircraft Access to National Airspace

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ABSTRACT

Use of unmanned aircraft (UA) has been quickly grown for military applications and explosive growth also expected for commercial applications. However, for these growths to be realized UA must be fully integrated with manned aircraft and be allowed to "file and fly" like manned aircraft. One technological barrier for such full integration is the lack of an onboard sense and avoid (SAA) system capable of providing UA with the ability to autonomously detect and avoid collisions with other aircraft. SAA problems/needs, various candidate technologies, an overall system-of-system solution approach, and recent flight test results will be discussed.

Key words: sense and avoid (SAA), unmanned aircraft, file and fly, autonomous control, sensor data integration, collision avoidance

BIOGRAPHY

Dr. Won-Zon Chen is a Technical Fellow with Northrop Grumman Corporation, a prime contractor for military aircraft, space, electronics, ship, and information technology. Dr. Chen received his bachelor degree from National Taiwan University and Ph.D. from University of California Los Angeles (UCLA), both in electrical engineering. Dr. Chen has 28 years of experience in aerospace industry. He has been involved in F-20 fighter aircraft, YF-23 Advanced Tactical Fighter, and F-35 Joint Strike Fighter development programs. He is currently devoted to developing autonomous control technologies for unmanned aircraft (UA). In particular, the sense and avoid (SAA) group that he leads has produced industry-leading results and is the recipient of the San Fernando Valley Engineers' Council (SFVEC) 2006 Distinguished Engineering Project Achievement Award..

Session D2-W1-T2: Micro- and Nanoscale Energy Systems

Session Organizer & Chair

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BIOGRAPHY

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Session D2-W1-T2: Micro- and Nanoscale Energy Systems

Sensor Network for Energy-Saving Applications

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ABSTRACT

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BIOGRAPHY

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Session D2-W1-T2: Micro- and Nanoscale Energy Systems

Green lifestyle technology development for energy saving

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ABSTRACT

Taiwan has very limited domestic energy resources and 95% energy is reliant on imports. Taiwan energy conservation policy proposes a general mechanism of increasing energy efficiency by 2% annually, the short-term to year 2010, and long-term to year 2020 annual energy-saving targets is of 0.25, and 0.9 EJ. For residual sector, the energy-saving amount per year is 20.5 PJ and 93.8 PJ for short-term and long-term respectively. That indicates almost 20% energy efficiency improvement of all home appliances. It's quite difficult to meet these targets if only depends on the facility improvement. An alternative way is the green lifestyle that one should come to for all of your energy saving bulbs, electric car conversions, organic clothing and so on. However, many people are trying to live more sustainably, but how to do that isn't always easy. Our studies tried to use novel technologies to make the energy saving control efficiently and effectively. A batteryless and wireless sensor network was developed for occupancy detection and air conditioning energy saving control. A miniaturized RFID reader integrated with a power outlet module was developed to show the electricity usage information on a RFID card in your packet. Smart lighting control can focus the lights around occupants. Integrating the LED lighting, RFID system and sensor networks, we can have a smart living space. Save energy can be achieved at the same time. Through the information exchange, we can know the energy waste in the environment and try to save it. Finally, we will know even the machine can work in high efficiency, only the men can stop the energy waste to achieve energy efficient living!!

BIOGRAPHY

Dr. Dasheng Lee received PhD degree in mechanical engineering from the National Taiwan University in 2004. Afterwards, he joined the Department of Energy and Refrigerating Air Conditioning Engineering of National Taipei University of Technology as an assistant professor. In 2007 he was promoted to associate professor.

From 2004 to 2009, Dr. Lee has published more than 10 research papers in SCI journals and got 10 patents. Most patents have been licensed to Taiwan local companies. His research interests include energy harvesting chip design, energy saving control, sensor network and energy conservation for civil buildings. Except energy-related researches, he also dedicated to the development and promotion of RFID technology.

Currently, he cooperated with EPCglobal Taiwan to build the RFID engineer certification program for engineers and trainers.

Session D2-W1-T2: Micro- and Nanoscale Energy Systems

Third Generation Solar Cells

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ABSTRACT

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BIOGRAPHY

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

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

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

Session D2-W1-T2: Micro- and Nanoscale Energy Systems

Applications of Guided Mode Resonance device in Communication, LED and PV

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ABSTRACT

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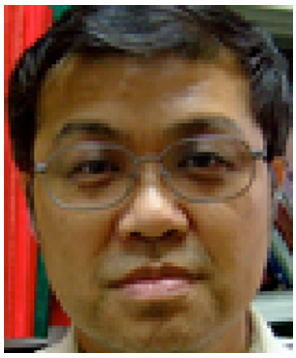
BIOGRAPHY



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Session D2-W2-T2: Medicine and Public Health

Session Organizer & Chair

Jeng-Shin Lee, PhD (李政欣 博士)

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BIOGRAPHY

Dr. Jeng-Shin Lee is the Deputy Director of Harvard Gene Therapy Initiative, an organization founded in 1998 within Harvard Medical School with the objective of promoting the use of gene transfer technology in both research and therapeutic applications. Over the last ten years, his group has been primarily responsible for the development of three cell based products intended for cancer immunotherapy, the development of both research and clinical grade production of adeno-associated viral vectors targeting neuromuscular systems, as well as newer generation lentiviral vector systems. The work has supported four approved investigational new drug (IND) applications in the United States and Europe, in collaboration with physician scientists at Dana Farber Cancer Institute and elsewhere.

Before joining Harvard Gene Therapy Initiative in 1999, Dr. Lee received post-doctoral training at Whitehead Institute, MIT, and Children's Hospital, Boston. Prior to that, he received his PhD in Virology from Harvard University in 1995 and MD from National Taiwan University in 1990.

Session D2-W2-T2: Medicine and Public Health

Development of Cell and Gene Therapy

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ABSTRACT

Recent scientific and technological advances provide a fertile ground for the development of new therapeutic strategies. Adaptation of ever more powerful gene transfer technologies is not only showing promise in recent attempts in gene therapy, but also opening up new opportunities in cell therapy, including the recent progress in the reprogramming of adult cells into pluripotent stem cells. Smooth translation of such technological breakthrough into clinical reality, however, requires understanding of the regulatory process and options for approval, as well as the underlying safety concerns.

This presentation will review the efforts at Harvard Gene Therapy Initiative in the development of three cell and gene therapy "products" that gained regulatory approval for human trials in recent years. Major focus of the discussion will be devoted to how the actual modalities of the packaged products evolved in the light of limitation and safety concerns of the applicable vector technologies.

BIOGRAPHY

Dr. Jeng-Shin Lee is the Deputy Director of Harvard Gene Therapy Initiative, an organization founded in 1998 within Harvard Medical School with the objective of promoting the use of gene transfer technology in both research and therapeutic applications. Over the last ten years, his group has been primarily responsible for the development of three cell based products intended for cancer immunotherapy, the development of both research and clinical grade production of adeno-associated viral vectors targeting neuromuscular systems, as well as newer generation lentiviral vector systems. The work has supported four approved investigational new drug (IND) applications in the United States and Europe, in collaboration with physician scientists at Dana Farber Cancer Institute and elsewhere.

Before joining Harvard Gene Therapy Initiative in 1999, Dr. Lee received post-doctoral training at Whitehead Institute, MIT, and Children's Hospital, Boston. Prior to that, he received his PhD in Virology from Harvard University in 1995 and MD from National Taiwan University in 1990.

Session D2-W2-T2: Medicine and Public Health

Gene Therapy of the Eye

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ABSTRACT

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BIOGRAPHY

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Session D2-W2-T2: Medicine and Public Health

Induced Pluripotent Stem Cells Using a Single Excisable Lentiviral Vector

Gustavo Mostoslavsky, PhD

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ABSTRACT

Mouse and human somatic cells can be induced to a state of pluripotency by retroviral expression of the regulatory proteins Oct4, Klf4, Sox2 and cMyc. The resulting induced pluripotent stem (iPS) cells are similar to embryonic stem (ES) cells and hold great promise for regenerative medicine. Most prior studies have employed multiple vectors for reprogramming, introducing a major source of variability among iPS cell lines and resulting in high numbers of viral integrations. This in turn increases oncogenic risk and limits clinical application of the cells. We devised a lentiviral expression system that uses 2A peptide and IRES technology to accomplish the production of the four reprogramming factors from a single "stem cell cassette" (STEMCCA) transcript. iPS cells were generated by constitutive expression of STEMCCA under control of an EF1a promoter or by inducible expression regulated by a doxycycline responsive TetO/miniCMV promoter. iPS cells generated in this manner display ES cell-like morphology, express stem cell markers and exhibit in vivo pluripotency as evidenced by their ability to differentiate in teratoma assays and their robust contribution to mouse chimeras. Combining all factors into a single transcript achieves the most efficient reprogramming system to date, and allows derivation of iPS cells with a single viral integration. This system was further developed to include loxp sites flanking the "stem cell cassette" and a red fluorescent reporter, allowing cre-mediated excision of the vector and visualization of excision after the completion of reprogramming. The resulting iPS cells are free of any exogenous transgenes, yet maintain ES cell marker gene expression and functional pluripotency. The use of a single lentiviral vector for reprogramming represents a powerful laboratory tool and a significant step toward the future application of iPS cell technology for clinical purposes.

BIOGRAPHY

Dr. Mostoslavsky was born in the city of Tucuman, Argentina in 1969. He received his M.D. from the School of Medicine at the National University of Tucuman, Argentina in 1993. He then moved to Israel where he pursued his Ph.D. thesis in immunology and molecular biology at the Hebrew University of Jerusalem, a degree completed in 2001. His interest in stem cell biology and gene transfer brought him to Boston, where he completed Postdoctoral research at Harvard Medical School.

He is currently Assistant Professor in the Section of Gastroenterology, Department of Medicine at Boston University School of Medicine. His previous academic positions include, Teaching assistant, Department of Microbiology, University of Tucuman, Argentina, Teaching assistant, Department of Biology, University of Tucuman, Argentina, Teaching assistant, Genetics Section, University of Tucuman, Argentina, Teaching assistant, Department of Microbiology, The Hebrew University Jerusalem, Israel, Research Fellow in Medicine, The Children's Hospital, Boston, MA, Research Fellow in Genetics, Harvard Medical School, Boston, MA, Lecturer in Genetics, Harvard Medical School, Boston MA. An example of his most relevant publications are 1.Mostoslavsky G., Fabian, A.J., Rooney, S., Alt, F.W. and Mulligan, R.C. Complete correction of murine Artemis immunodeficiency by lentiviral vector-mediated gene transfer. 2006. PNAS. 103(44): 16406-16411. Doi:10.1073/pnas.0608130103. 2.Sommer, C.A., Stadtfeld, M., Murphy, G.J., Hochedlinger, K., Kotton, D.N., Mostoslavsky, G. iPS Cell Generation Using a Single Lentiviral Stem Cell Cassette. 2008. Stem Cells. Epub Dec 18. 3. Mammoto, A., Connor, K.M., Mammoto, T., Yung, C. W., Huh, D., Aderman, C.H., Mostoslavsky, G., Smith, L.E.H. and Ingber, D.E. A mechanosensitive transcriptional mechanism that controls angiogenesis. 2009. Nature. Doi:10.1038. 457:1103-1108. A major interest of his lab is is to advance our understanding of stem cell biology with a focus on their genetic manipulation via gene transfer and their potential use for stem cell-based therapy. By discovering the mechanisms involved in stem cell self-renewal and differentiation we will be able to manipulate stem cell fate and use it as the basis for the correction of several diseases. Project areas in his lab focuses on the use of different stem cell populations, including embryonic stem cells, induced Pluripotent Stem (iPS) cells, hematopoietic stem cells and intestinal stem cells and their genetic manipulation by lentiviral vectors.

Dr. Mostoslavsky is a member of the International Society for Stem Cell Research (ISSSCR) since its foundation in 2002. He was the recipient of several awards including the Golda Meir Award from The Hebrew University of Jerusalem, Israel; a Ph.D. Fellowship from the Ministry of Science and the Arts of Israel; The Hebrew University Excellency Award as Teaching Assistant at the Department of Microbiology, Faculty of Medicine; a Travel Allowance Fellowship from Boehringer Ingelheim Fonds; and a Lady Tata Memorial Trust Postdoctoral Award.

Session D2-W3-T2: Solder and Atomic Layer Deposition

Session Organizer & Chair

Chih-hung (Alex) Chang, PhD (張至弘 教授)

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BIOGRAPHY

Chih-hung (Alex) Chang was born in Taipei, Taiwan 1969. He received a B.S. degree from the Department of Chemical Engineering, National Taiwan University in June 1991. He received his PhD degree in chemical engineering from University of Florida, Gainesville Florida in December 1999.

He did a research project to study deposition of thin film platinum on titanium substrates using electrochemical methods with Prof. Shi-Chern Yen as his undergraduate thesis. He was awarded a scholarship from the National Science Council for this research activity. He served in Taiwanese Army as a second lieutenant from 1991 till 1993. He worked for Nan-Ya Plastics Co. for one year as a research engineer from 1993 to 1994. He received a graduate fellowship from the Department of Chemical Engineering, University of Florida (UF), and started the graduate program in August 1994. His dissertation research concerned the development of a manufacturing process for the growth of thin-film photovoltaic (PV) cells using rapid thermal processing (RTP) under Prof. Timothy J. Anderson's guidance. He joined Oregon State University in January, 2000. He is currently an associate professor in the School of Chemical, Biological, and Environmental Engineering. He was a visiting professor in the Materials Science and Engineering Department at National Taiwan University from April 2008 till September 2008 sponsored by the National Science Council of Taiwan.

Prof. Chang is a member of a number of professional societies including American Institute of Chemical Engineers, The Electrochemical Society, American Vacuum Society, Institute of Electrical and Electronics Engineers, American Chemical Society, Material Research Society, American Association for the Advancement of Science, Microscopy Society of American, and Society of Information Display. He is a SHARP Labs of America scholar and a recipient of AVS Graduate Research award, National Science Foundation's CAREER award, and awardees of W.M. Keck Foundation. His group has studied solution based thin film deposition processes, ink jet printing, microreaction technology, and X-ray absorption fine

Session D2-W3-T2: Solder and Atomic Layer Deposition

Nanodiamond, Carbon Nanowalls and Applications

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ABSTRACT

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BIOGRAPHY

EDUCATION:

- Ph. D. and M.S. in Electrical Engineering (1979 & 1983), Texas Tech University, USA
- B. S. in Electrical Engineering (1977), National Taiwan University, Taipei, Taiwan

PROFESSIONAL EMPLOYMENT HISTORY:

- Chair Professor of Electrical Engineering (2006-present); Dean of EECS (2009-present), VP for R&D (2007-2009), Director for Center for Micro/Nano Science and Technology (2005-2006); Director for Institute of Nanotechnology and Microsystems Engineering (2005-2006); Director for Institute of Innovations and Advanced Studies (2006-present), Editor-in-Chief, BANYAN Research Express@NCKU (2007-present) , National Cheng Kung University, Tainan, Taiwan.
- Visiting Scientist, Cavendish Laboratory, Cambridge University, 1991-1992; Tokyo Institute of Technology and Nippon Institute of Technology, 1992.
- Professor Emeritus, Alumni Chair Professor, Professor, Associate Professor, Assistant Professor, Auburn University, Auburn, Alabama USA (1983- present).

RESEARCH INTEREST:

nanotechnologies and applications, plasma engineering and manufacturing, microelectronics.

HONORS AND AWARDS:

- Member of ECE Academy, Texas Tech University (2006)
- IEEE Fellow (2005)

- Chair Professorship: Auburn University (1992), NCKU (2006)

PROFESSIONAL ACTIVITIES:

- Vice President for Publications (2008-present), IEEE Nanotechnology Council.
- Vice President for Technical Activities (2005-2007), IEEE Nanotechnology Council.
- Associate Editor (1991-present), New Diamond and Frontier Carbon Technology, MYU K.K., Tokyo, Japan.
- Program Chair, New Diamond and Nano Carbons, Taipei, Taiwan, May 2008.
- Conference Chair, Asia Pacific Conference on Transducers and Micro-Nanotechnology, Tainan, Taiwan, June 2008.
- Conference Chair, Emerging Information and Technology Conference, Tainan, Taiwan, June 2008.

PATENTS:

7 US patents.

Session D2-W3-T2: Solder and Atomic Layer Deposition

Assembly and Integration of Nano-Components Using Lead-Free Nano-Solders

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ABSTRACT

Many new nanomaterials have been created or developed in the past two decades. With the dramatic development of nanotechnology in the past several years, promise has been shown in the potential applications and commercialization of nanomaterials in many emerging fields such as nanoelectronics, nanophotonics, sensors, fuel cells, nanobiotechnology and nanomedicine. However, in order to fully manipulate and utilize nanomaterials in the manufacturing scale, efficient and effective integration strategies have to be developed. In this talk, I will present our recent effort in the development of nanoscale lead-free solders ("nano-solders") and nano-soldering techniques for the assembly and integration of key nano-components (2005 JOM, 57, 60-64; 2006 Small, 2, 225-229; 2006 IEEE Transactions on Nanotechnology, 5, 62-66; 2009 Small, in press).

The soldering of two widely used building blocks, nanowires and colloidal particles, will be presented in this talk. Electrodeposition method is used to synthesize multi-functional nanowires in nanoporous templates in the diameter range of 15-200 nm and length up 20 μm. Nano-solders have been directly fabricated onto nanowires and are then used for soldering nanowires with functional joints. In another application, core-shell colloid-solder particles are synthesized by a polymer seeding process combined with solder (metal) reduction method. Solder layer is then used to bond colloidal assemblies and form permanent structures. Nano-soldering techniques have the great potential as efficient manufacturing ways for nanoscale assembly and integration.

Key words: Nanoelectronics, interconnects, nanomaterials, nano-soldering, self-assembly

BIOGRAPHY

Zhiyong Gu completed his undergraduate studies at Qingdao Institute of Chemical Technology, China, in 1996. He received his M.S. from University of Notre Dame and Ph.D. from the State University of New York at Buffalo in 2001 and 2004, respectively, all in Chemical Engineering. In April 2004, he joined the

Department of Chemical and Biomolecular Engineering at the Johns Hopkins University, working as a Postdoctoral Fellow until August 2006.

In September 2006, Zhiyong joined the Department of Chemical Engineering at University of Massachusetts Lowell as an Assistant Professor. He is also affiliated with the CHN/NCOE Nanomanufacturing Center at UML. His current research interests include synthesis of nanoparticles and nanowires, self-assembly and directed assembly, amphiphilic block copolymers, nanocomposite materials, and nanoscale integration for electronics, sensors and biomedical applications. He has co-authored 4 book chapters and over 30 refereed publications, and contributed to over 80 presentations in national and international conferences.

Session D2-W3-T2: Solder and Atomic Layer Deposition

Interface Engineering of Organic Electronics with Atomic-Layer-Deposited Thin Films

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ABSTRACT

The technique of atomic layer deposition (ALD) is well-suited for interface engineering of organic electronics, thanks to its unique capabilities that include low deposition temperatures, high conformality, precise thickness control, low defect density, and large-area uniformity. This presentation will cover our works on the application of ALD films as an electron-injection-enhancing layer for organic light-emitting diodes (OLED), as a charge recombination barrier for dye-sensitized solar cells (DSSC), and as an encapsulation layer for polymer-cased bulk-heterojunction solar cells. An 8-Å ALD Al2O3 film deposited between the electroluminescent layer and the cathode of a polymer-based OLED enhances electron injection and prevents hole quenching at the cathode, thereby improving the EL efficiency by ~100%; additionally, the ALD Al2O3 film allows the OLED to be patterned with photolithography, by isolating the organic active materials from solvents involved in the photolithography process [Organic Electronics, 9 (2008), 667]. In DSSC, ALD Al2O3 films uniformly overcoat the nanoporous TiO2 electrode and significantly reduce the efficiency loss caused by charge recombination: at the optimal thickness of 1 Å, the ALD films increase the power conversion efficiency (PCE) of the DSSC's by 14% (J. Mater. Chem., in press). The damaging effects of ambient H2O and O2 on the lifetime of polymer-based bulk-heterojunction solar cells are prevented by encapsulating the solar cells with a 30-nm ALD nano-laminated film, whose process simultaneous serves as a post-annealing treatment, achieving > 4% PCE and long in-air lifetime. The works are supported by National Science Council (97-ET-7-002-013-ET and 96-2221-E-002-143-MY3), the Photovoltaics Technology Center at Industrial Technology Research Institute, and Ministry of Economics Affairs (97-EC-17-A-08-S1-015).

Key words: Atomic layer deposition, solar cell, organic light-emitting diode

BIOGRAPHY

EDUCATION
1998 2002 Ph.D., University of Rochester, Rochester, NY, USA

WORK EXPERIENCE

2004-present	Assistant professor of materials science and engineering, National Taiwan University
2003-2004	Senior process development engineer, DuPont Displays, Santa Barbara, CA, USA
2002-2003	Process development engineer, Headway Technologies, Milpitas, CA, USA

PATENTS

2 U.S. Patents; 4 Taiwan Patents

PUBLICATIONS

30 peer-reviewed journal papers and conference papers. 2 books.

PROFESSIONAL MEMBERSHIP

Taiwan: Materials Research Society, Polymer Society,
USA: Materials Research Society, American Institute of Chemical Engineers

Session D2-W4-T2: System on Chip

Session Organizer & Chair

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BIOGRAPHY

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Session D2-W4-T2: System on Chip

On-demand Memory Platform for Multi-Task Wireless Video Entertainment Systems

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ABSTRACT

With increasing demands on ubiquitous wireless high-data-rate multimedia services, it is critical to have efficient processing capability and a merging multi-task system to sustain the growth. Moreover, green computing design concepts become essential to handle concurrent multimedia services at minimum processing power. In this talk, we present a new architecture of multi-core with low-power on-demand memory platform to overcome the challenges in the multi-task system design that needs to support wireless video entertainment.

On-demand memory platform consists of distributed memories, shared memories, distributed memory management units (MMU) and a three-layer centralized memory management unit. Combining with the packet switching techniques, the distributed MMUs will focus on the on-chip communication, data transfer interfaces and buffering of the local processor elements. The centralized MMU has three hierarchy layers, which are layer 0, layer 1 and layer 2, respectively. It provides higher bandwidth and lower power accesses of shared memories for the multi-task systems. The layer 0 is the on-chip communication interface to connect the multi-core platform and the shared memory. And the layer 1 and layer 2 focuses on memory allocation and memory access control, respectively. With circuit and architecture co-designs, the on-demand memory platform will provide dynamic scheduling mechanisms to optimize the memory allocation and bandwidth of on-chip communication. Advantages and highlight of a case study will also be discussed.

BIOGRAPHY

Professor Wei Hwang received the M. Sc and Ph.D. degrees in electrical engineering from the University of Manitoba, Canada in 1970 and 1974, respectively.

From 1975 to 1978, he was Assistant Professor of Electrical Engineering at Concordia University in Montreal., Canada. From 1979 to 1984, he was Associate Professor of Electrical Engineering at Columbia University in New York, NY, USA. From 1984 to 2002, he was a Research Staff Member at the IBM

Thomas J. Watson Research Center, Yorktown Heights, NY, USA, where he worked on high performance DRAM and microprocessor design. In 2002, he joined National Chiao Tung University (NCTU) in Hsinchu, Taiwan, where he holds a Chair Professor of Electronics Engineering. During 2002-2008, he served as Director of Microelectronics and Information Systems Research Center. During 2003-2007, he also served as Co-Principal Investigator of National System-on-Chip (NSoC) Program in Taiwan. From 2005 to 2007, he was Vice President and Acting President of NCTU.

He has received several IBM Awards, including sixteen IBM Invention Plateau Invention Achievement Awards, four IBM Research Division Technical Awards, was named an IBM Master Inventor. He has also received the CIEE Outstanding Electrical Engineering Professor Award in 2004 and Outstanding Scholar Award from the Foundation for the advancement of Outstanding Scholarship for 2005 to 2010. Dr. Hwang is the coauthor of the book "Electrical Transports in Solids-with particular reference to organic semiconductors", which has been translated into Russian and Chinese. He has authored or coauthored over 180 technical papers in renowned international journals and conferences, and holds over 150 international patents (including 65 U.S. patents). He has presented numerous plenary, invited or tutorial papers/talks at international conferences. He has served as the General Chair of 2007 IEEE SoC Conference (SOCC 2007) and the General Chair of 2007 IEEE International Workshop on Memory Technology, Design and Testing (MTDT 2007). He is severing as a Supervisor of IEEE Taipei Section for 2007 to 2010. He is a Life Fellow of IEEE.

Session D2-W4-T2: System on Chip

XML Content Processors for Web Application Firewall

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ABSTRACT

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BIOGRAPHY

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Session D2-W4-T2: System on Chip

QuteVP: A SystemC-based Virtual Platform for SoC HW/SW Co-Design and Co-Verification

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ABSTRACT

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BIOGRAPHY

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Keynote Speech

Moderator

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BIOGRAPHY

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Keynote Speech

Broad-based Societal Implications of IT Development

A Case Presentation on the Convergence of IT and Large-Scale Digital Content on World Culture and Heritage

Ching-chih Chen, PhD (陳劉欽智 教授)

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Project Director, NSF/IDLP Global Memory Net
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ABSTRACT

The US President's Information Technology Advisory Committee (PITAC)'s First Report to President Clinton (February 1999), entitled *"Information Technology Research: Investing in Our Future,"* was a pivotal document, from federal funding point of view, which has propelled the fast IT development in all fronts in this past decade. This explosive growth on the use of Internet and WWW in this decade has brought the world together, and has leveled the playing field for rich and poor in all fields. This growth has no sign of slowing down, and in fact, the development in this coming decade will surely be even more dramatic, faster and diversified. As this conference is asking "how the enormous shifts in technology landscape require our shift adaptation to new technological advances," let me stress the importance of IT's broad-based societal impacts as one of the significant measures for the success of any collective and collaborative developments/projects.

In this fast-moving digital age, "data" of all kinds has to be presented fast and organized meaningfully as useful "information", and finally be presented in such a way that "knowledge" can be derived from the digested information in rather user-friendly and seamless way. Thus, among all IT applications in all subject fields, the commonly shared problem is how to develop such type of knowledge base which can achieve broad-based and global impacts. In this regard, the development of a multiyear project supported by the US National Science Foundation's International Digital Library Project, *Global Memory Net (GMNet, http://www.memorynet.org),* and the partnership experience with UNESCO's World Heritage Center in the development of *World Heritage Memory Net (WHMNet)* will be shared.

Since its public launching in July 2007, in two years, *GMNet* has reached citizens and scholars around 140 countries and 3700+ cities. As to *WHMNet,* when launched, it will provide much more retrieval capabilities. At a simple click, it provides integrated multimedia -- texts, images, videos, and 3-D, multilingual information in over 80 languages on all 891 world heritage sites of 148 countries. It provides also content-based image retrieval, as well as geo- and tempo- search capabilities. From simple descriptive information of a given site, users can also instantly search for all relevant bibliographical and Internet resources with Web 2.0 features.

While the subject topics of these two applications relate to culture and heritage, the concepts and systems developed can be applied to all subject fields in science and technology. In fact, of the 891 World Heritage Sites in WHMNet, over 160 are "natural" sites which would include information resources of all media in archeology, paleontology, biology, etc. In addition, with our rich multimedia and multilingual contents, we are open for meaningful collaboration with computer science specialists, such as further development in cloud computing, machine translation, etc.

BIOGRAPHY

Ching-chih Chen is Professor of the Graduate School of Library and Information Science, Simmons College, Boston, and is a consultant and speaker to over 40 countries. She is the author/editor of more than 35 books and over 200 journal articles in areas of new information technologies, such as global digital libraries, multimedia technology, digital imaging, interactive videodisc technology, global information infrastructure, information management, and information resources, etc. She produced the award winning interactive videodisc and multimedia CD entitled *The First Emperor of China*, supported by the US National Endowment for Humanities (NEH). She has led two major National Science Foundation / International Digital Library Projects (IDLP): (1) *Global Memory Net*, a global image digital library and gateway to the world cultural, historical, and heritage multimedia resources, with collaborators from different part of the world, and this project has also led to *World Heritage Memory Net* in partnership with the UNESCO's World Heritage Center, and (2) International Collaboration to Advance User-oriented Technologies for Managing and Distributing Images in Digital Libraries. She is also co-PI, with Prof. Raj Reddy of Carnegie Mellon University, of the *China-US Million Book Digital Library Project*.

A Fellow of the American Association for the Advancement of Science, she was appointed by President Clinton in February 1997 to serve as a member of the U.S. President's Information Technology Advisory Committee (PITAC). PITAC was established by a new Presidential Executive Order. Under both Presidents Clinton and Bush during 1997 to December 2002, she co-chaired the PITAC Subcommittee on International Issues, and was a member of the PITAC Subcommittees on Next Generation Internet (NGI) and IT*2 Initiative Review; and Panels on Digital Divide, Digital Library, Learning of the Future, and Individual Security. She also chaired the PITAC's activity on Digital Divide for Smaller Institutions. During 1987 to 2001, Dr. Chen was Chief Organizer of a series of 12 *International Conferences on New Information Technology (NIT)* in many continents of the world. The outcome of NIT '99 (Taipei) and NIT'2001 (Beijing) are the two-volume books related to the development of *Global Digital Libraries – IT and Global Digital Library Development* (1999) and *Global Digital Library Development in the New Millennium: Fertile Ground for Distributed Cross-Disciplinary Collaboration* (2001).

She is a recipient of many major awards, and was also elected in 1985 as Fellow of the American Association for the Advancement of Science. She served as an Honorary Professor of Tsinghua University in Beijing from August 1999 to 2002 and University of Hainan, China, 2004. Active in the digital library area she was the co-Chair of the 4th ACM/IEEE *Joint Conference on Digital Libraries (JCDL)* of 2004 held in Tucson, Arizona in June 2004. She was on the Advisory Board of DELOS (the European Digital Network for Excellence), serving as the US Co-Chair of the NSF/DELOS Working Group in Digital Imagery for Significant Cultural, Historical and Heritage Materials, and served as the co-editor for the *Journal of Digital Library's Special Issue on Multimedia Contents in Digital Libraries* (February 2006).

A sought-after international speaker, she have delivered keynote speeches and made presentations at many international conferences including those in countries like Argentina, China, Croatia, France, Germany, India, Italy, Japan, Korea, Latvia, Mexico, Morocco, Russia, Spain, Singapore, South Africa, Swaziland, Taiwan, Thailand, UK, Vietnam, etc.

She has been on the advisory board of several national digital library projects; served as a consultant to OCLC for its Global Digital Initiative (2005) (http://www.oclc.org/news/releases/200520.htm); and received the coveted LITA/OCLC Kilgour Award from the Library Information Technology Association in June 2006. (http://www.ala.org/lita/litaresources/litascholarships/kilgrour06.htm), (http://www.oclc.org/research/announcements/20060421.htm), (http://www.ala.org/ala/pressreleases2006/april2006/2006KilgourAward.htm). The broad-based societal impact of her R&D work has been significant, and for this global work, she received the International Peace Prize of the United Cultural Convention of the USA presented its International Peace Prize in June 2006 for better promoting intercultural understanding during this troubled time. She received also the American Library Association's major Beta Phi Mu Award in June 2008 (http://www.ala.org/ala/newspresscenter/news/pressreleases2008/march2008/beta08.cfm).

Session D2-W2-T3: Computational Biology

Session Organizer & Chair

Li-San Wang, PhD (王立三 教授)

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University of Pennsylvania
Philadelphia, Pennsylvania 19104
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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 and a fellow of the Institute on Aging, University of Pennsylvania. Dr. Wang's research interests include phylogenetics, comparative genomics, and microarray analysis.He has authored twenty six peer-reviewed book chapters and journals on computational biology and bioinformatics, and served on the program and organizing committees of several international workshops and conferences.

Session D2-W2-T3: Computational Biology

Discovery of a Novel Target for Cancer Therapy Using High-throughput Technologies

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ABSTRACT

Targeting of tumor tissues is one of the most powerful approaches to accelerate the efficiency of anticancer treatments. The investigation of effective targets, including proteins specifically and abundantly expressed in abnormal regions, has been one of the most important research topics in cancer therapy. In this study, we performed a high-throughput technology, proteomic analysis, on human breast carcinoma tissues to investigate the tumor-specific protein expression in breast carcinoma. Our study showed that ATP synthase was up-regulated in tumor tissues and was present on the plasma membrane of breast cancer cells.

ATP synthase is of crucial importance in almost all organisms because ATP is the common "energy currency" of cells. Until now, no 3D structure of human ATP synthase structure was shown in PDB, therefore, we predicted human ATP synthase using homology modeling and furthermore found out its potential inhibitors using docking and virtual screening approach. We treated the breast cancer cells with ATP synthase inhibitors and examined the inhibitory efficiency. Aurovertin B, an ATP synthase inhibitor, has strong inhibition on the proliferation of several breast cancer cell lines, but little influence on the normal cell lines. Aurovertin B inhibits proliferation of cancer cells by inducing apoptosis and arresting cell cycle at the G0/G1 phase. This study showed aurovertin B can be used as an antitumorigenic agent and may be exploited in cancer chemotherapy. The findings suggest that ATP synthase may represent a new target for fighting breast cancer and other cancer types.

BIOGRAPHY

Hsueh-Fen Juan was born in 1969, Miao-Li, Taiwan. She received her BS and MS degree in Botany and PhD in Biochemical Sciences from National Taiwan University (NTU) in 1999. She worked as a research scientist in the Japan International Research Center for Agricultural Sciences (Tsukuba, Japan) during

2000-2001 and a postdoctoral research fellow in the Institute of Biological Chemistry, Academia Sinica (Taipei, Taiwan) during 2001-2002.

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

Prof. Juan has developed a number of novel methods to advance systems-biology research and applied such approach for drug discovery and elucidating molecular mechanism of drug responses in cancer cells. In the past five years, she has published more than 32 journal papers including prestigious journals such as *Proc. Natl. Acad. Sci. USA*, *Oncogene*, *J. Proteome Res.*, *Proteomics*, *Bioinformatics*. She also serves as a reviewer of various journals like *Molecular and Cellular Proteomics* (ASBMB), *Proteomics* (Wiley-VCH), *BMC Bioinformatics*, and has organized several international systems biology and bioinformatics symposiums. She is currently the Board Member in The Taiwan Society for Biochemistry and Molecular Biology, Taiwan Proteomics Society, and Taiwan Bioinformatics and System Biology Society. She also is the committee for Bio-Physics: Softmatter, Biophysics and System Biology, National Center for Theoretical Sciences. Since Dr. Juan made significant contributions through systems biology approach to development of methodology and cancer therapy; recently, she received a special award “Taiwan's Ten Outstanding Young Persons”.

Session D2-W2-T3: Computational Biology

High-Performance Computing in Network Biology

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ABSTRACT

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Session D2-W2-T3: Computational Biology

Understanding Chromatin Organization and Gene Regulation with ChIP-seq

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ABSTRACT

Understanding the mechanisms that regulate gene expression in normal cells and the ways in which these mechanisms are subverted in cancer will aid in the development of effective cancer treatments. To comprehend genome-wide transcriptional activity it is useful to have maps of the genomic locations where transcription factor proteins are bound to the DNA. These genome-wide maps detailing the cis-acting targets of trans-acting factors, which we refer to as cistromes, can be generated by ChIP-seq , a combination of next generation DNA sequencing (seq) and chromatin immunoprecipitation (ChIP). Considering the large number of trans-acting factors encoded in the humans genome, and the tendency for cistromes to be cell type and condition specific, it is clearly infeasible to generate a comprehensive set of such maps. As an alternative, we describe a way of using ChIP-seq to gather information for multiple transcription factors through the analysis of chromatin structure and DNA sequence. ChIP-seq targeting the methylated histones H3K4me2 and H3K4me3 is used to observe chromatin organization across enhancer and promoter locations. Using this data we characterize the nucleosome occupancy of potential enhancer regions accurately enough to identify those genomic regions that are differentially bound by transcription factors under different conditions. The identities of these transcription factors and their cistromes are inferred through DNA sequence analyses. We demonstrate this approach by identifying androgen receptor as the main regulatory factor in the response of a prostate cancer cell line to androgen exposure.

BIOGRAPHY

1994-1996	M.Sc. Chemical Engineering, University of Cape Town, South Africa Algorithm development for the solution of phase and chemical equilibrium problems
1997-2003	Ph.D. Chemical Engineering, Princeton, NJ Design and implementation of algorithms for global optimization
2003-2007	Research fellow, Department of Biostatistics, Harvard School of Public Health, Dept. of Biostatistical Science and Dana-Farber Cancer Institute, Boston, MA Analysis of ChIP-chip, DNA sequence analysis and gene regulation in cancer.

2007-2009 Research scientist, Department of Biostatistics, Harvard School of Public Health, Dept. of Biostatistical Science and Dana-Farber Cancer Institute, Boston, MA
Analysis of ChIP-seq for transcription factor and epigenetic studies, development of gene expression models.

Session D2-W2-T3: Computational Biology

Methods and Systems for ChIP-seq Data Analysis

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ABSTRACT

ChIP-seq, is a new molecular biology method that uses Chromatin Immunoprecipitation (ChIP) and Next Generation DNA sequencing technologies to identify positions on the chromosome that interact with specific proteins. It is a modification of an earlier method known as ChIp-on-chip, that also used ChIP, but identified the enriched DNA fragments by hybridization to a microarray. ChIP-seq is a powerful new method and potentially useful tool in many aspects of biomedical research including regulation of gene transcription, DNA structures and epigenetics. However, due to the large size of the generated data and the wide scale of the complexity, it is a challenge to develop efficient and effective data analysis methods, which are reproducible and have "reasonable" false positive and/or false negative rates. In this talk, we briefly survey some of the computational methods and software systems recently developed for ChIP-seq analysis such as Genome Studio (Illumina, Inc), Chip Seq Peak Finder (Johnson et al 2007), SISSR (Jothi et al 2008), Cis Genome (Ji et al 2008), QuEST (Valoriev et al, 2008), and USeq software package (Nix at al, 2008) based on their peak and region identification algorithms and scoring methods. We will also describe some properties of the data that create challenges for a signal processing algorithm and outline our strategy to use data fusion methods to develop improved software to support this important new technology. (This is a joint work with Dr. Stuart Brown of NYU School of Medicine).

BIOGRAPHY

Dr. D. Frank Hsu, is the Clavius Professor of Science and Professor of Computer and Information Science at Fordham University, New York. He has held visiting positions at Keio University, JAIST, Taiwan University, Tsing-Hua University, MIT, and University of Paris-Sud. Combinational Fusion Analysis (Algorithm), an information fusion method he has developed recently, has been applied to a variety of domains such as information retrival, target tracking, virtual screening and drug discovery, and bioinformatics. Dr. Hsu has served on several editorial boards including IEEE Trans on Computers, Networks, Monograph on Combinatorial Optimization, International Journal on Foundation of Computer Science and is currently with Journal of Interconnection Networks (EIC 2000-2006, Special Issues 2007-***), Pattern Recognition Letters (as Associate Editor), and Ubiquitos Computing and Intelligence (as

Advisory Editor). Dr. Hsu is a Foundation Fellow of the Institute of Combinatorics and Applications and a Fellow of the New York Academy of Sciences.

Session D2-W4-T3: Network-on-Chip

Session Organizer & Chair

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BIOGRAPHY

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

Since 1982, he has been a member of the faculty in the Department of Electrical Engineering, National Taiwan University, where he is currently a full professor. During the fall of 1999, he was a visiting professor in the Department of Computer Science and Engineering, University of California, San Diego, USA. During the fall of 2003, he held an academic visitor position in the Department of System Level Design, IBM Thomas J. Watson Research Center, Yorktown Heights, New York, USA. During the falls of 2004 to 2008, he was a visiting professor in the Department of Electrical and Computer Engineering, University of Wisconsin, Madison, USA. His current research interests include: VLSI physical design, SOC hardware/software co-design, and Wireless LAN and Bluetooth IC design.

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

Session D2-W4-T3: Network-on-Chip

Error Control for On-chip Interconnect Networks

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ABSTRACT

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BIOGRAPHY

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Session D2-W4-T3: Network-on-Chip

Application-Aware Oblivious Routing and Bandwidth-Adaptive Networks

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ABSTRACT

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Session D2-W4-T3: Network-on-Chip

Multiband RF-Interconnect for Reconfigurable Network-on-Chip Communications

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ABSTRACT

One of the key benefits of the scaling of CMOS is that the switching speed of the transistor improves over each technology generation. According to ITRS, fT and fmax, will be 600GHz and 1 THz, respectively, in 16nm CMOS technology. With the advance in CMOS mm-wave circuits, hundreds of GHz bandwidth will be available in the near future. In addition, comparing with CMOS repeaters charging and discharging the wire, EM waves travel in a guided medium at the speed of light which is about 10ps/mm on silicon substrate. The question here is: How can we utilize over hundreds of GHz of bandwidth in a future mobile system through RF-Interconnect (RF-I) while concurrently achieving ultra-low power operation and dynamic allocation in bandwidth to meet future Network-on-Chip needs?

One of the possibilities is to use multi-band RF-I, based on frequency-division-multiple-access algorithms (FDMA) to facilitate inter-core communications on-chip. The main advantages of RF-I include:

- Superior Signal to Noise ratio: Since all data streams modulate RF-carriers, which are at least 10GHz above the baseband, the high speed RF-interconnect does not generate and/or suffer from any baseband switching noise. This reduces possible interference to the sensitive near/sub-Vth operated circuit.
- High bandwidth: A multi-band RF-interconnect link has a much higher aggregate data rate than a single repeater buffer link. For example, the router of the RF-I node can first collect all the data from the nearby ULP core. Utilizing the superior bandwidth of RF-I, one RF-I node is able to handle a large amount of data generated from multiple ULP cores.
- Low Power: Compared to a repeater buffer, a multi-band RF-interconnect is able to operate at much better energy per bit in the NoC. This is especially true in ULP cores, where only several RF-nodes are enough to satisfy the bandwidth demand between the ULP cores and the rest of the NoC. Compared to normal repeated wire networks, which consume considerable amounts of power, a few RF-I nodes only consume a very small amount of power. (see Section IV, benchmarked using pJ/bit as a metric)
- Low Overhead – High data rate/wire and low area/Gigabit and low latency due to speed-of-light data transmission (see Section IV, benchmarked using Area/(Gbit/sec) as a metric)
- Re-configurability – Efficient simultaneous communications with adaptive bandwidths via shared on-chip transmission lines
- Multicast support – Scalable means to communicate from one transmitter to a number of receivers on chip
- Total compatibility and scalability with mainstream digital CMOS technology

The concept of RF-I is based on transmission of waves, rather than voltage signaling. When using voltage signaling in conventional RC time constant dominated interconnects, the entire length of the wire has to be charged and discharged to signify either '1' or '0'. In the RF approach, an electro-magnetic (EM) wave is continuously sent along the wire (treated as a transmission line). Data is modulated onto that carrier wave using amplitude and/or phase changes.

A simultaneous tri-band on-chip RF-interconnect for future network-on-chip is demonstrated. Two RF bands in mm-wave frequencies, 30GHz and 50GHz, are modulated using amplitude-shift keying, while the base-band utilizes a low swing capacitive coupling technique. Each RF-band and base-band carries 4Gbps and 2Gbps respectively. Three different bands, up to 10Gbps, are transmitted simultaneously across a shared 5mm on-chip differential transmission line. The energy per bit is 0.125pJ/b/mm in base-band, while RF-band is 0.09pJ/b/mm. Based on this demonstration, it is possible to improve bandwidth efficiency using N-channel multi-carrier RF-I. Those N distinct channels transmit N different data streams onto the same

transmission line. The total aggregate data rate (RTotal) equals to RTotal = Rbaseband × N, where the data rate of each base-band is Rbaseband and the number of channels is N.

As an example of use of RF-I re-configurability, we recently proposed MORFIC (Mesh Overlaid with RF Inter-Connect), a hybrid NoC design. It is composed of a traditional mesh of routers augmented with a shared pool of RF-I that can be configured as short-cuts within the mesh. In this design, we have 64 computing cores, 32 cache memory modules and 4 memory output ports – and RF-I is a bundle of transmission lines spanning the mesh, and features 16 carrier frequencies. We examined four architectures: (1) Mesh Baseline – a baseline mesh architecture without any RF-I, (2) Mesh Wire Baseline – the baseline mesh architecture with express shortcuts between routers (conventional wire, not RF-I) that are chosen at chip design time (i.e. no adaptability to application variation), (3) Mesh Static Shortcuts – the same express shortcuts as the Mesh Wire Baseline but using RF-I instead of conventional repeated wire, and (4) Mesh Adaptive Shortcuts – the overlaid RF-I with shortcuts tailored to the particular application in execution. From the simulation results of our in-house cycle-accurate simulator, we demonstrated a significant performance improvement of the Mesh Adaptive Shortcuts over the Mesh Baseline, an average packet latency reduction of 20-25%, through the reconfigurable RF-I. We further demonstrated a 65% power reduction by reducing the bandwidth of the baseline mesh by 75% - reducing the 16 Byte wide to 4 Byte wide baseline mesh. Our continued exploration of the MORFIC architecture will be instrumental in gauging future CMP interconnect design tradeoffs, and in better quantifying what benefits CMPs can expect from MORFIC in future generations of CMOS technologies down the road.

BIOGRAPHY

Dr. Mau-Chung Frank Chang is the *Wintek Chair Professor* in the Electrical Engineering Department and the Director of the High Speed Electronics Laboratory at University of California, Los Angeles (UCLA).

Before joining UCLA, he was the Assistant Director and Department Manager of the High Speed Electronics Laboratory at Rockwell Science Center (1983-1997), Thousand Oaks, California. In this tenure, he successfully developed and transferred the *AlGaAs/GaAs Heterojunction Bipolar Transistor* (HBT) and *BiFET* (Planar HBT/MESFET) integrated circuit technologies from the research laboratory to the production line (now Conexant Systems and Skyworks). The *HBT/BiFET* productions have grown into multi-billion dollar businesses and dominated the cell phone power amplifiers and front-end module markets (exceeding one billion units/year). Throughout his career, his research has primarily focused on the development of high-speed semiconductor devices and integrated circuits for RF and mixed-signal communication and sensing system applications. He was the principal investigator at Rockwell in leading DARPA's ultra-high speed *ADC/DAC* development for direct conversion transceiver (*DCT*) and digital radar receivers (*DRR*) systems. He was the inventor of the multiband, reconfigurable *RF-Interconnects*, based on FDMA and CDMA multiple access algorithms, for

ChipMulti-Processor (CMP) inter-core communications and inter-chip *CPU-to-Memory* communications. He also pioneered the development of world's first multi-gigabit/sec *ADC, DAC* and *DDS* in both *GaAs HBTs* and *Si CMOS* technologies; the first 60GHz radio transceiver front-end based on *transformer-folded-cascode* (*Origami*) high-linearity circuit topology; and the low phase noise CMOS VCO (FOM<-200dBc/Hz) with Digitally Controlled on-chip Artificial Dielectric (*DiCAD*). He was also the first to demonstrate CMOS oscillators in the Terahertz frequency range (*324GHz*). Dr. Chang has authored or co-authored over 270 technical papers, 10 book chapters, authored 1 book, edited 1 book and holds 20 U.S. patents. He was an editor of the *IEEE Transactions on Electron Devices* (1999-2001) and served as the Guest Editor for the IEEE *Journal of Solid-State Circuits* in 1991 and 1992, and for the Journal of High-Speed Electronics and Systems in 1994.

He was elected to the US *National Academy of Engineering* in 2008 for the development and commercialization of GaAs power amplifiers and integrated circuits. He was elected as a Fellow of IEEE in 1996 and received IEEE *David Sarnoff Award* in 2006 for developing and commercializing HBT power amplifiers for modern wireless communication systems. He was also the recipient of 2008 *Pan Wen-Yuan Foundation* Award for his fundamental contributions in developing AlGaAs/GaAs hetero-junction bipolar transistors. His recent paper "*CMP Network-on-chip Overlaid with Multiband RF-Interconnect*" was selected for the *Best Paper Award* in 2008 IEEE *International Symposium on High-Performance Computer Architecture (HPCA)*. He received Rockwell's *Leonardo Da Vinci Award* (Engineer of the Year) in 1992; National Chiao-Tung University's *Distinguished Alumnus Award* in 1997; and The College of Engineering, National Tsing-Hua University's *Distinguished Alumnus Award* in 2002.

Session D2-W2-T4: Medicine and Public Health

Session Organizer & Chair

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Session D2-W2-T4: Medicine and Public Health

Omics Era: Transcriptomics, Pathway and Signature Analyses to Predict Diseases

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ABSTRACT

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BIOGRAPHY

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

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

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

Session D2-W2-T4: Medicine and Public Health

The Link between Bone and Energy Metabolisms. Genome-Wide Association Studies of Complex Traits in the Framingham Study

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ABSTRACT

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Session D2-W2-T4: Medicine and Public Health

Parental and Offspring Genome-Wide DNA Methylation Changes, Residential Petrochemical Exposure, and Childhood Leukemia Risk

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ABSTRACT

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BIOGRAPHY

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Session D2-W2-T4: Medicine and Public Health

Finding Disease Related Modules in Co-expressed Protein Interaction Networks

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ABSTRACT

As molecular networks represent the backbone of molecular activity within cells, integrative analysis of transcriptomic profiles in the context of protein interaction networks provides opportunities for understanding the molecular mechanism of diseases. While protein-protein interaction data constitute static network maps, integration of condition-specific co-expression information provides clues to the dynamic features of the networks. Here, we present a network-based comparative analysis that integrates gene expression profiles with protein-protein interaction and biological function annotations to elucidate heart failure related molecular modules. The revealed hub genes and molecular modules may be used as potential disease markers and provide new directions for heart failure therapy.

BIOGRAPHY

Hsuan-Cheng Huang received his B.A., M.A., and Ph.D. degrees in physics from National Taiwan University in 1992, 1994 and 1998, respectively. He was a postdoctoral research fellow in the Department of Physics, National Taiwan University, Taipei, Taiwan, and in High Energy Accelerator Research Organization (KEK), Japan, where he was engaged in experimental high-energy physics research, from 1999 to 2002. He was then awarded as an NSC Distinguished Postdoctoral Fellow in 2003. Encouraged by the emerging of systems biology, he rapidly became interested in applying computational methods to the understanding of biological systems. Dr. Huang joined National Yang-Ming University in 2004 and is currently an associate professor in the Institute of Biomedical Informatics, National Yang-Ming University, Taipei, Taiwan. In 2007, he received the NSC Wu Ta-You Memorial Award, an honor for excellent young investigators in Taiwan. His research interests include bioinformatics, computational and systems biology, and network biology. Currently, he endeavors his research efforts to computational analysis and modeling of biological networks, and applies them to unravel molecular mechanisms of cancer cells and essential genes in microorganisms, as well as for further applications in drug discovery and bioenergy development.

Session D2-W4-T4: C4I

Session Organizer & Chair

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Session D2-W4-T4: C4I

Autonomous Robot Team Formation and Cooperation

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ABSTRACT

Technological advances on many fronts have enabled cost effective robots to perform autonomous and cooperative tasks. Distributed swarm-like behavior and wireless communication among others open possibilities to solve problems never before possible. Problems such as chemical spills and wild fire containment present scenarios that require a number of robot teams to dispose the threats or minimize their impact in a timely manner. Coupling wireless networking and simple yet efficient swarm intelligence, we have developed a truly decentralized solution where robots cooperatively form dynamic teams to surround and contain threats. Each robot has its own view of an Artificial Potential Field (APF), allowing autonomous movements that collectively accomplish tasks as a team. In this talk, we will start by presenting several state-of-the-art approaches in the field of autonomous robot teams, followed by an in-depth look of our APF and TDMA-network based approach. Simulation demo and experiment results will be shown to demonstrate the effectiveness of our approach.

BIOGRAPHY

Shanchieh Jay Yang was born in Taipei, Taiwan in 1973. He received his BS degree in electronic engineering from the National Chiao-Tung University in Taiwan in 1995, and his MS and Ph.D. degrees in electrical and computer engineering from the University of Texas at Austin in 1998 and 2001, respectively.

He is currently an associate professor in the Department of Computer Engineering at Rochester Institute of Technology in Rochester NY, USA. Before joining RIT in 2002, he has worked as a Research Associate for Fujitsu Laboratory of America and NetQoS, and as an Intern for Bell Laboratory, Lucent Technologies. In summer 2005, he was selected as a Visiting Research Faculty for Air Force Research Laboratory, Rome NY. He has authored and co-authored more than 25 refereed articles in areas including networking, autonomous robots, information fusion, and haptics. His current research interests focus on impact assessments of cyber and terrorist attacks, cooperative and autonomous robots, ad hoc sensor networks, and cyber physical microsystems.

Prof. Yang is an active member of the Center for Multisource Information Fusion (CMIF) based in western New York, and a member of IEEE and IEEE Communication Society. He was a chair for IEEE Joint Communications and Aerospace Chapter in Rochester NY in 2005, and the chapter was recognized as an Outstanding Chapter of Region 1. He has participated in the development of a multidisciplinary Ph.D. program in Computing and Information Science at RIT. He received Norman A. Miles Award for Academic Excellence in Teaching in 2007 and TxTEC Graduate Fellowship in 1999. He has been on the organization committees for IEEE Upstate NY Workshop on Communications and Networking from 2004 to 2007 and ISIF/IEEE International Conference on Information Fusion in 2009. He has also been a reviewer for numerous journals and conferences, including IEEE/ACM Transaction on Networking, IEEE Transaction on Information Forensics and Security, IEEE INFOCOM, IEEE ICC, IEEE Globecom, IEEE MILCOM, and IEEE MASS.

Session D2-W4-T4: C4I

An adaptive reasoning and learning framework for cognitive radio systems

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ABSTRACT

This talk will present an on-going work on the design and implementation of an Adaptive Reasoning and Learning Framework (ARALF) for cognitive radio systems. Based on four integrated ontology, namely user, time, location, and radio, ARALF weaves two reasoning and learning methods, namely multi-objective intellectual perceptron (MOIP) and multi-objective case-based reasoning (MOCBR), into an efficient cognition engine. The hardware platform of ARALF consists of a Universal Software Radio Peripheral (USRP) board equipped with RF front-end and several sensors such as GPS, timer, and controlled by an embedded Linux OS running an HMI, and the software platform consists of GNU Radio SDR, CR engine, the two learning methods, and a case database. Initial experiments demonstrate how the fine tuning of the cognition engine and related system parameters is crucially important for successful learning.

BIOGRAPHY

Pao-Ann Hsiung, Ph.D., was born in Mumbai, India on January 1, 1967 and currently resides in Taiwan. He received his B.S. in mathematics and his Ph.D. in electrical engineering from the National Taiwan University, Taipei, Taiwan, ROC, in 1991 and 1996, respectively.

From 1996 to 2000, he was a Post-Doctoral Researcher at Academia Sinica, Taiwan. From February 2001 to July 2002, he was an Assistant Professor and from August 2002 to July 2007 he was an Associate Professor at the National Chung Cheng University, Taiwan. Since August 2007, he has been a full Professor. He has published more than 165 papers in international journals and conferences. He has taken an active part in paper refereeing for international journals and conferences. His main research interests include reconfigurable computing and system design, multi-core programming, cognitive radio architecture, System-on-Chip (SoC) design and verification, embedded software synthesis and verification, real-time system design and verification, hardware-software codesign and coverification, and component-based object-oriented application frameworks for real-time embedded systems.

Dr. Hsiung is a senior member of the IEEE, a senior member of the ACM, and a life member of the IICM. He was the recipient of the 2001 ACM Taipei Chapter Kuo-Ting Li Young Researcher for his significant contributions to design automation of electronic systems. He was also a recipient of the 2004 Young Scholar Research Award given by National Chung Cheng University to five young faculty members per year. He has been included in several professional listings such as Marquis' Who's Who in the World, etc. Dr. Hsiung is an editorial board member of the International Journal of Embedded Systems, Inderscience Publishers; the International Journal of Multimedia and Ubiquitous Engineering, Science and Engineering Research Center; an associate editor of the Journal of Software Engineering, Academic Journals, Inc.; an editorial board member of the Open Software Engineering Journal, Bentham Science Publishers, Ltd.; an international editorial board member of the International Journal of Patterns.

Session D2-W4-T4: C4I

A Fast Time-to-Market SoC Design Platform

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ABSTRACT

SoC applications for consumer electronics are largely driven by integration and time-to-market. They are prevalent in personal communication and infotainment devices. High integration SoC products also drive down the cost and enable rich feature applications with lower power consumption. However, with the rapid evolution of consumer products, product life cycle has been dramatically reduced, and designers are constantly given very short development schedule. With the increasing complexity and decreasing development schedule, consumer SoC products are prone to design errors.

In the session, we will present a platform based SoC design environment to tackle the above issues. A hardware platform was developed to serve for the purpose of architecture validation and early software development. And an RTL compiler was developed to generate the integrated RTL in a timely fashion. By leveraging a well proven platform environment, we are able to do complex SoC designs in much greater productivity and faster time-to-market w/o comprising the quality. Some of examples even showed that we are able to cut the design cycle by more than half.

BIOGRAPHY

Emerson Mingfu Hsiao is the Director of Filed Application and Marketing at Faraday Technology Corporation. He received his B.S in Electrical Engineering from Chung Yuan University in 1990, M.S and Ph.D in Electrical Engineering from National Taiwan University in 1992, and 2003 respectively. His research interest includes VLSI physical design, logic synthesis and signal integrity.

Post-Conference Dinner (by Invitation)

Hosted by

Hsin-Hsiung Chang, PhD (張新雄 博士)

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BIOGRAPHY

Dr. Hsin-Hsiung Chang is the director of the Science and Technology Division, Taipei Economic and Cultural Representative in the United States, which is an overseas office of the National Science Council, Taiwan, located in Washington, DC. Prior to this position, Dr. Chang was the director of the Science and Technology Division in Canada.

Dr. Chang received his Ph.D. degree in Agricultural Biotechnology from the National Taiwan University in 1979. When he was in the Graduate School, he received a scholarship of the Ministry of Education for a Ph.D. graduate program to study abroad. He did one year of research at the Cornell University from 1978 to 1979. After returning back to Taiwan, he finished his dissertation and received his Ph.D. degree. He was then promoted as an associate professor and a professor thereafter.

Dr. Chang had served for more than 20 years at the National Taiwan University. His research was aimed at the fields of plant gene transformation, plant physiology and crop science. He was one of the pioneer researchers in the field of plant gene transformation in Taiwan. He had successfully accomplished the gene transformation on rice plant which was one of the most difficult works in this area. He research paper on rice gene transformation was published in an international journal, which was widely cited by the related researchers.

During his academic years in 1985-1993, Dr. Chang was a visiting professor at the University of Paris and the University of Perpignon in France, as well as a visiting professor at the University of Cape Town in South Africa.

From 1993 to 1994, Dr. Chang served as the director of the Department of International Cooperation, National Science Council. He was responsible for the cooperation programs internationally. From 1996 to 2007 Dr. Chang was appointed by the National Science Council as the director of the Science and Technology Division in Houston, Chicago and Canada consecutively. In August 2007, Dr. Chang was appointed by the National Science Council as the director of the Science and Technology Division in

Washington, DC, responsible for the bilateral collaboration of science and technology between Taiwan and the United States.