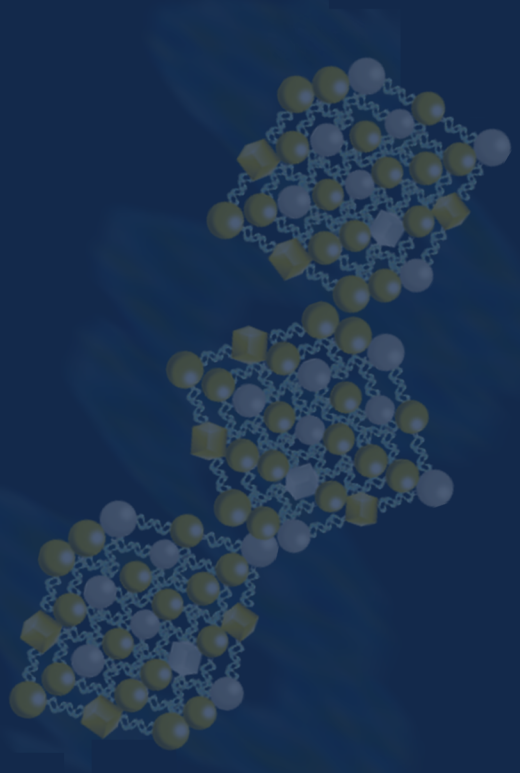
The 9th IEEE International Conference on Nano/Molecular Medicine and Engineering

IEEE-NANOMED

2015

TECHNICAL PROGRAM



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November 15-18, 2015 | Waikiki Beach, Hawaii, USA

IEEE-NANOMED 2015 TECHNICAL PROGRAM

NOVEMBER 2015

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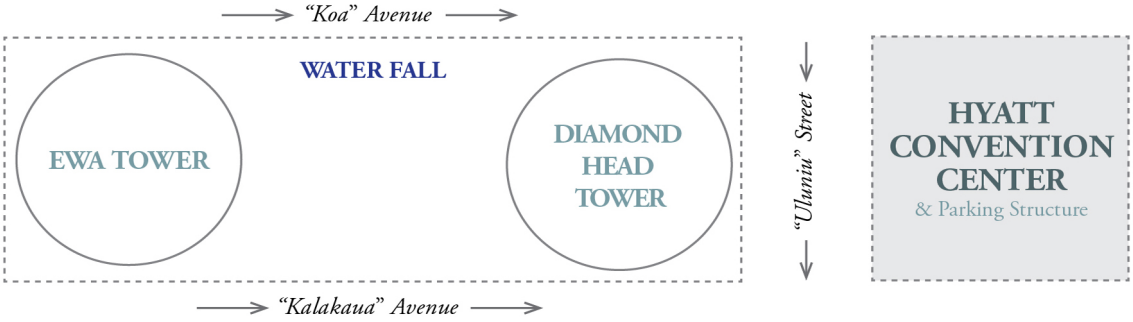

HYATT CONVENTION CENTER
& Parking Structure

FIRST FLOOR:
"CONVENTION CENTER FOYER" & "SUITE 1"

SECOND FLOOR:
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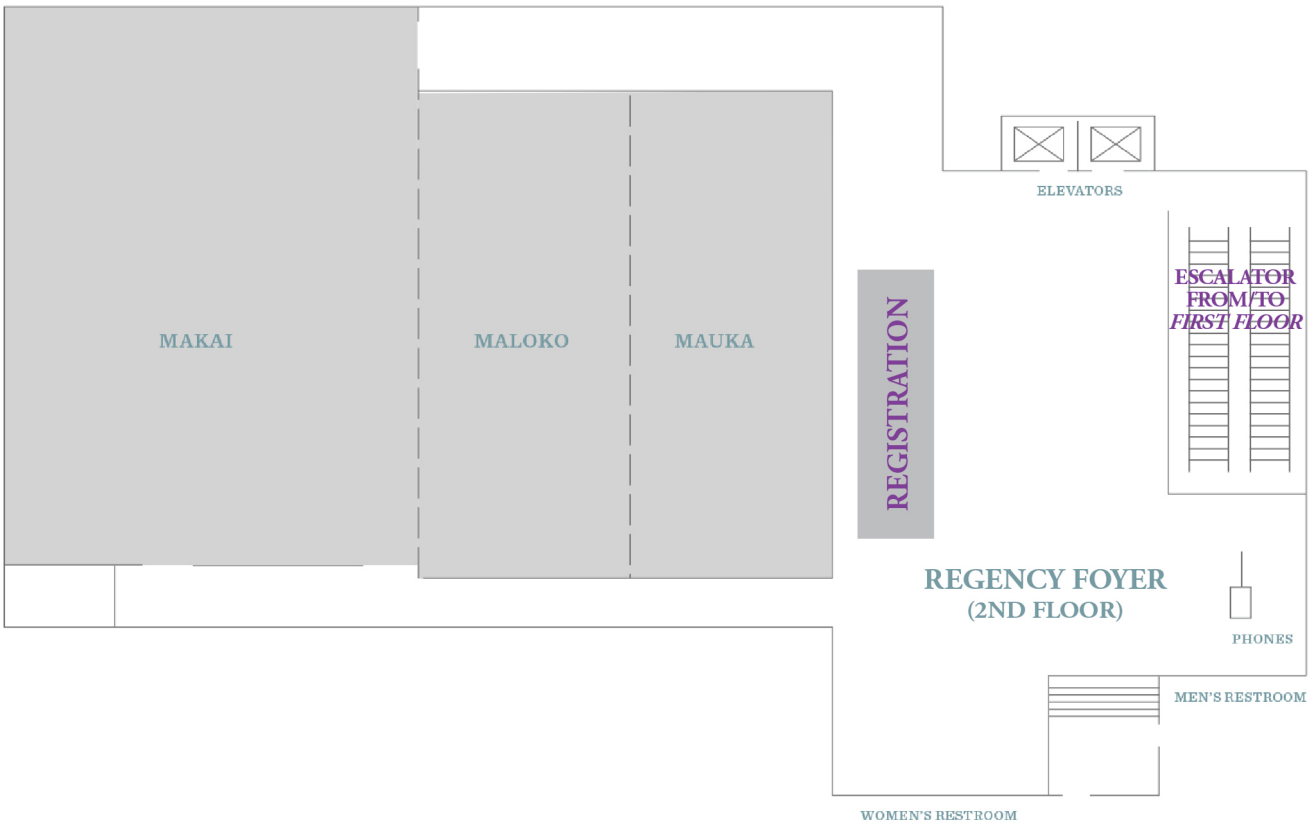
"REGENCY BALLROOM: **MAKAI, MALOKO & MAUKA"**

MAP: *SECOND FLOOR*



On behalf of
the IEEE Nanotechnology Council
& the conference organizing
committee

WELCOME

I am delighted to welcome you to the 9th International Conference on Nano/Molecular Medicine and Engineering (IEEE-NANOMED 2015) and the first IEEE-NANOMED held outside Asia in November 15 – 18, 2015. Originally launched in 2006, IEEE-NANOMED has grown to be one of the major international conferences in nanomedicine and nano/molecular engineering and has brought together world-class engineers, physicians, and scientists from all over the world and every sector of academy and industry, enabling the exchange of the latest advances in basic and clinical research in the field of nano/molecular medicine and engineering.

IEEE-NANOMED 2015 is destined to be one of the best yet, thanks to the talents and dedication of many volunteers, the invaluable assistance from our stellar professional staffs, and the strong support from sponsors. IEEE-NANOMED 2015 is sponsored by the IEEE Nanotechnology Council, the University of Arkansas, Shenzhen Academy of Robotics, University of California at Santa Cruz, RSC Advances of the Royal Socity of Chemistry, and Huawei Technologies Co., Ltd. Special gratitude and appreciation is extended to Program Chairs and Technical Program Committee. Without their outstanding work, we would not have such an excellent and challenging technical program, which broadly reaches the field of nano/molecular medicine and engineering and provides a highly innovative and informative venue for essential and advanced scientific and engineering research as well as translational and clinical research. Twelve state-of-the-art plenary and keynote presentations by leading experts, 25 technical sessions and 3 workshops with over +130 invited presentations, and 3 poster sessions during the 4-day event ensure an interactive and inspiring exchange between participants, making IEEE-NANOMED 2015 the right place for new bridges in science and knowledge.

We are happy to host IEEE-NANOMED 2015 at Waikiki Beach, the world-famous white sand beachfront area of Honolulu, the state capitol, in the beautiful island of O'ahu, Hawaii, USA. Known as "The Gathering Place," O'ahu offers a near endless supply of scenic beauty and exciting activities to explore, the better to extend thought provoking and profitable discussions from the formal conference. We wish you a superb conference experience and a memorable stay in Waikiki Beach, Hawaii!

Welcome to IEEE-NANOMED 2015!

Jin-Woo Kim, General Chair

Professor of Biological Engineering, Biomedical Engineering and Nanoscience & Engineering
Department of Biological & Agricultural Engineering
Institute for Nanoscience & Engineering
University of Arkansas, Fayetteville, AR, USA

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Tim YEH, Univ. of Texas, Austin, USA
Lijie Grace ZHANG, George Washington Univ., USA

PLENARY & KEYNOTE HIGHLIGHTS

PLENARY

Peixuan GUO

Univ. of Kentucky, USA

"Discovery of a Third Type of Biomotor Using Revolution Mechanism without Rotation & Application of Its Components in Single Pore Sensing & RNA Nanotechnology"

Chiming HO

Univ. of California, Los Angeles, USA

"Phenotypic Personalized Medicine (PPM)"

Taeghwan HYEON

Seoul National Univ., Korea

"Designed Chemical Synthesis and Assembly of Uniform-sized Nanoparticle for Medical Applications"

Kevin Kit PARKER

Harvard Univ., USA

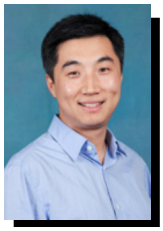
"Beyond Electrospinning: New Manufacturing Methods for Bioinspired Textiles"

KEYNOTES

Oleg GANG

Brookhaven National Laboratory, USA

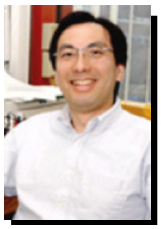
"DNA-Programmable Nanoparticle Assembly: From Principles to Material Design"



Xiaohu GAO

Univ. of Washington, USA

"Multifunctional Nanoparticles for Cancer Imaging and Treatment"



Dai FUKUMURA

MGH/Harvard Medical School, USA

"Targeting Tumor Vasculature and Microenvironment for Nanomedicine"

David L. KAPLAN

Tufts Univ., USA

"Advances and Challenges with Fibrous Protein Biomaterial Designs"

Teri W. ODOM

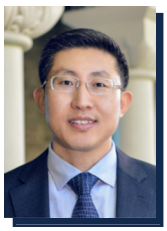
Northwestern Univ., USA

"Gold Nanostar Probes for Imaging and Therapeutics"

Dong SUN

City Univ. of Hong Kong, Hong Kong, China

"Cell Surgery Robotics in Cell Fusion Application"



Yu SUN

Univ. of Toronto, Toronto, Canada

"Robotic Manipulation of Cellular and Intracellular Structures"

Vladimir ZHAROV

Univ. of Arkansas for Medical Sciences, Little Rock, USA

"In Vivo Blood Nanotest"

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Technical Sessions

SS1 Micro and Nanotechnologies for Monitoring and Regulating the Immune System
Session Chair: Andrew SMITH, Univ. of Illinois, Urbana-Champaign, USA

SS2 Nano/Microengineering-Assisted Therapy
Session Chair: Yanan DU, Tsinghua Univ., China

SS3 Single Cell Analysis towards Personalized Medicine
Session Chair: SJ Claire HUR, Harvard Univ., USA

SS4 Micro/Nanotechnologies for Mechanobiology and Regenerative Medicine
Session Chair: Deok-Ho KIM, Univ. of Washington, USA; Yu SUN, Univ. of Toronto, Canada

SS5 Bioelectronic Devices for Electroceutical Therapies and Diagnostics
Session Chair: Marco ROLANDI, Univ. of California, Santa Cruz, USA

SS6 Emerging Micro-/Nano-Scale Sensing Technologies for Use in Medical Engineering
Session Chair: Hyuck CHOO, California Institute of Technology, USA

SS7 Quantitative Live Cell Imaging
Session Chair: Kwonmoo LEE, Worcester Polytechnic Institute, USA

SS8 Nanobiomaterials and 3D Nano/Microfabrication Techniques for Biomedical Application
Session Chair: Lijie (Grace) ZHANG, George Washington Univ., USA

SS9 Emerging Nanocarriers for Improved Drug Delivery
Session Chair: Seungpyo HONG, Univ. of Illinois, Chicago, USA

SS10 Nanobiosensors for Rapid and Sensitive Detection of Biomolecules
Session Chair: Sang-Hyun OH, Univ. of Minnesota, Twin Cities, USA

SS11 Biochips and Bio-MEMS
Session Chair: Amy SHEN, Okinawa Institute of Science & Technology Graduate Univ., Japan

SS12 Detection, Delivery and Microscopy in Single Cells
Session Chair: Tim YEH, Univ. of Texas, Austin, USA.

SS13 Novel Approaches to Target Tumor Microenvironment in Solid Tumors
Session Chair: Mahavir B. CHOUGULE, Univ. of Hawaii, Hilo, USA

SS14 Nano/Microsystems for Clinical Diagnostics and Regeneration
Session Chair: Justyn JAWORSKI, Hanyang Univ., Korea

SS15 Innovative Optical Sensing Technologies for Biomedical Diagnosis
Session Chair: Donglei (Emma) FAN, Univ. of Texas, Austin, USA

SS16 Engineering the Cell-Biomaterial Interface and Opportunities at the Interface of Nanotechnology and Stem Cell Biology
Session Chair: Kristopher A. KILIAN, Univ. of Illinois, Urbana-Champaign, USA; KiBum LEE, Rutgers Univ., USA

SS17 Theranostic Nanomaterials for Biomedical Applications
Session Chair: Min-Ho KIM, Kent State Univ., USA

SS18 Engineering-based Approaches to Personalized Medicine
Session Chair: Pak Kin WONG, Univ. of Arizona, USA

SS19 Paper Microfluidic Devices for Molecular Diagnostics
Session Chair: Hideaki TSUTSUI, Univ. of California, Riverside, USA

SS20 Micro/Nano Technology for Surface Modification and Patterning
Session Chair: Hongsoo CHOI, Daegu Gyeongbuk Institute of Science & Technology, Korea

SS21 Matching Materials to Medicine and Biology: A Complex Challenge
Session Chair: Joel M. FRIEDMAN, Albert Einstein College of Medicine, USA

SS22 Microfluidics and Nanofluidics for Drug Carrier Development
Session Chair: Jungkyu (Jay) KIM, Texas Tech Univ., USA

SS23 BioMEMS: Gene Circuits to Physiological Biomimicry
Session Chair: YongTae KIM, Georgia Institute of Technology, USA

SS24 Nanotechnology in Drug Delivery
Session Chair: Dong Woo LIM, Hanyang Univ., Korea

SS25 Biomolecular Nanomaterials for Advanced Devices
Session Chair: Haewook HAN, Pohang Univ. of Science & Technology, Korea

Workshops

WS1 Biomedical Optics for Clinical Nanomedicine
Workshop Chair: Euiheon CHUNG, Gwangju Institute of Science & Technology, Korea; Chulhong KIM, Pohang Univ. of Science & Technology, Korea

WS2 Micro Needles for New Transdermal Drug Delivery Systems
Workshop Chair: Beomjoon KIM, Univ. of Tokyo, Japan

WS3 Soft Nano/Bio Devices for Biomedicine
Workshop Chair: Jae-Woong JEONG, Univ. of Colorado, USA

IEEE-NANOMED 2015

The 9th IEEE International Conference on Nano/Molecular Medicine and Engineering

WAIKIKI BEACH, HAWAII, USA NOVEMBER 15 | 18

November 15, Sunday

08:30-12:00	**Registration** at Regency Foyer, 1/F Convention Center	**International Symposium** *in Honor of Prof. Chih-Ming Ho* (Maloko)		
12:00-13:00				
13:00-14:00			**WS1: Biomedical Optics for Clinical Nanomedicine** (Mauka) Chair: Euiheon Chung; Co-Chair: Chulhong Kim	**Keynote Talk 1: Dai Fukumura** (Mauka) "***Targeting Tumor Vasculature & Microenvironment for Nanomedicine***"
14:00-15:40				**WS1: Session 1** (Mauka)
15:40-16:00				**Coffee Break** at Regency Foyer
16:00-18:00				**WS1: Session 2** (Mauka)
18:00-20:00	**Welcome Reception** at Poor Area, 3/F Diamond Head Tower			

November 16, Monday

08:15-08:30	**Registration** at Regency Foyer		**Opening Ceremony**				
08:30-09:20			**Plenary Talk 1: Taeghwan Hyeon** (Makai) "***Designed Chemical Synthesis & Assembly of Uniformed-sized Nanoparticles for Medical Applications***" Chair: Jin-Woo Kim				
09:20-10:10			**Plenary Talk 2: Peixuan Guo** (Makai) "***Discovery of a Third Type of Biomotor Using Revolution Mechanism without Rotation & Application of Its Components in Single Pore Sensing & RNA Nanotechnology***" Chair: Jin-Woo Kim				
10:10-10:40			**Coffee Break** at Convention Center Foyer				
10:40-11:20			**Keynote Talk 2: Oleg Gang** (Makai) "***DNA-Programmable Nanoparticle Assembly: From Principles to Material Design***" Chair: Jin-Woo Kim				
11:20-12:00			**Keynote Talk 3: Teri W. Odom** (Makai) "***Gold Nanostar Probes for Imaging & Therapeutics***" Chair: Edward K.-H. Chow				
12:00-13:00			**Lunch Break**				
13:00-13:40		Poster Session I at Convention Center Foyer	**Keynote Talk 4: Xiaohu Gao** (Makai) "***Multifunctional Nanoparticles for Cancer Imaging & Treatment***" Chair: Dean Ho				
13:40-14:00			**Break**				
14:00-15:40	**Registration** at Regency Foyer		**SS1: Micro & Nanotechnologies for Monitoring & Regulating the Immune System** (Makai) Chair: Andrew Smith	**SS2: Nano/ Microengineering-assisted Therapy** (Maloko) Chair: Yanan Du	**SS3: Single Cell Analysis towards Personalized Medicine** (Mauka) Chair: SJ Claire Hur	**WS2: Micro Needles for New Transdermal Drug Delivery Systems** (Suite 1) Chair: Beomjoon Kim	
15:40-16:00			**Coffee Break** at Convention Center Foyer				
16:00-17:40			**SS4: Micro/ Nanotechnologies for Mechanobiology & Regenerative Medicine** (Makai) Chair: Deok-Ho Kim Co-Chair: Yu Sun	**SS5: Bioelectronic Devices for Electroceutical Therapies & Diagnostics** (Maloko) Chair: Marco Rolandi	**SS6: Emerging Micro-/Nano-Scale Sensing Technologies for Use in Medical Engineering** (Mauka) Chair: Hyuck Choo	16:00-17:00 **WS2** (cont.) Chair: Beomjoon Kim	
						17:00-17:50 **Best Student Paper Competition** (Suite 1) Chair: Pak Kin Wong	
17:40-17:55			**Break**				
17:55-20:00		18:00	**SS7: Quantitative Live Cell Imaging** (Makai) Chair: Kwonmoo Lee	17:55-18:55 **SS8: Nanobiomaterials & 3D Nano/ Microfabrication Techniques for Biomedical Application** (Maloko) Chair: Lijie (Grace) Zhang	**SS10: Nanobiosensors for Rapid & Sensitive Detection of Biomolecules** (Mauka) Chair: Sang-Hyun Oh	**SS11: Biochips & Bio-MEMS** (Suite 1) Chair: Amy Shen	
				18:55-20:30 **SS9: Emerging Nanocarriers for Improved Drug Delivery** (Maloko) Chair: Seungpyo Hong		

IEEE-NANOMED 2015

NOVEMBER 15 | 18 WAIKIKI BEACH, HAWAII, USA

November 17, Tuesday

	November 17 (Tuesday)					
08:00-08:30	Registration at Regency Foyer	Poster Session II at Convention Center Foyer				
08:30-09:20			**Plenary Talk 3: Chih-Ming Ho** (Makai) "***Phenotypic Personalized Medicine (PPM)***" Chair: Wen J. Li			
09:20-10:10			**Plenary Talk 4: Kevin Kit Parker** (Makai) "***Beyond Electrospinning: New Manufacturing Methods for Bioinspired Textiles***" Chair: Jin-Woo Kim			
10:10-10:40			**Coffee Break** at Convention Center Foyer			
10:40-11:20			**Keynote Talk 5: Vladimir P. Zharov** (Makai) "***In Vivo Blood Nanotest***" Chair: Jin-Woo Kim			
11:20-12:00			**Keynote Talk 6: David L. Kaplan** (Makai) "***Advances & Challenges with Fibrous Protein Biomaterial Designs***" Chair: Deok-Ho Kim			
12:00-13:00			**Lunch Break**			
13:00-13:40		Poster Session III at Convention Center Foyer	**Keynote Talk 7: Yu Sun** (Makai) "***Robotic Manipulation of Cellular & Intracellular Structures***" Chair: Wen J. Li			**WS3: Soft Nano/Bio Devices for Biomedicine** (Suite 1) Chair: Jae-Woong Jeong
13:40-14:00			**Break**			
14:00-15:40			**SS12: Detection, Delivery & Microscopy in Single Cells** (Makai) Chair: Tim Yeh	**SS13: Novel Approaches to Target Tumor Microenvironment in Solid Tumors** (Maloko) Chair: Mahavir B. Chougule	**SS14: Nano/Microsystems for Clinical Diagnostics & Regeneration** (Mauka) Chair: Justyn Jaworski	
15:40-16:00			**Coffee Break** at Convention Center Foyer			
16:00-18:30			**SS15: Innovative Optical Sensing Technologies for Biomedical Diagnosis** (Makai) Chair: Donglei (Emma) Fan	**SS16: Engineering the Cell-Biomaterial Interface & Opportunities at the Interface of Nanotechnology & Stem Cell Biology** (Maloko) Chair: Kristopher A. Kilian Co-Chair: KiBum Lee	**SS17: Theranostic Nanomaterials for Biomedical Applications** (Mauka) Chair: Min-Ho Kim	**SS18: Engineering-based Approaches to Personalized Medicine** (Suite 1) Chair: Pak Kin Wong
19:30-22:00	**Conference Banquet** at Makai, 1/F Convention Center					

The 9th IEEE International Conference on Nano/Molecular Medicine and Engineering

November 18, Wednesday

	November 18 (Wednesday)			
08:30-09:10	**Keynote Talk 8: Dong Sun** (Makai) "***Cell Surgery Robotics in Cell Fusion Application***" Chair: Edward K.-H. Chow			
09:10-09:20	**Coffee Break** at Regency Foyer			
09:20-11:00	**SS19: Paper Microfluidic Devices for Molecular Dagnostics** (Makai) Chair: Hideaki Tsutsui	**SS20: Micro/Nano Technology for Surface Modification & Patterning** (Maloko) Chair: Hongsoo Choi	**SS21: Matching Materials to Medicine & Biology: A Complex Challenge** (Mauka) Chair: Chester Drum	**SS25: Biomolecular Nanomaterials for Advanced Devices** (Suite 1) Chair: Haewook Han
11:00-11:10	**Break**			
11:10-13:00	**SS22: Microfluidics & Nanofluidics for Drug Carrier Development** (Makai) Chair: Jungkyu (Jay) Kim	**SS23: BioMEMS: Gene Circuits to Physiological Biomimicry** (Maloko) Chair: YongTae Kim	**SS24: Nanotechnology in Drug Delivery** (Mauka) Chair: Dong Woo Lim	
14:00-16:00	**Farewell Reception** at Poor Area, 3/F Diamond Head Tower			

Designed Chemical Synthesis and Assembly of Uniform-sized Nanoparticles for Medical Applications

PL1: 08:30 – 09:20
Monday, November 16, 2015
Location: Makai

Taeghwan HYEON

Center for Nanoparticle Research
Institute for Basic Science (IBS), Seoul, Korea
School of Chemical and Biological Engineering
Seoul National University, Seoul, Korea
thyeon@snu.ac.kr

Abstract

Over the last 10 years, our laboratory has focused on the designed chemical synthesis, assembly and applications of uniform-sized nanocrystals. In particular, we developed a novel generalized procedure called as the "heat-up process" for the direct synthesis of uniform-sized nanocrystals of many metals, oxides, and chalcogenides.1 Furthermore we assemble these uniform-sized nanocrystals to fabricated multifunctional nano-structured materials and apply them to medicine and energy.

Using 3 nm-sized iron oxide nanoparticles, new non-toxic MRI contrast agent was realized for high resolution MRI of blood vessels down to 0.2 mm.2 We reported the first successful demonstration of high-resolution in vivo three-photon imaging using biocompatible and bright Mn2+ doped ZnS nanocrystals.3 We fabricated tumor pH-sensitive magnetic nanogrenades composed of self-assembled iron oxide nanoparticles and pH-responsive ligands for theranostic application, enabling the visualization of small tumors of < 3 mm via pH-responsive T1 MRI and fluorescence imaging and superior photodynamic therapeutic efficacy in highly drug-resistant heterogeneous tumors.4 We synthesized tumor pH-sensitive nanoformulated triptolide coated with folate targeting ligand to treat hepatocellular carcinoma (HCC), which has one of the worst prognosis for survival as it is poorly responsive to both conventional chemotherapy and mechanism directed therapy.

1. "Ultra-Large Scale Syntheses of Monodisperse Nanocrystals," Nature Mater. 2004, 3, 891.
2. "Large-scale Synthesis of Uniform and Extremely Small-sized Iron Oxide Nanoparticles for High-resolution T1 MRI Contrast Agents," J. Am. Chem. Soc. 2011, 133, 12624.
3. "High-Resolution Three-Photon Biomedical Imaging using Doped ZnS Nanocrystals," Nature Mater. 2013, 12, 359.
4. "Multifunctional Tumor pH-Sensitive Self-Assembled Nanoparticles for Bimodal Imaging and Treatment of Resistant Heterogeneous Tumors," J. Am. Chem. Soc. 2014, 136, 5647.

Short Bio

Taeghwan Hyeon received his B. S. (1987) and M. S. (1989) in Chemistry from Seoul National University (SNU), Korea. He obtained his Ph.D. in Chemistry from U. Illinois (1996). Since he joined the faculty of the School of Chemical and Biological Engineering of SNU in September 1997, he has been focused on the synthesis and applications of uniform-sized nanoparticles and nanoporous materials, and published > 250 papers in prominent international journals. In 2010 he was appointed as the first "SNU Distinguished Fellow" (Distinguished University Professor) of the Seoul National University. In February 2011, he was selected as "Top 100 Chemists" of the decade (2000-2010) by UNESCO&IUPAC. In 2012, he was appointed as a Director of Center for Nanoparticle Research of Institute for Basic Science (IBS). He is Fellow of Royal Society of Chemistry (RSC) and Materials Research Society (MRS). He received many awards including Hoam Prize (2012, Samsung Hoam Foundation), POSCO-T. J. Park Award (2008), the Korean Young Scientist Award (2002), and DuPont Sci&Tech Award (2005). Since 2010, he has served as an Associate Editor of J. Am. Chem. Soc. He has been serving as editorial (advisory) board members of ACS Central Science, Advanced Materials, Nanoscale, Nano Today, and Small.

Discovery of a Third Type of Biomotor Using Revolution Mechanism without Rotation and Application of Its Components in Single Pore Sensing and RNA Nanotechnology

PL2: 09:20 – 10:10
Monday, November 16, 2015
Location: Makai

Peixuan GUO

Nanobiotechnology Center
Markey Cancer Center
College of Pharmacy
University of Kentucky, Lexington, KY, USA
peixuan.guo@uky.edu

Abstract

The third type of biomotors using the revolution mechanism without rotation was discovered in 2013, and subsequently found widespread in bacteria, animal viruses, bacteriophages, and is expected to be prevalent in eukaryotic cells. DNA translocation motors are ubiquitous in living systems for mitosis, chromosome segregation, bacterial binary fission, viral genomic trafficking, RNA transcription, nuclear pore transport, viral genome packaging and DNA replication/repair/homologous recombination/Holliday junction resolution. The motion events are accomplished by biomotors using ATP as energy. Biomotors were once classified into two categories: linear and rotation motors. For decades, dsDNA packaging motors of viruses have been popularly believed to be a five-fold rotation motor. However, extensive studies revealed that none of the motor components rotate during DNA packaging. The puzzle concerning how the spiral-shape motor nut can drive the helical dsDNA bolt without rotation of either the bolt or the nut has been solved by the finding of revolution mechanism without rotation. By analogy, rotation resembles the Earth rotating on its own axis for one cycle every 24 hours, while revolution resembles the Earth revolving around the Sun, one circle per 365 days (see animations: http://nanobio.uky.edu/movie.html). Revolution motors can be distinguished from rotation motors by channel size and chirality: left-handed channel wall for revolution motors in an anti-chiral arrangement with DNA; and right-handed for rotation motors as parallel threads with DNA. Larger channel (>3 nm) for revolution motors to revolve the 2-nm dsDNA inside the channel, and smaller channel (<2 nm) for rotation motors to maintain close contact between the channel wall and dsDNA. The direction of motion is controlled by channel chirality and rectification. Binding of ATP to the ATPase results in entropy change of the ATPase, leading to a high affinity for dsDNA. ATP hydrolysis results in a second entropy change with a low DNA-affinity, resulting in the release of dsDNA for concomitant transfer to the adjacent subunit regulated by inter-subunit interaction. Coordination of several vector factors in the same direction make the motor unusually powerful and effective. Revolution mechanism that avoids DNA coiling and tangling for translocating the lengthy genomic could save much bioenergy. The application of the motor components for single pore sensing, single molecular finger printing, potential high throughput dsDNA sequencing, earlier disease single antibody or antigen detection, the methods for the development of highly potent drugs base on motor mechanisms, and how the studies on the motor pRNA of bacteriophage phi29 DNA packaging motor leads to the emergence of the field of RNA nanotechnology will be presented.

Short Bio

Ph.D from U Minnesota; postdoc NIH; Purdue assistant Prof 1990; tenured 1993; full Prof 1997, Biomed Engineering Endowed Chair U Cincinnati 2007; Endowed Chair of Nanobiotech U Kentucky 2012; Director NIH NDC 2006-2011; current U Kentucky Director of Nanobiotech Center; Director of NCI CNPP: RNA Nanotech for Cancer Therapy. Constructed the first viral DNA packaging motor (PNAS 1986), discovered phi29 motor pRNA (Science 1987); discovered pRNA hexamer (Mol Cell 1998), pioneered RNA nanotechnology (Mol Cell 1998, featured in Cell 1998; Nature Nanotech 2010, 2011); built a system to detect single-fluorophores (EMBOJ 2007); incorporated phi29 motor channel into membrane (Nature Nanotech 2009) for single pore sensing and DNA sequencing; discovered a third class of biomotor using revolution mechanism; developed approaches for ultra-potent drugs; received Pfizer Distinguished Faculty Award; Purdue Faculty Scholar Award; Lions Club Cancer Res Award; Distinguished Alumni of U Minnesota; 100 Years Distinguished Chinese Alumni of U Minnesota; editorial board of 7 nanotech journals; reported numerous times by TV such as ABC, NBC, BBC; featured by NIH, NSF, MSNBC, NCI and ScienceNow; member of two prominent national nanotech initiatives by NSF and NIH; NIH/NCI Intramural Site-visit Review Panel twice; Examination Panel of Chinese National Academy of Sciences since 2014.

Phenotypic Personalized Medicine (PPM)

PL3: 08:30 – 09:20
Tuesday, November 17, 2015
Location: Makai

CHIH-MING HO

Mechanical and Aerospace Engineering Department
Bioengineering Department
University of California, Los Angeles, CA, USA
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ABSTRACT

Patient response rates to chemotherapy are fairly low in cancer treatment, often due to human diversity and cancer heterogeneity. For example, the response rate for lung cancer is about 25% and only 10% for hepatoma. Therefore, personalized medicine is necessary to improve treatment efficacy/response rate as well as safety by providing precisely tailored patient therapy.

Cancer and infectious disease therapy often use combinatorial medicine, where multiple compounds that address different pathways may improve treatment outcomes. Current methods are far from optimal, however, as typical multi-drug design is achieved through additive dosing, where maxima but tolerable doses are simply combined. Rational combinatorial design must move beyond arbitrary dosing, but in order for this to be accomplished, several important questions need to be raised. Silencing genes to combat resistance, mediating apoptosis, and allowing vascular access, among other targets, are all pathways worth targeting, but what if more pathways are targeted at the same time to comprehensively attack the tumor? How will dosing be determined? How will the dosages of each drug be adjusted if efficacy is improved but toxicity is worsened? More importantly, how will 'optimization' be defined, especially if the desired outcome is to simultaneously eliminate tumor growth, eliminate resistance, maintain white blood cell counts, and a host of other conditions? An attempt to optimize any one of these conditions will inevitably de-optimize another condition. Furthermore, these conditions will also vary from patient to patient.

To address these major challenges, recent technology developments have enabled the precise determination of which medicines may be most effective for a single patient based on his/her specific phenotypic expression. Engineering feedback system control (FSC.X) techniques can realize unprecedented levels of adaptability to rapidly home in on an optimized drug-dose combination based on the measured end-point phenotype of a specific patient. In addition, subsequent dosing treatments can be tailored in parallel with evolving patient´s conditions. In other words, the emergence of phenotypic personalized medicine (PPM) can not only customize therapy to one specific patient, but also can rapidly adapt rationally designed combinations to the dynamic physical response of that patient. PPM will intersect medical and biological sciences with technology development and will catalyze revolutionary progress towards truly personalized medicine.

SHORT BIO

Chih-Ming Ho received Ph.D. from The Johns Hopkins University. Currently, he holds the Ben Rich-Lockheed Martin Chair Professor and Distinguished Professor in UCLA School of Engineering. He served as UCLA Associate Vice Chancellor for Research from 2001 to 2005.

He is known for his researches in personalized medicine, micro/nano fluidics, and turbulence. In 1997, Dr. Ho was inducted as a member of the National Academy of Engineering. In the next year, he was elected as an Academician of Academia Sinica. In 2014, Dr. Ho received Doctor of Engineering Honoris Causa from Hong Kong University of Science and Technology. Dr. Ho holds ten honorary chair professorships including the Einstein Professorship from Chinese Academy of Science. Dr. Ho was elected Fellow of the American Physical Society, American Institute for Medical and Biological Engineering American Institute of Aeronautics and Astronautics as well as 3M-Nano Society.

On the international level, he has served on advisory panels to provide assistance to many countries and regions including China, France, Hong Kong, Israel, Japan, Korea, Singapore, Switzerland, Taiwan, Thailand and United Kingdom, on the developments of medicine, engineering and science.

Beyond Electrospinning: New Manufacturing Methods for Bioinspired Textiles

PL4: 09:20 – 10:10
Tuesday, November 17, 2015
Location: Makai

Kevin Kit PARKER

Tarr Family Professor of Bioengineering and Applied Physics
Core Member, WYSS Institute for Biologically Inspired Engineering
Harvard University, Cambridge, MA, USA
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Abstract

From a structural perspective, the extracellular matrix (ECM) is a scaffold that guides the self-assembly of cells into functional tissues. Natural ECMs therefore provide excellent design rules for tissue engineering scaffolds. New scaffolds using nanofibrous scaffolds composed of blended polymer/bioprotein fibers that simultaneously recapitulate 3D ECM architecture, high-fidelity nanoscale topography, and bio-activity. Their high porosity, structural anisotropy, and bioactivity present unique advantages for engineering 3D anisotropic tissues. We have developed three novel platforms for nanofiber manufacturing that allows the mass production of fibers and yarns with nanometer-scale diameters in polymers including fibronectin, DNA, alginate, and Kevlar. I will present preliminary results with these fibers and discuss the possibility of antiquating electrospinning for the manufacture of protein-based nanofibers.

Short Bio

Kevin Kit Parker is the Tarr Family Professor of Bioengineering and Applied Physics in the John A. Paulson School of Engineering and Applied Sciences at Harvard University. He is a primary faculty member of both the Harvard Stem Cell Institute and the Wyss Institute for Biologically-Inspired Engineering. He received his B.S. in Biomedical Engineering from Boston University, his M.S. in Mechanical Engineering and PhD in Applied Physics from Vanderbilt University. He was a postdoctoral fellow in Pathology at Children's Hospital in Boston and in Biomedical Engineering at the Johns Hopkins School of Medicine. Parker is a Lieutenant Colonel in the United States Army Reserve and has served two combat tours in Afghanistan.

In addition to his teaching responsibilities at Harvard, Parker is the director of the multidisciplinary SEAS Disease Biophysics Group. His research includes cardiac cell biology and tissue engineering, traumatic brain injury, and biological applications of micro- and nanotechnologies. He is involved in projects ranging from creating organs-on-chips to developing nanofabrics for applications in tissue regeneration.

Targeting Tumor Vasculature and Microenvironment for Nanomedicine

KN1: 13:00 – 14:00
Sunday, November 15, 2015
Location: Mauka

Dai FUKUMURA

Department of Radiation Oncology
Massachusetts General Hospital, Boston, MA, USA
Harvard Medical School, Boston, MA, USA
dai@steele.mgh.harvard.edu

Abstract

Intravital microscopy techniques have provided unprecedented insight into pathophysiology of tumors revealing that tumor vasculature has abnormal and heterogeneous organization, structure, and function (e.g., hyper-permeability, heterogeneous and compromised blood flow) resulting in abnormal microenvironment (e.g., hypoxia, acidosis, elevated interstitial fluid pressure) and hindrance of the delivery and efficacy of therapeutic agents. One can exploit aberrant microenvironment in tumors for selective treatment of tumors. Optimization of nanomedicine design such as charge, size, and shape would offer new hope for cancer treatment. Nanotherapeutics exhibit many advantages over small-molecule chemotherapeutics, including diminished systemic toxicity, improved circulation times and enhanced permeability and retention (EPR) effect. However, after the extravasation, these relatively large nanotherapeutics cannot penetrate into tumor. We proposed a multistage nanoparticle delivery system to solve this dichotomy. We have demonstrated superior intratumoral diffusion of multistage nanoparticles that can release small size nanoparticles upon exposure to enzymes uniquely present in tumor tissues. However, optimization of nanoparticle design alone may not be sufficient to overcome the barriers to drug delivery. Alternative approach would be to tame abnormal tumor vasculature and microenvironment. For example, an imbalance of pro- and anti-angiogenic factors causes the deranged tumor angiogenesis. Restoring tissue balance of these factors in tumors may "normalize" tumor vasculature and thus, improve its function. Administration of nanomedicine during periods of vascular normalization potentiates their treatment efficacy. Furthermore, in highly desmoplastic tumors, blood vessels may be collapsed due to solid stress - built-up physical stress generated by growing tumor cells and fibrotic microenvironment and drug distribution may also be hindered. Targeting desmoplasia would be a novel approach to enhance delivery and efficacy of nanomedicine. Collectively, abnormal tumor vasculature and microenvironment form formidable barriers to anti-tumor therapies. Novel treatment approaches to exploit and/or tame such abnormalities would enhance delivery and efficacy of existing and future nanomedicine treatment strategies.

Short Bio

Dai Fukumura, M.D., Ph.D. is an internationally recognized expert in imaging, angiogenesis, vascular and tumor biology. His research areas include 1) role of host-tumor interaction (microenvironment) in angiogenesis, tumor growth, metastasis and treatment response; 2) role of nitric oxide in vessel formation, function and normalization; 3) probing and exploiting tumor microenvironment using nanotechnology; 4) role of obesity in angiogenesis and tumor progression; and 5) tissue-engineered blood vessels. Specifically related to today's talk, Dr. Fukumura and his colleagues have been dissecting how the tumor microenvironment hinders delivery and efficacy of nanotherapeutics, and to develop strategies to overcome these barriers. They studied and established the tumor microenvironment and transport properties of nanoparticles using different size, charge and configuration quantum dot-based probes. Dr. Fukumura found that a "one size fits all" approach does not work for nanotherapeutics, and proposed and demonstrated a provocative multistage nanoparticle delivery system.

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DNA-Programmable Nanoparticle Assembly: From Principles to Material Design

KN2: 10:40 – 11:20
Monday, November 16, 2015
Location: Makai

Oleg GANG

Center for Functional Nanomaterials
Brookhaven National Laboratory, Upton, NY, USA
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Abstract

In the last decades nanoscale inorganic objects emerged as a novel type of matter with unique functional properties and a plethora of prospective applications. Although a broad range of nano-synthesis methods has been developed, our abilities to organize these nano-components into designed architectures and control their transformations are still limited. In this regard, an incorporation of bio-molecules into a nano-object allows establishing highly selective interactions between the components of nano-systems. Such bio-encoding may permit programming of complex and dynamically tunable systems via self-assembly: biomolecules act as site-specific scaffolds, smart assembly guides and reconfigurable structural elements.

I will discuss our advances in addressing the challenge of programmable assembly using the DNA platform, in which a high degree of addressability of nucleic acids is used to direct the formation of structures from nanoscale inorganic components. Our work explores the major leading parameters determining a structure formation and methods for creating targeted architectures. The principles

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and practical approaches developed by our group allow for assembly of well-defined three-dimensional superlattices, two-dimensional membranes and finite-sized clusters from the multiple types of the components. I will also discuss how interplay of polymeric and colloidal effects can result in the novel interactions effects in these systems. Our recent progress on the development of by-design assembly strategies will be illustrated by nanoparticle lattices with "engineered" crystallographic symmetries and clusters with prescribed architectures. Novel approaches for dynamical control of assemblies, such as selective triggering of transformations, will be presented. Finally, I will discuss the sensing and optical applications based on the DNA assembled nanoparticle systems.

Research is supported by the U.S. DOE Office of Science and Office of Basic Energy Sciences under contract No. DE-SC0012704.

Short Bio

Oleg Gang is a group leader for Soft and BioNanomaterial group at the Center for Functional Nanomaterials at Brookhaven National Laboratory (BNL), located at Upton, NY. He received his PhD in physics from Bar-Ilan University (Israel) and performed his postdoc work at the Division of Applied Sciences at Harvard University, after which he joined BNL. Oleg's studied a broad range of molecular and nanoscale sot matter systems, including structure of liquid interfaces, nano-wetting, molecular and nanoscale self-assembly, polymer phenomena, nano-optical effects and applications of nanomaterials to biomedical problems. His current interests are focused on the development of novel strategies for bio-programmable self-assembly of designed nanoparticle architectures with potential applications in nano-optics, bio-sensing and energy transfer. Oleg is also involved in the development of new synchrotron-based x-ray methods for soft and hybrid materials.

Oleg is Fellow of American Physical Society 2014; a recipient of TechConnect National Innovation Award 2013; Science and Technology Award for Outstanding Achievements of Brookhaven National Laboratory 2011; Gordon Battelle Prize for Scientific Discovery 2010; US Department of Energy Outstanding Mentor Award 2009, and Rothschild and Goldhaber fellowships. He gave more than 100 invited, keynote and plenary presentations and authored about 90 research papers.

Gold Nanostar Probes for Imaging and Therapeutics

KN3: 11:20 – 12:00
Monday, November 16, 2015
Location: Makai

Teri W. Odom

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todom@northwestern.edu

Abstract

Nanotechnology offers new strategies for minimally invasive and localized approaches to diagnose and treat diseases. Recently, nanoparticles have been explored in a range of applications, including as drug delivery vehicles, imaging probes, and therapeutic agents. Although increased therapeutic efficacy has been realized, direct visualization of how engineered nanoparticles interact with specific organelles or cellular components has seen limited attention. Such interactions will have implications for fundamentals in cancer biology as well as in the design of translational therapeutic agents. This talk will describe how drug-loaded gold nanostars can behave as multi-spectral optical probes for interrogating how therapeutic nanoconstructs affect cancer cells at the nanoscale. We will focus on model cancer cell systems that can be used to visualize how gold nanostar nanoconstructs target cells, rotate on the plasma membrane, are endocytosed, and are trafficked intracellularly. We will also discuss mechanisms of cell death associated with these unique therapeutic nanoconstructs.

Short Bio

Teri W. Odom is Charles E. and Emma H. Morrison Professor of Chemistry and Professor of Materials Science and Engineering at Northwestern University. She is an expert in designing structured nanoscale materials that exhibit extraordinary size and shape-dependent properties. Such multi-scale structures are driving a diverse range of applications, from insight into how drugs affect the intracellular components of cells to the realization of nano-light sources that can beat the diffraction limit to controlled wettability by tuning the level of hierarchical structuring.

Odom has received numerous honors and awards, including being named a Fellow of the Royal Society of Chemistry; an NIH Director's Pioneer Award from the National Institutes of Health; the Materials Research Society Outstanding Young Investigator Award; the National Fresenius Award from Phi Lambda Upsilon and the ACS; an Alfred P. Sloan Research Fellowship; a National Science Foundation CAREER Award; and a David and Lucile Packard Fellowship in Science and Engineering. Odom was the first Chair of the Noble Metal Nanoparticles Gordon Research Conference. Odom serves as Executive Editor of the new journal ACS Photonics (2013 – present).

Multifunctional Nanoparticles for Cancer Imaging and Treatment

KN4: 13:00 – 13:40
Monday, November 16, 2015
Location: Makai

Xiaohu Gao

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Abstract

Nanoparticles in the 1-100 nm size range are of considerable current interest, not only because of their unique size-dependent properties but also their dimensional similarities with biological macromolecules (e.g., nucleic acids and proteins). These similarities could allow an integration of nanotechnology and biology, leading to major advances in medical diagnostics, prognostics, and targeted therapeutics. In this talk, I present recent development of multifunctional nanostructures for ultrasensitive detection and characterization of cancer cells and targeted therapeutics delivery.

Short Bio

Prof. Xiaohu Gao received his Ph.D. degree in bioanalytical chemistry from Indiana University, Bloomington in 2004, and his postdoctoral training from the Department of Biomedical Engineering at Georgia Tech and Emory University. He became a faculty member in the Department of Bioengineering and the Center for Nanotechnology at the University of Washington, Seattle in 2005. His research program is focused on biomedical nanotechnology, biomolecular engineering, molecular imaging, and targeted drug delivery. He is a recipient of the NSF CAREER Award, and has been a member of the American Chemical Society (ACS) and Biomedical Engineering Society (BMES) since 2003. He is an elected fellow of the American Institute for Medical and Biological Engineering (AIBME). He has published 65 peer reviewed articles with a total citation over 10,000 according to Web-of-Science.

In Vivo Blood Nanotest

KN5: 10:40 - 11:20
Tuesday, November 17, 2015
Location: Makai

Vladimir ZHAROV

Arkansas Nanomedicine Center, University of Arkansas for Medical Sciences, Little Rock, AR, USA
zharovvladimirp@uams.edu

Abstract

Cardiovascular diseases, cancers, and infections remain the main causes of death in the United States and worldwide. The diagnosis of many diseases begins with a common medical procedure: examination of extracted blood samples. The sensitivity of current blood testing is limited by the small volume of blood collected, in which theoretically no less than one disease-specific marker (e.g., tumor cell, clot, virus and bacterium) can be detected. It can miss many thousands of abnormal cells in the whole blood volume (~5 L in adults), which can be sufficient for disease progression to difficult-to-treat, if not already incurable, complications (e.g., metastasis, stroke, or sepsis). We have developed novel concept of early disease diagnosis ("in vivo reading written in blood") by in vivo photoacoustic (PA) detection of disease-associated circulating markers using both natural and artificial nanoparticles as high contrast PA molecular agents. Unlike typical blood sampling through extraction of a volume of blood ranging from 10 μL (drop) to a few milliliters, in vivo examination involves nearly the entire volume of blood passing through 1- to 2-mm-diameter peripheral vessels over 0.5 - 1 h (a few minutes in larger vessels) and thus will enable a dramatic increase in diagnostic sensitivity, ultimately up to 103 - 105 times, reflecting the ratio of the volume of blood sampled in vivo to that in vitro. In addition, the integration of simultaneous diagnosis and therapy—theranostics—can eradicate circulating abnormal cells, and thus can potentially prevent, or at least inhibit deadly metastasis, sepsis or stroke. This lecture summarizes recent advances of this platform with focus on nano-theranostics of melanoma, malaria, Staphylococcus aureus-related sepsis, and thrombosis.

Short Bio

Vladimir Zharov, PhD, DSc, Professor is the Director of the Arkansas Nanomedicine Center at the University of Arkansas for Medical Sciences and the Winthrop P. Rockefeller Cancer Institute in Little Rock, AR, USA. He received PhD and DSc degrees from the Bauman Moscow State Technical University (BMSTU), completed a postdoctoral fellowship at Lawrence Berkeley National Laboratory at the University of California, and served as the Chairman of Biomedical Engineering Department at the BMSTU. His record of innovative achievements are documented in ~200 publications (5 in Nature journals), 52 patents, and 5 books. Dr. Zharov is the principle investigator on 16 NIH, NSF, DoD and other agency grants. He pioneered super-resolution photoacoustic and phototohermal spectroscopy and microscopy, pulse nanotherapy of infections and cancer, laser-ultrasonic nanosurgery, photoacoustic tweezers, photothermal histology, and in vivo photoacoustic flow cytometry. Dr. Zharov is the State Prize Winner, the most prestigious national award in Russia, and the first recipient of the US Maiman Award, named after the inventor of the first laser.

Advances and Challenges with Fibrous Protein Biomaterial Designs

KN6: 11:20 – 12:00
Tuesday, November 17, 2015
Location: Makai

David L. KAPLAN

Department of Biomedical Engineering
Tufts University, Medford, MA, USA
david.kaplan@tufts.edu

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Abstract

The study of biomaterials underpins drug delivery systems, medical devices and tissue engineering-regenerative medicine scaffolding. Fibrous proteins, including collagens, elastins and silks provide a useful suite of structural templates upon which to build insight into design-function relationships for biomaterials, as well as useful material systems for the above applications. Traditional trial and error strategies, while useful, extend time frames for discovery and utility, thus improved experimental strategies to shorten the path from design to utility for new biomaterials are needed. We will review some of the strategies being implemented towards this goal, attained by marrying modeling tools with experimental platforms including bioengineering of variants of fibrous proteins followed by processing methods to generate solid-state materials for characterization. The goal is to develop predictive tools for biomaterial designs, with our current focus on hierarchical features and mechanics. The strategies, outcomes and vision for these approaches will be discussed.

Short Bio

David Kaplan is the Stern Family Endowed Professor of Engineering at Tufts University. He is Professor & Chair of the Department of Biomedical Engineering and also holds faculty appointments in the School of Medicine, Department of Chemistry and the Department of Chemical and Biological Engineering. His research focus is on biopolymer engineering to understand structure-function relationships, with emphasis on studies related to self-assembly, biomaterials engineering and regenerative medicine. Since 2004 he has directed the NIH P41 Center on Tissue Engineering and he has published over 700 peer reviewed papers. He is the editor-in-chief of ACS Biomaterials Science and Engineering and serves on many other editorial boards and programs for journals and universities. He has received a number of awards for teaching, was Elected Fellow American Institute of Medical and Biological Engineering and received the Columbus Discovery Medal and Society for Biomaterials Clemson Award for contributions to the literature.

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Robotic Manipulation of Cellular and Intracellular Structures

KN7: 13:00 – 13:40
Tuesday, November 17, 2015
Location: Makai

Yu SUN

Department of Mechanical & Industrial Engineering
Institute of Biomaterials & Biomedical Engineering
University of Toronto, Toronto, Canada
sun@mie.utoronto.ca

Abstract

Advances in biology and medicine require enabling techniques for manipulating and characterizing cells and sub-cellular structures. Robotic cell surgery and automated biophysical characterization of cells enable new frontiers in science and have tangible clinical relevance. Precise extraction of chromatins and sub-cellular organelles is poised to revolutionize genomics and proteomics. Robotic deposition of foreign materials into cells is enabling new drug efficacy tests for the pharmaceutical industry. Biophysical characterization of cells has revealed increasing relevance of cells' electrical and mechanical properties for predicting disease states. However, due to the small sizes of these objects and to their heterogeneity in a clinical sample, automated manipulation of single cells and intracellular structures is challenging.

This talk will introduce some of our robotic cell manipulation technologies. Hardware platforms and techniques such as cell immobilization, vision-based contact detection, visual servo control, and mechanical measurement of cellular and intracellular structures will be presented. Example work with collaborating hospitals on robotic manipulation of sperm, oocytes, and bladder cancer cells will be discussed. System performance and applications to molecule testing and clinical cell surgery will be highlighted. Using automated micropipette aspiration and atomic force microscopy, cellular and intracellular structures of normal urothelial cells and bladder cancer cells present in voided urine were characterized. Finally, single chromatin manipulation under scanning electron microscopy will be used as an example to illustrate our technologies for manipulating nanometer-sized sub-cellular and sub-nuclear structures.

Short Bio

Yu Sun is a Professor in the Department of Mechanical and Industrial Engineering, with joint appointments in the Institute of Biomaterials and Biomedical Engineering and the Department of Electrical and Computer Engineering at the University of Toronto. He obtained his Ph.D. in mechanical engineering from the University of Minnesota in 2003 and did his postdoctoral research at ETH-Zürich. He is presently a McLean Senior Faculty Fellow at the University of Toronto and the Canada Research Chair in Micro and Nano Engineering Systems. In 2012-2013, he directed the University of Toronto Nanofabrication Center. Sun has served and serves on the editorial boards of several IEEE Transactions, J. Micromechanics Microengineering, Scientific Reports, and Microsystems & Nanoengineering. Among the awards he received were the McLean Award, the First Prize in Technical Achievement of ASRM (American Society for Reproductive Medicine), and an NSERC E.W.R. Steacie Memorial Fellowship. He was elected to be a Fellow of ASME (American Society of Mechanical Engineers), IEEE (Institute of Electrical and Electronics Engineers), and CAE (Canadian Academy of Engineering) for his work on micro-nano devices and robotic systems.

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Cell Surgery Robotics in Cell Fusion Application

KN8: 08:30 – 09:10
Wednesday, November 18, 2015
Location: Makai

Dong SUN

Department of Mechanical & Biomedical Engineering
City University of Hong Kong, Hong Kong, China
medsun@cityu.edu.hk

Abstract

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Cell surgery robotics, enabled with special bio-manipulation tools capable of operation at the single cell level, is an innovation based on traditional surgery robotics into the areas of precision medicine and regenerative medicine. This talk will present the application of cell surgery robotics equipped with optical tweezers manipulator to achieving engineered laser-induced cell fusion. Cell fusion is a process by which two or multiple cells combine to form a single entity. This process is important in numerous biological events and applications, such as tissue regeneration and cell reprogramming. Laser-induced cell surgery robotic system, in which optical tweezers is used to trap and transport cells and optical scissors is used to cut cells, can achieve specific cell fusion artificially with high selectivity and fusion efficiency. Our research on the fusion between hepatocellular carcinoma cell (HepG2) and human embryonic stem cell (hESC), has demonstrated that the generated fused cells can have both stemness and cancer characteristics, and hence more like tumor-initiative cells. Experimental results showed that the fused cells expressed both cancer markers and stemness markers, exhibited increased resistance to drug treatment and enhanced tumorigenesis. This case study has evidenced that the laser-induced cell surgery robotic system will provide a new opportunity to study fusion during cell differentiation, maturation, reprogramming, and canceration.

Short Bio

Professor Sun is an internationally renowned scholar in robotics and the related area of biomedical engineering. He graduated from Tsinghua University and The Chinese University of Hong Kong, and then performed his post-doc research at the University of Toronto, Canada. He joined the City University of Hong Kong in 2000, and is now the Chair Professor and the Head of the Department of Mechanical and Biomedical Engineering. He has successfully led many research projects supported by external grants including the Collaborative Research Fund of Hong Kong, with outcomes in both fundamental and applied research. He received numerous best paper awards, as well as industrial awards such as Hong Kong Awards for Industry. He received the 2014 Outstanding Research Award of City University of Hong Kong. He has served editorial boards for several international journals including the IEEE Transactions on Robotics, and organized international conferences as General or Program Chair. He is a Fellow of the IEEE.

IEEE-NANOMED TECHNICAL SESSIONS

Micro and Nanotechnologies for Monitoring and Regulating the Immune System

SS1: 14:00 - 15:40
Monday, November 16, 2015
Location: Makai

Session Chair: **Andrew SMITH**
Univ. of Illinois, Urbana-Champaign,USA

Description

The immune system protects against disease but also plays a critical role in the pathogenesis of cancer and cardiovascular diseases and can deleteriously impact drug delivery. Therefore there is an important clinical need to develop tools that can measure and modulate the protein and cellular mediators of immune function. This session will focus on technologies with nanometer and micrometer dimensions that can measure immune system function in bodily fluids, enhance or attenuate immune responses in tissue, modulate local or systemic inflammation, or target immune cells in the body.

SS1.1 Efficient targeting of inflammation-associated macrophages, Andrew SMITH, Univ. of Illinois, Urbana-Champaign, USA (invited)

SS1.2 Biomaterials-based immune modulation for type 1 diabetes, Benjamin G. KESELOWSKY, Univ. of Florida, USA (invited)

SS1.3 Digital cytokine secretion by CD_4+ T cells, Jun HUANG, Univ. of Chicago, USA (invited)

SS1.4 Ultra-photostable 'giant' quantum dots as effective molecular probes and components for theranostic nanoparticles, Jennifer A. HOLLINGSWORTH, Los Alamos National Laboratory, USA (invited)

SS1.5 Nanosecond pulse laser mediated large cargo delivery into live cells, Tuhin SANTRA; Yi-Chie WU; Ting-Hsiang WU; Daniel L. CLEMENS; Bai-Yu LEE; Ximiao WEN; Marcus A. HORWITZ; Michael A. TEITELL; Pei-Yu CHIOU, Univ. of California, Los Angeles, USA, (Paper – 144)

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Nano/Microengineering-Assisted Therapy

SS2: 14:00 - 15:40
Monday, November 16, 2015
Location: Maloko

Session Chair: **Yanan DU**
Tsinghua Univ., China

Description

This session will highlight the latest advances in taking advantage of nano/micro scale technologies as powerful tools to facilitate therapeutic applications for treatment of severe diseases. Novel nano/microengineered systems will be exemplified by nano-carriers for drugs and genes with targeted delivery and high efficiency or as micro-carriers for cells for high efficient regenerative therapy or as nano/micro devices to manipulate the cell/tissue fates for improved therapeutic performances. The selected speakers will represent diverse background with interdisciplinary expertise in related fields.

SS2.1 Bioengineering tools to elucidate and control the fate of transplanted stem cells, Weian ZHAO, Univ. of California, Irvine, USA (Invited)

SS2.2 Cell labeling and imaging with smart nanoparticles, Chenjie XU, Nanyang Technological Univ., Singapore (Invited)

SS2.3 Polymeric thin films for cell and drug delivery, Hirokazu KAJI, Tohoku Univ., Japan (Invited)

SS2.4 Multiphoton based biofabrication of protein microstructures and micropatterns with submicron features, Barbara CHAN, Univ. of Hong Kong, China (Invited)

SS2.5 Primed microcryogels as injectable 3D microniches for site-directed and augmented cell therapy, Yanan DU, Tsinghua Univ., China (Invited)

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Single Cell Analysis towards Personalized Medicine

SS3: 14:00 - 15:40
Monday, November 16, 2015
Location: Mauka

Session Chair: **SJ Claire HUR**
Harvard Univ., USA

Description

Rapid advances in clinical medicine have revealed new formidable obstacles associated with individual variations in treatment responses. These diverse responses to therapy lead to the development of personalized medicine for better therapeutic outcomes, but systematic and quantitative single-cell level analyses are imperative to identify factors contributing to the heterogeneity. This session will focus on recent advancement in micro- and nanotechnologies, facilitating single-cell level cellular assays in order to elucidate underlying relationships between cellular phenotypes and disease states and to gain new insights into these clinical questions.

SS3.1 Miniaturized platforms for analyses of extracellular vesicles, Hakho LEE, Harvard Medical School, USA (Invited)

SS3.2 Single-cell level Localized gene delivery using encoded viral micropatch for cell-based protein translocation assays of G protein-coupled receptors, Wook PARK, Kyung Hee Univ., Korea (Invited)

SS3.3 Microfluidic technologies for rapid sorting and fractionating of cells by biomechanical signatures, Todd SULCHEK, et al., Georgia Institute of Technology, USA (Invited)

SS3.4 Stochasticity and spatial interaction govern stem cell differentiation dynamics, Quinton SMITH; Evgeny STUKALIN; Sravanti KUSUMA; Sharon GERECHT; Sean X. SUN, Johns Hopkins Univ., USA (Invited)

SS3.5 A versatile microfluidic electroporator for clinical and biological research, Mengxing OUYANG; Chris H. CHOI; Jung Hyun LEE; Winfield HILL; SJ Claire HUR, Harvard Univ., USA (Invited)

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Micro/Nanotechnologies for Mechanobiology and Regenerative Medicine

SS4: 16:00 - 17:40
Monday, November 16, 2015
Location: Makai

Session Chair: **Deok-Ho KIM**
Univ. of Washington, USA
Yu SUN
Univ. of Toronto, Canada

Description

This session offers several presentations to discuss micro/nanotechnologies-enabled devices and instruments for studying cellular mechanobiology. Cell function is directed by several factors in the microenvironment, including mechanical forces. Cells sense the mechanical characteristics of their microenvironment and translate the mechanical cues to intracellular biochemical signals that regulate several cellular and molecular processes important in development, homeostasis, and disease. Much of our understanding of the molecular mechanisms underlying the ability of cells to sense and react to mechanical stimuli is largely based on traditional macroscale tissue culture assays. Novel micro- and nanoscale techniques for investigating cellular mechanobiological processes in normal and pathophysiological contexts have been under intense development in recent years. These approaches are providing new insights into cell mechanotransduction and mechanobiological responses, leading to improved fundamental understanding of cell biology and new strategies for cell-based regenerative therapies. This session will discuss some of those recent advances in integrative cellular mechanobiology, including new discoveries and micro- and nanoengineered technologies.

SS4.1 Microrobots as a potential platform for stem cell transportation, Sangwon KIM; Hongsoo CHOI, Daegu Gyeongbuk Institute of Science & Technology, Korea (Invited)

SS4.2 An integrated multielectrode array nanodevice for drug-induced cardiotoxicity screening and drug discovery, Alec SMITH, Univ. of Washington, USA (Invited)

SS4.3 Shape-memory nanopatterns for shaping cell fate, Mitsuhiro EBARA, National Institute for Materials Science, Japan (Invited)

SS4.4 Salivary gland-derived ecto-mesenchymal cells is essential for salivary gland homeostasis and regeneration, Moryama REYES-GIL, Montefiore Medical Center & Albert Einstein College of Medicine, USA (Invited)

SS4.5 High flux ionic transport control using nanochannel networks membranes, Jungyul PARK, Sogang University, Korea (Invited)

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Bioelectronic Devices for Electroceutical Therapies and Diagnostics

SS5: 16:00 - 17:40
Monday, November 16, 2015
Location: Maloko

Session Chair: **Marco ROLANDI**
Univ. of California, Santa Cruz, USA

Description

Progress in bioelectronics encompasses devices that mimic biological functionality and interface with biological systems. Silicon nanowires record and stimulate single cell potential. Gramicidin and bacteriorhodopsin are integrated with carbon nanotubes, silicon nanowires, and organic field effect transistors to develop biosensors with increased functionality. Ionic and mixed conductivity in biological and organic polymers record and stimulate physiological functions, and are assembled into logic circuits. Edible batteries power these circuits. This session will focus on recent developments in bioelectronic devices that are designed to sense and treat medical conditions towards electroceuticals, or medicines that affect physiological function with electronic and ionic signals.

SS5.1 Living materials – A life on the edge, Fiorenzo OMENETTO, Tufts Univ., USA (Invited)

SS5.2 Multi-parameter monitoring of in vitro tissue models using organic electronics, Roisin OWENS, Ecole Nationale Supérieure des Mines de St. Etienne, France (Invited)

SS5.3 Silicon nanowire devices with membrane transporter components as a bioelectronic interface platform, Alexander NOY, Lawrence Livermore National Laboratory, USA (Invited)

SS5.4 Bioprotonic devices for pH control and affecting cellular function, Zahra HEMMATIAN, Univ. of California, Santa Cruz, USA (Invited)

SS5.5 A nanoelectronic sensor for diagnosis of infectious diseases, Joon-Hong KIM, Washington State Univ., USA (Invited)

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Emerging Micro-/Nano-Scale Sensing Technologies for Use in Medical Engineering

SS6: 16:00 - 17:40
Monday, November 16, 2015
Location: Mauka

Session Chair: **Hyuck CHOO**
California Institute of Technology, USA

Description

This session will cover new and exciting emerging microscale and nanoscale technologies for biomedical sensors. These micro-/nano-scale physical transducers employ one or combinations of mechanical, optical, electronic, and chemical/molecular approaches that can be applied to therapeutics, diagnostics, imaging, sensing, and patient management. Both early stage conceptual investigation and early translational stage work will be presented.

SS6.1 A nanophotonic-based intraocular pressure sensor with remote optical readout: in-vitro and in-vivo study, Jeong Oen LEE; Haeri PARK; Juan DU; David W. SRETAVAN; Hyuck CHOO, California Institute of Technology, USA (Invited)

SS6.2 Nanoscale bio-molecule sensing in fluid, Yeon Sik JEONG, Korea Advanced Institute of Science & Technology, Korea (Invited)

SS6.3 Field-effect transistors: revolutionary devices for label free detection of biomolecules, Yong-Sang KIM, Sungkyunkwan Univ., Korea (Invited)

SS6.4 Biomedical sensing with optical micro resonators on Chip, Yves-Alain PETER, Polytechnique Montréal, Canada (Invited)

SS6.5 Pressure transmitter for local pressure sensing in a microchannel, Chia-Hung Dylan TSAI; Makoto KANEKO, Osaka Univ., Japan (Paper – 124)

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Quantitative Live Cell Imaging

SS7: 17:55 - 20:00
Monday, November 16, 2015
Location: Makai

Session Chair: **Kwonmoo LEE**
Worcester Polytechnic Institute, USA

Description

There have been significant advances in fluorescence microscopy which allowed unprecedented progress in molecular and cellular biology. However, extracting quantitative information from live cell images are still great challenge in biomedical investigation. This session will focus on new development of imaging technologies and their application to shed light on quantitative nature of biological processes.

SS7.1 Spatiotemporal control mechanisms of axonal transport revealed by quantitative live cell imaging, Ge YANG, Carnegie Mellon Univ., USA (Invited)

SS7.2 Physical aspects of spindle assembly, Dan NEEDLEMAN, Harvard Univ., USA (Invited)

SS7.3 Manipulation and modeling of tyrosine kinase receptor cluster, Ji YU, Univ. of Connecticut Health Center, USA (Invited)

SS7.4 Probing the hierarchy of functionally redundant molecular systems using intrinsic image fluctuation, Kwonmoo LEE, Worcester Polytechnic Institute, USA (Invited)

SS7.5 Microchannel fabrication by local melting of hydrogel toward in vitro 3D cell structures, Masaru TAKEUCHI; Tomoyuki OYA; Akihiko ICHIKAWA; Kenichi OHARA; Masahiro NAKAJIMA; Toshio FUKUDA; Yasuhisa HASEGAWA, Nagoya Univ., Japan (Paper – 176)

SS7.6 Dissociation of brain tissue into viable single neurons in a microfluidic device, Linan JIANG; Robert KARFT; Linda RESTIFO; Yitshak ZOHAR, Univ. of Arizona, USA (Paper – 191)

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Nanobiomaterials and 3D Nano/Microfabrication Techniques

SS8: 17:55 -18:55
Monday, November 16, 2015
Location: Maloko

Session Chair: **Lijie (Grace) ZHANG**
George Washington Univ., USA

Description

Nanobiomaterials are biomaterials with nanometer features that can simulate the dimensions of natural tissues or organs. They offer a broad range of properties that can differ dramatically from their bulk counterparts and are attractive for biomedical applications. This symposium aims to bring together experts in medicine, engineering, and science to discuss developments in nanobiomaterials and 3D nano/microfabrication techniques for biomedical applications. It will focus on novel material advancements, advanced fabrication techniques for various biomedical applications including but not limited to tissue regeneration, drug delivery and cancer treatments, etc.

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SS8.1 Advances and challenges for developing internal health sensors: a focus on nanotechnology, Thomas J. WEBSTER, Northeastern Univ., USA (Invited)

SS8.2 Engineering biomedical function in supramolecular nanomaterial, Hicham FENNIRI, Northeastern Univ., USA (Invited)

SS8.3 Design of a 3D bioprinted tissue construct with a smart self-modulatory nano release system for improved vascularized bone regeneration, Lijie Grace, ZHANG, George Washington Univ., USA (Invited)

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Emerging Nanocarriers for Improved Drug Delivery

SS9: 18:55 -20:30
Monday, November 16, 2015
Location: Maloko

Session Chair: **Seungpyo HONG**
Univ. of Illinois , Chicago, USA

Description

This session seeks papers that describe emerging nanocarriers for improved drug/gene delivery. Those nanocarriers include a variety of hybrid systems, novel polymer-based systems, inorganic nanoparticles, and carbon-based platforms that have recently attracted a great deal of scientific interests. This session will emphasize those novel systems and their impact in targeted drug/gene delivery applications.

SS9.1 Development of oligospermines as miniciricleDNA carriers to combat lung cancer dependent on oncogenic EML4-ALK protein, Rohit KOLHATKAR, Univ. of Illinois, Chicago, USA (Invited)

SS9.2 A programmable microfluidic biochemical factory: conjugation, synthesis and analysis, Jungkyu (Jay) KIM, Texas Tech Univ., USA (Invited)

SS9.3 Combination therapy using polymerized-siRNA technique for cancer treatment, Sun Hwa KIM, Korea Institute of Science & Technology, Korea (Invited)

SS9.4 Site specific targeted drug delivery using biocompatible paramagnetic nanoparticles, Joel M. FRIEDMAN, Albert Einstein College of Medicine, USA (Invited)

SS9.5 Modular dendron micelles for controlled cell interactions, Seungpyo HONG, Univ. of Illinois, Chicago, USA (Invited)

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Nanobiosensors for Rapid and Sensitive Detection of Biomolecules

SS10: 17:55 -20:00
Monday, November 16, 2015
Location: Mauka

Session Chair: **Sang-Hyun OH**
Univ. of Minnesota, Twin Cities, USA

Description

Advances in top-down nanofabrication and bottom-up assembly techniques have enabled a new generation of biosensors for rapid and sensitive detection of analyte molecules. While significant progress has been made in improving the detection sensitivity, many challenges remain such as overcoming the diffusion limit in miniaturized sensors and interfacing engineered surfaces with biomolecules. This session will focus on how to harness engineered nanostructures – such as nanoparticles, nanopores, nanowires – to address the fundamental challenges in biosensing and spectroscopy.

SS10.1 Merging plasmonic tweezers and spectroscopy for enhanced sensing and analytics, Yuebing ZHENG, Univ. of Texas, Austin, USA (Invited)

SS10.2 Porous plasmonic nanostructures for bio applications, Wei Chuan SHIH, Univ. of Houston, USA (Invited)

SS10.3 Graphene varactors: a novel wireless biosensing platform, Steven J. KOESTER, Univ. of Minnesota, USA (Invited)

SS10.4 Nanogap engineering for single molecule Raman detection, Yung Dong SUH, Korea Research Institute of Chemical Technology, Korea; Sungkyunkwan Univ., Korea (Invited)

SS10.5 Surface transport of analytes to improve nanopore biosensors, Megan ARMSTRONG, Corina CURSCHELLAS; Siheng HE; Henry HESS, Columbia Univ., USA (Paper – 158)

SS10.6 Electromechanical properties of one dimensional carbon chains, Zeina AL-DOLAMI; Arun NAIR; Steve TUNG, Univ. of Arkansas, USA (Paper – 193)

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Biochips and Bio-MEMS

SS11: 17:55 - 20:00
Monday, November 16, 2015
Location: Suite 1

Session Chair: **Amy SHEN**
Okinawa Institute of Science & Technology Graduate Univ., Japan

Description

Miniaturized and integrated small-scale devices have been actively developed for fundamental biological/biochemical research and applications in medical diagnostics and therapy. This session provides a forum to discuss the current trends and technologies in Biochips and Bio-MEMs. We will showcase a variety of bio-MEMs platforms for an assortment of biological applications. One focus of the session is to discuss emerging techniques for immunoassay at micro and nano-scales. Integrated optofluidic platforms will also be presented for single cell analysis. Finally microneedles will be shown to treat cardiovascular diseases by targeted drug delivery.

SS11.1 Formation of parallel aq./org. two-phase flow in extended-nano channel for fL chemical analysis, Yutaka KAZOE; Takehiko KITAMORI, Univ. of Tokyo, Japan (Invited)

SS11.2 Optothermal cell assembly, poration, and lysis in a single optofluidic platform, Aaron T. OHTA, Univ. of Hawaii, Mānoa, USA (Invited)

SS11.3 Screening of affinity agents for cancer cells on integrated microfluidic systems, Gwo-Bin "Vincent" LEE, National Tsing Hua Univ., Taiwan (Invited)

SS11.4 Continuous pulse pressure measuring device using pressure sensing elements with microstructures, Ting-Hao LIN; Chia-Ming CHANG; Yen-Ming HUANG; Cheng-Wen MA; Tzung-Dau WANG; Shey-Shi LU; Yao-Joe YANG, National Taiwan Univ., Taiwan (Paper – 167)

SS11.5 An integrated microfluidic platform for microparticle-labeled immunoassays, Jungkyu KIM, Texas Tech Univ., USA (Invited)

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Detection, Delivery and Microscopy in Single Cells

SS12: 14:00 -15:40
Tuesday, November 17, 2015
Location: Makai

Session Chair: **Tim YEH**
Univ. of Texas, Austin, USA.

Description

This session will focus on imaging tools and nanosensors that can probe cellular activities at the single-cell level. For imaging tools, super-resolution microscopic techniques that are compatible with live cells are of primary interest. One example is the high-resolution 3D single-particle tracking microscopy. For nanosensors, methods that address multiplexed detection and systems that can function both as "sensors" and "actuators" are the emphases. One example is the plasmonic nanosensors for tunable molecule release inside single cells. Specific applications of these imaging tools and nanosensors for cancer research, disease detection and treatment will be discussed.

SS12.1 High performance rotary micro/nanomotors assembled from nanoscale building blocks: applications in tunable biochemical release, Donglei FAN and Kwanoh KIM, Univ. of Texas, Austin, USA (Invited)

SS12.2 Intracellular three-dimensional single-particle tracking with multiplexed two-photon excitation, Tim YEH, Univ. of Texas, Austin, USA (Invited)

SS12.3 Multicolor nanoparticles for analysis of single circulating cells in multiple fluids in vivo, Ekaterina I. GALANZHA, Univ. of Arkansas for Medical Sciences, USA (Invited)

SS12.4 Nanomedical applications for mitochondrial Ca2+ dynamics, An-Chi WEI, National Taiwan Univ., Taiwan (Invited)

SS12.5 Dual-faced nano-mushrooms for tri-functional cell diagnosis, Fan-Gang TSENG, National Tsing Hua Univ., Taiwan (Invited)

Novel Approaches to Target Tumor Microenvironment in Solid Tumors

SS13: 14:00 -15:40
Tuesday, November 17, 2015
Location: Maloko

Session Chair: **Mahavir B. CHOUGULE**
Univ. of Hawaii, Hilo, USA

Description

This session addresses the development of nanoparticle based cancer therapies and overcoming the physiological and tumor microenvironment barriers. This session broadly encompasses the biomaterial based nanoparticles, liposomes, Drug polymer conjugate, dual-Stage Nano-in-Micro targeted system, immunotherapy, preclinical and clinical studies, bench-to-bed translational application of nanomedicines.

SS13.1 Dual-stage nano-in-micro (NiM) targeted drug delivery systems (DDS) for treating non-small cell lung cancer, Patrick SINKO, Rutgers Univ., USA (Invited)

SS13.2 Multifunctional nanoparticles for cancer diagnosis and therapy, Dr. Miqin ZHANG, Univ. of Washington, USA (Invited)

SS13.3 Biodegradable nanoparticles as vaccine delivery systems, Aliasger K. SALEM, Univ. of Iowa, USA (Invited)

SS13.4 Tumor targeted nanocarriers for the treatment of lung cancer, Mahavir B. CHOUGULE, Univ. of Hawaii, Hilo, USA (Invited)

Nano/Microsystems for Clinical Diagnostics and Regeneration

SS14: 14:00 -15:40
Tuesday, November 17, 2015
Location: Mauka

Session Chair: **Justyn JAWORSKI**
Hanyang Univ., Korea

Description

This session will offer insight into new and emerging topics of interest to researchers and physicians focusing in medical devices based on micro/nanotechnology platforms. Because of the diversity of nanotechnology research that exists, in this session we will converge primarily on advances in micro/nanofabrication techniques. With this, the session will showcase engineering works on forthcoming medical tools for diagnostic as well as regenerative medicines. Topics of interest include micro/nanofabrication techniques for the development of analytical tools for biomarker and chemical analyte detection as well as micro/nanoscale patterning techniques for engineering cellular level environments for directing cell growth and behavior.

SS14.1 Temperature-mediated elasticity modulation of fibroblast-derived matrix induces control of stem cell fate, Kangwon LEE, Seoul National Univ., Korea (Invited)

SS14.2 Paper based molecular diagnostics with integrated sample prep, Catherine KLAPPERICH, Boston Univ., USA (Invited)

SS14.3 Titanium surface nanopatterning for modulating cellular response, Masaru P. RAO, Univ. of California, Riverside, USA (Invited)

SS14.4 Nano/microfabrication with purely biological components: towards sensing and patterning, Justyn JAWORSKI, Hanyang Univ., Korea (Invited)

SS14.5 Directing cell migration via nanoscale interfaces patterned by direct-write multiphoton lithography, Hojeong JEON, Korea Institute of Science & Technology, Korea (Invited)

Innovative Optical Sensing Technologies for Biomedical Diagnosis

SS15: 16:00 -18:30
Tuesday, November 17, 2015
Location: Makai

Session Chair: **Donglei (Emma) FAN**
Univ. of Texas, Austin, USA

Description

The special invited session will focus on innovative optical sensing mechanisms, approaches, fabrication, and devices for sensitive, precision, dynamic, and rapid detection of analytes, relevant to biomedical diagnosis. The sensing principles include, plasmonics, fluorescence and their hybrids.

SS15.1 Few-atom silver cluster-based biosensing, Tim YEH, Univ. of Texas, Austin, USA (Invited)

SS15.2 Microfluidics-controlled synthesis of functional nanomaterials for drug delivery, Jiashu SUN; Xingyu JIANG, National Center for Nanoscience & Technology, China (Invited)

SS15.3 Bioenabled nano-plasmonic sensors for biological and chemical detection, Alan X. WANG; Gregory L. RORRER, Oregon State Univ., USA (Invited)

SS15.4 Raman and surfaced-enhanced Raman spectroscopy for kidney disease diagnosis, Wei-Chuan SHIH, Univ. of Houston, USA (Invited)

SS15.5 Probing the payload inside liposome with aqueous quadrupole electrophoretic trap, Sung Hyun SO; Jihoon KIM; Gyeong Rak PARK; Hwan-Jun YOON; Ahra CHO; Ji-Ho PARK; Euiheon CHUNG; Jae Hyun PARK, Gyeongsang National Univ., Korea; Korea Institute of Ocean Science & Technology, Korea; Korea Advanced Institute of Science & Technology, Korea; Gwangju Institute of Science & Technology, Korea (Paper – 153)

SS15.6 A colorimetric method for assessing the adsorption strength of oligonucleotides on noble metal nanoparticles, Na LI; Lu YU; Jiaqi ZOU, Univ. of Miami, USA (Paper – 157)

Engineering the Cell-Biomaterial Interface and Opportunities at the Interface of Nanotechnology and Stem Cell Biology

SS16: 16:00 -18:30
Tuesday, November 17, 2015
Location: Maloko

Session Chair: **Kristopher A. KILIAN**
Univ. of Illinois, Urbana-Champaign, USA
KiBum LEE
Rutgers Univ., USA

Description

Engineering the Cell-Biomaterial Interface – Cells integrate soluble signals with the mechanical and biochemical properties of the extracellular matrix to guide diverse biological processes. Through careful design of the biomaterials interface, cell adhesion and mechanotransduction can be influenced to direct desired outcomes. In this ses-

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sion, world leaders in biomaterials science and mechanobiology will discuss emerging trends in engineered extracellular matrices, to better inform the design of biomaterials for regenerative therapies and tissue engineering.
Opportunities at the Interface of Nanotechnology and Stem Cell Biology – Stem cells show great potential for various applications owing to their ability to self -renew, differentiate, and migrate. From our current understanding of stem cell biology, their behaviors are controlled by a combination of soluble and physical cues. As such, recent advances in nanotechnology – the "top-down" patterning of physical cues and the "bottom-up" synthesis of multifunctional nanomaterials – can provide excellent and unique opportunities for researchers to specifically tune and engineer interaction between nanomaterials and stem cells in order to control stem cell behaviors. This can include various approaches including the use of nanoscale patterns, to the use of nanoparticles, and even sensing techniques.

SS16.1 Manipulation of cell behavior via regulation of cellular adhesive states using nanostructured biomaterials, John H. SLATER, Univ. of Delaware, USA (Invited)

SS16.2 Mechanobiology of myofibroblast development and function, Esther W. GOMEZ, Pennsylvania State Univ., USA (Invited)

SS16.3 Natural and synthetic hydrogels for engineering the ovarian follicle environment, Ariella SHIKANOV, Univ. of Michigan, USA (Invited)

SS16.4 Interfacial guidance cues in soft materials: dynamic reprogramming to a tumorigenic cancer stem cell state, Kristopher A. KILIAN, Univ. of Illinois, Urbana-Champaign, USA (Invited)

SS16.5 Nanoengineered extracellular matrix for scaled-up culture of human ES/iPS cells, Kenichiro KAMEI, Kyoto Univ., Japan (Invited)

SS16.6 Bioelectronic nose and tongue based on carbon nanotube devices, Seunghun HONG, Seoul National Univ., Korea (Invited)

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Theranostic Nanomaterials for Biomedical Applications

SS17: 16:00 -18:30
Tuesday, November 17, 2015
Location: Mauka

Session Chair: **Min-Ho KIM**
Kent State Univ., USA

Description

Theranostic nanomedicine is an emerging area of research, involving the use of nanoparticles or other nanomaterials for diagnostics, imaging, drug delivery, and therapeutic applications. Recently, there have been increasing efforts to develop various theranostic nanoplatforms for biomedical applications and interests in these nanomaterials continue to rise. This session will focus on recent studies on the use of a different type of theranostic nanomaterials in biomedical applications including drug delivery and therapeutics for cancers and infectious disease.

SS17.1 Nanohybrid liposomal cerasomes for imaging guided therapy of cancer, Zhifei DAI, Peking Univ., China (Invited)

SS17.2 Applications of L-tyrosine polyphosphate for nanomedicine, Kush N. SHAH; Andrew J. DITTO; Brittany BALSER; John J. REHO; Jacqueline NOVAK; Wiley J. YOUNGS; Rolando J. RAMIREZ; Yang YUN, Univ. of Akron, USA; Walsh Univ., USA (Invited)

SS17.3 Upconversion fluorescent nanoparticles for cancer diagnosis and treatment, Yong ZHANG, National Univ. of Singapore, Singapore (Invited)

SS17.4 Magnetic responsive nanoparticles for hyperthermia therapy of wound biofilm infection, Min-Ho KIM, Kent State Univ., USA (Invited)

SS17.5 Synthesis and characterization of copper oxide nanoparticles and its antimicrobial applications, Maribel GUZMAN; Celine ROUSSE; Jean DILLE; Stéphane GODET, Pontificia Univ. Católica del Perú, Peru; Université de Reims Champagne-Ardenne, France; Université Libre de Bruxelles, Belgium (Paper – 105)

SS17.6 Hierarchically nanopatterned topographical cues for stem cell therapy approaches, Jangho KIM; Won-Gyu BAE; Hoon SEONWOO; Sunho PARK; Ki Taek LIM; Hoon Eui JEONG; Khap-Yang SUH; Yun-Hoon CHOUNG; Pill-Hoon CHOUNG; Jong Hoon CHUNG, Chonnam National Univ., Korea; Seoul National Univ., Korea; Kangwon National Univ., Korea; Ulsan National Institute of Science & Technology, Korea; Ajou University, Korea (Paper-139).

SS17.7 Nanoparticles for targeted photothermal therapy and Wnt inhibition of triple-negative breast cancer, Rachel EDELSTEIN; Emily DAY, Univ. of Delaware, USA (Paper –142)

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Engineering-based Approaches to Personalized Medicine

SS18: 16:00 -18:30
Tuesday, November 17, 2015
Location: Suite 1

Session Chair: **Pak Kin WONG**
Pennsylvania State Univ., USA

Description

Recently, personalized or precision medicine has become a major goal of most biomedical research. The need for personalized medicine is clear as patient heterogeneity is a major roadblock in the treatment of many complex diseases such as cancer. A wide range of approaches has been developed to deal with this problem and make personalized medicine a reality. In this session, we will explore how non-traditional approaches, such as engineering-based approaches, to drug optimization can be implemented towards personalized medical treatment.

SS18.1 A nanoengineered systems framework for probing collective cell migration, Pak Kin WONG, Pennsylvania State Univ., USA (Invited)

SS18.2 Phenotypic personalized medicine: optimizing patient-specific therapy for applications in cancer and organ transplantation, Dean HO, Univ. of California, Los Angeles, USA (Invited)

SS18.3 Optimization of fatty acids production from a cell-free system by feedback system control scheme, Yitong ZHAO, California State Polytechnic Univ., Pomona, USA (Invited)

SS18.4 Phenotypic optimized treatment against drug resistant cancers, Edward Kai-Hua CHOW, National Univ. of Singapore, Singapore (Invited)

SS18.5 Combination of asiatic acid and madecassic acid synergistically induces the neuronal differentiation, Xianting DING, Shanghai Jiao Tong Univ., China (Invited)

SS18.6 STAT3 inhibitor loaded bioresponsive polymeric nanotherapy for lung cancer, Rongbing YANG; Kihoon NAM; Sung Wan KIM; Peibin YUE; James TURKSON; Mahavir B. CHOUGULE, Univ. of Hawaii, Hilo, USA; Univ. of Utah, USA; Univ. of Hawaii Cancer Center, USA (Paper – 162)

SS18.7 Mathematical modeling for biological processes involving tissue growth and granulomas, Chiu-Yen KAO, Claremont McKenna College, USA (Paper – 190)

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Paper Microfluidic Devices for Molecular Diagnostics

SS19: 09:20 -11:00
Wednesday, November 18, 2015
Location: Makai

Session Chair: **Hideaki TSUTSUI**
Univ. of California, Riverside, USA

Description

Paper microfluidic devices are quickly emerging as a new platform technology to provide economical solutions to medical diagnosis, environmental monitoring, and food and water safety at places where conventional technologies are difficult to come by. This session will focus on recent advancements in fabrication methods, analyte detection mechanisms, system integrations, and new applications. The goal of this session is to exchange exciting new ideas and foster innovations of paper microfluidic technologies.

SS19.1 Pencil and paper diagnostic devices, Andres MARTINEZ, California Polytechnic State Univ., USA (Invited)

SS19.2 Paper microfluidics for the conversion of lab-based testing to the home: example of phenylalanine monitoring, Elain FU, Oregon State Univ., USA (Invited)

SS19.3 Bottom-up methods for high-resolution fabrication of paper microfluidic devices, Hong LIU, Southeast Univ., China (Invited)

SS19.4 Paper-based electrochemical sensors for point-of-care testing, Peter B. LILLEHOJ, Michigan State Univ., USA (Invited)

SS19.5 Mems-based differential calorimetry for biomolecular characterization, Qiao LIN; Yuan JIA; Bin WANG; Xiangsong FENG, Columbia Univ., USA (Paper – 199)

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Micro/Nano Technology for Surface Modification and Patterning

SS20: 09:20 -11:00
Wednesday, November 18, 2015
Location: Maloko

Session Chair: **Hongsoo CHOI**
Daegu Gyeongbuk Institute of Science & Technology, Korea

Description

Micro/nano technology have attracted researchers in many different fields with emerging applications. Micro-/nanofabrication technology, which has significantly advanced in recent years, is the foundation of the topological engineering. The potential applications of topological engineering based on micro-/nano technology include self-assembly, label free bio detection, biomimetic artificial cochlea, biomimetic extracellular matrix (ECM) for neural interface, etc. In this Special Session, we aim to bring together researchers with diverse backgrounds and hold open discussions on innovative fabrication technologies and various applications of micro/nano technology for topological engineering and biomedical engineering. The Special Session is devoted to rewarding academic communities with knowledge about cutting edge research results and new challenges.

SS20.1 Electrical brain signal pattern analysis in focal cerebral ischemic rats for stroke rehabilitation monitoring, Ji-Woong CHOI, Daegu Gyeongbuk Institute of Science & Technology, Korea (Invited)

SS20.2 Nano hole array structure for label free bio detection, Jae Eun JANG, Daegu Gyeongbuk Institute of Science & Technology, Korea (Invited)

SS20.3 Building three-dimensional micro and nano devices by self-assembly, Jeong-Hyun CHO, Univ. of Minnesota, USA. (Invited)

SS20.4 Nano-topographical surface treatment for enhanced cell engineering, Hongsoo CHOI, Daegu Gyeongbuk Institute of Science & Technology, Korea (Invited)

SS20.5 Automated cooperative micro-assembly using multiple bubble microrobots, M. Arifur RAHMAN; Julian CHENG; Aaron OHTA, Univ. of Hawaii, Manoa, USA (Paper – 128)

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Matching Materials to Medicine and Biology: A Complex Challenge

SS21: 09:20 -11:00
Wednesday, November 18, 2015
Location: Mauka

Session Chair: **Joel M. FRIEDMAN**
Albert Einstein College of Medicine, USA

Description

The potential applications of nanomedicine are extremely broad and parallel the most advanced developments of disease understanding, diagnosis and treatment. Picking the right material to match an endpoint use, within the considerations inherent engineering limitations, is a question that requires deep understanding of both physical and biological parameters. This session will provide a multidimensional view of materials selection for engineering purpose, ranging from inorganic, to biopolymeric and protein based platforms. The precision matching of materials to problems in technology evaluation, cancer, cardiovascular disease, cellular therapies and bioproduction will be discussed.

SS21.1 What to do when you know there is no NO: harnessing the therapeutic potential of nitric oxide through nanoparticle delivery platforms, Joel M. FRIEDMAN, Albert Einstein College of Medicine, USA (Invited)

SS21.2 What can a Physicist Bring to Nanomedicine Research?, Thirumalai VENKATESAN, National Univ. of Singapore, Singapore (Invited)

SS21.3 Developing Advanced Biomaterials for Cellular Medicine, Minglin MA, Cornell Univ., USA (Invited)

SS21.4 Cancer cell behaviors regulation by the constructed physical properties of the microenvironment, Wenguang YANG; Haibo YU; Yuechao WANG; Wenxue WANG; Lianqing LIU, Shenyang Institute of Automation, Chinese Academy of Sciences, China; Univ. of Chinese Academy of Sciences, China (Paper – 130)

SS21. 5 An endothelial cultured condition medium embedded porous PLGA scaffold for the enhancement of mouse embryonic stem cell differentiation, Jung Dong KIM; Jung-hyun BAE; Hong Kee KIM; Do-Hyeon JEONG, Raphas Co., Ltd., Korea (Paper – 180)

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Microfluidics and Nanofluidics for Drug Carrier Development

SS22: 11:10 -13:00
Wednesday, November 18, 2015
Location: Makai

Session Chair: **Jungkyu (Jay) KIM**
Texas Tech Univ., USA

Description

This session seeks papers that describe studies involving micro/nanofluidic techniques for drug synthesis and drug carrier productions. This session broadly encompasses the on-chip synthesis, processing and characterization of drug carrier with traditional micro/nanofabrication techniques, multiphase flow and autonomous micro/nanofluidic platform.

SS22.1 Micro-nanofluidics systems for controlled transport of analytes and cell encapsulation, Alessandro GRATTONI, Houston Methodist Research Institute, USA (Invited)

SS22.2 Microfluidic assisted drug carrier development, Amy SHEN, Okinawa Institute of Science & Technology, Japan (Invited)

SS22.3 Multistage nanovector delivery for tissue engineering and regenerative medicine, Jason H. SAKAMOTO, NanoMedical Systems, USA (Invited)

SS22.4 Novel fabrication technique for the industrialization of dissolving microneedle, Jung Dong KIM; Jung-hyun BAE; Hong Kee KIM; Do-Hyeon JEONG, Raphas Co., Ltd., Korea (Paper – 135)

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BioMEMS: Gene Circuits to Physiological Biomimicry

SS23: 11:10 -13:00
Wednesday, November 18, 2015
Location: Maloko

Session Chair: **YongTae KIM**
Georgia Institute of Technology, USA

Description

This session includes 5 invited speakers' talks on cutting edge approaches in multiscale biological systems engineering that involves the design and manipulation of microengineered electromechanical systems at molecular, cellular, and tissue levels for advanced biotechnology and nanomedicine.

IEEE-NANOMED TECHNICAL SESSIONS

SS23.1 Droplet microfluidics for optimizing synthetic gene circuits in engineered cells, Warren C. RUDER, Virginia Polytechnic Institute & State Univ., USA (Invited)

SS23.2 Integrated cellular neural interface, Liang GUO, Ohio State Univ., USA (Invited)

SS23.3 Cardiac contractility as a function of global tissue organization, Anna GROSBERG, Univ. of California, Irvine, USA (Invited)

SS23.4 Chick embryo-based microvasculature engineering, Tomohiro KAWAHARA, Kyushu Institute of Technology, JAPAN (Invited)

SS23.5 Engineering microsystems for nanomedicine development, YongTae KIM, Georgia Institute of Technology, USA (Invited)

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Nanotechnology in Drug Delivery

SS24: 11:10 -13:00
Wednesday, November 18, 2015
Location: Mauka

Session Chair: **Dong Woo LIM**
Hanyang Univ., Korea

Description

Controlled bionano architectures have been of great interest for advanced drug delivery. This session focuses on development of a new class of functional bionano materials for DNA vaccination, controlled drug release, tissue engineering, regenerative medicine, and bioimaging.

SS24.1 Opportunities of engineered nanoconstructs in biomolecular imaging, drug delivery and regenerative medicine, Jonghoon CHOI, Hanyang Univ., Korea (Invited)

SS24.2 Aptamer-RNA conjugates for targeted therapy and imaging, Hyejung MOK, Konkuk Univ., Korea (Invited)

SS24.3 Anisotropic polymer nanoparticles with stimuli-responsiveness, Dong Woo LIM, Hanyang Univ., Korea (Invited)

SS24.4 'Particle in a particle' strategy for effective delivery of oral iron, Jonathan J. POWELL; Nuno FARIA; Gladys O. LATUNDE-DADA; Laetitia C. PELE; Dora I. PEREIRA, Medical Research Council-Human Nutrition Research, United Kingdom; King's College, United Kingdom (Paper – 161)

SS24.5 Colorimetric detection of botulinum neurotoxin type a using gold nanoparticles, Shan CHEN; Lok Ting CHU; Ting-Hsuan CHEN, City Univ. of Hong Kong, China (Paper – 170)

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Biomolecular Nanomaterials for Advanced Devices

SS25: 9:20 -13:00
Wednesday, November 18, 2015
Location: Suite 1

Session Chair: **Haewook HAN**
Pohang Univ. of Science & Technology, Korea

Description

Biomolecular nanomaterials have recently recognized as new photonic materials over a wide range of electromagnetic spectra, including UV, visible, infrared, and terahertz waves. DNAs and proteins can be used to fabricate biomolecular nanocrystals doped by dye molecules to activate specific optical properties for device applications. This session will focus on the recent advances in the design, fabrication, and characterization of biomolecular nanomaterials for advanced devices.

SS25.1 Biomolecule conjugated nanoparticle as building block for memory device, Hyun Ho LEE, Myongji Univ., Korea (Invited)

SS25.2 THz time-domain spectroscopy of biomolecular materials, Haewook HAN; Jin-Woo KIM, Pohang Univ. of Science & Technology, Korea; Univ. of Arkansas, USA (Invited)

SS25.3 Simulating molecular dynamics of DNA-functionalized nanoparticle building blocks, Jacob HENDRICKS; Jin-Woo KIM, Univ. of Wisconsin, River Falls, USA; Univ. of Arkansas, USA (Invited)

SS25.4 Programmable nanoscale building blocks for epitaxial self-assembly of multifunctional nanostructures, Jin-Woo KIM; Haewook HAN, Univ. of Arkansas, USA; Pohang Univ. of Science & Technology, Korea (Invited)

SS25.5 Shape Memory Polymer Nanocomposites, Sayyeda M. HASAN; Robert S. THOMPSON; Harrison EMERY; Adam L. NATHAN; Fang ZHOU; Duncan J. MAITLAND, Texas A&M Univ., College Station, USA; Univ. of Minnesota, USA (Paper – 110)

SS25.6 SWCNTs modified nanoneedle biosensor for rapid detection of DNA, Darius SAADAT-MOGHADDAM; Jong-Hoon KIM, Washington State Univ., Vancouver, USA (Paper – 168)

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IEEE-NANOMED WORKSHOPS

Biomedical Optics for Clinical Nanomedicine

WS1: 13:00 -18:00
Sunday, November 15, 2015
Location: Mauka

Workshop Chair: **Euiheon CHUNG**
Gwangju Institute of Science & Technology, Korea
Chulhong KIM
Pohang Univ. of Science &Technology, Korea

Description

This session aims at bringing together seasoned and new researchers in the field of biophotonics to tackle challenging problems we face today and tomorrow: cancer and brain disease. These major issues require innovative imaging modalities and nanoprobes to detect molecular, cellular, and tissue-level changes with advanced fluorescence imaging, optical coherence tomography, ultrasound mediated optical tomography, super-resolution microscopy, phase-based imaging, and even computational microscopy. This session will provide a platform to foster sharing and collaboration in this vibrant research arena. Preclinical and clinical impacts of these pioneering imaging modalities in nanomedicine would be emphasized.

Keynote Talk

Targeting tumor vasculature and microenvironment for nanomedicine

Dai FUKUMURA
Radiation Oncology, Massachusetts General Hospital (MGH)/ Harvard Medical School, Boston, MA

WS1.1 Multiplexed molecular imaging with SERS-coded nanoparticles for in vivo tumor detection and surgical guidance, Jonathan T.C. LIU, Univ. of Washington, USA (Invited)

WS1.2 Multimodal optical imaging for the visualization of tissue microenvironments, Ki Hean KIM, Pohang Univ. of Science & Technology, Korea (Invited)

WS1.3 Light-based molecular sensing and imaging for translational biophotonics, Wei-Chuan SHIH, Univ. of Houston, USA (Invited)

WS1.4 Biophotonic reading & writing for translational medicine, Euiheon CHUNG, Gwangju Institute of Science & Technology, Korea (Invited)

WS1.5 Engineering biological systems to improve nanomedicine, Jiho PARK, Korea Advanced Institute of Science & Technology, Korea (Invited)

WS1.6 A computational look at nano-scale toward giga-pixel nanoscopy, Aydogan OZCAN, Univ. of California, Los Angeles, USA (Invited)

WS1.7 In vivo multiscale and multifunctional photoacoustic imaging, Chulhong KIM, Pohang Univ. of Science & Technology, Korea (Invited)

WS1.8 Photoacoustic imaging with superb resolution, speed and sensitivity, Junjie YAO; Lihong V. WANG, Washington Univ., USA (Invited)

WS1.9 In vivo ultrasound and photoacoustic imaging of burn skin regeneration enhanced by stem cell therapy, Seung Yun NAM, Pukyong National Univ., Korea (Invited)

WS1.10 High-throughput optical coherence tomography for volumetric mouse brain ex vivo, Woong Gyu JUNG, Ulsan National Institute of Science & Technology, Korea (Invited)

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Micro Needles for New Transdermal Drug Delivery Systems

WS2: 14:00 - 17:00
Monday, November 16, 2015
Location: Suite 1

Workshop Chair: **Beomjoon KIM**
Univ. of Tokyo, Japan

Description

This session will exhibit and introduce the latest developments in micro needle based- technology and its applications, especially to new transdermal drug delivery systems. The gathering will provide a platform to facilitate interdisciplinary communications and new collaborations for delegates from academic, industrial, pharmaceutical, and clinical backgrounds. The fields will cover design and fabrication technologies for micro needles, drug and vaccine delivery as well as sensors and electrodes, immunology, skin biomechanics, regulatory issues, etc. Moreover, not only miniaturized needles but also novel MEMS devices and nano/bio molecules, which allow transport of macromolecular drugs will be discussed.

WS2.1 Local delivery of phenylephrine using hollow microneedles as a treatment of fecal incontinence, Hyesun JEON; Mee-Ree HAN; Jung-Hwan PARK; Jung Ho PARK, Univ. of Michigan, USA; Chung Ang Univ., Korea; Gachon Univ., Korea; Sungkyunkwan Univ., Korea (Invited)

WS2.2 Low-cost metallic microneedles for biomedical applications, Boris STOEBER, Univ. of British Columbia, Canada (Invited)

WS2.3 Novel fabrication technique for the industrialization of dissolving microneedle, Jung Dong KIM; Jung-Hyun BAE; Do-Hyeon JEONG, Raphas. Co., Ltd., Korea (Invited)

WS2.4 Development of transdermal delivery system of peptide and protein drugs using self- dissolving microneedle arrays fabricated from hyaluronic acid, Hidemasa KATSUMI; Ying-Shu QUANQ; Fumio KAMIYAMA; Akira YAMAMOTO, Kyoto Pharmaceutical Univ., Kyoto, Japan; CosMED Pharmaceutical Company, Ltd, Japan (Invited)

WS2.5 Effects of different morphology of microneedles on drug permeability against skin, Cheong-Weon CHO; Boojoon SUL, Chungnam National Univ., Korea (Invited)

WS2.6 Development of micro-needles based on MEMS technologies for trans-dermal drug delivery system, Mitsuhiro SHIKIDA, Hiroshima City Univ., Japan (Invited)

WS2.7 Microneedles for treatment of cardiovascular diseases, WonHyoung RYU, Yonsei Univ., Korea (Invited)

WS2.8 Improved DNA vaccination using multi-layer coated microneedles, Ji Hoon JEONG, Sungkyunkwan Univ., Korea (Invited)

Conference Best Student Paper Competition

SSB: 17:00 - 17:50
Monday, November 16, 2015
Location: Suite 1

SSB.1 Characterization of plasma deposited hydrocarbon diffusion barriers for embolic foam devices, Landon NASH; Kendal P. EZELL; Sayyeda M. HASAN; Duncan J. MAITLAND, Texas A&M Univ., College Station, USA (Paper – 120)

SSB.2 Left-Right asymmetry in cell orientation requires high substrate rigidity, Yuanye BAO; Zhaobin GUO; Yaozhun HUANG; Miu Ling LAM; Ting-Hsuan CHEN, City Univ. of Hong Kong, China (Paper – 169)

SSB.3 Large field-of-view super-resolution imaging of endo-cellular structures through micro-beads array, Yi LI; Hok Sum Sam LAI; Shuhan HU; Raymond H.W. LAM; Wen Jung LI, City Univ. of Hong Kong, China (Paper – 189)

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Soft Nano/Bio Devices for Biomedicine

WS3: 13:00 -15:40
Tuesday, November 17, 2015
Location: Suite 1

Workshop Chair: **Jae-Woong JEONG**
Univ. of Colorado, USA.

Description

Conventional biomedical devices that interfaced with biological organs were rigid and bulky. Biological organs and systems, by contrast, are soft, elastic and curved. This session will address recent research and development initiatives for a new class of soft, flexible nano/bio devices that overcome this fundamental mismatch in mechanics and form.

WS3.1 Embolic applications of shape memory polymer foams, Duncan MAITLAND, Texas A & M Univ., College Station, USA (Invited)

WS3.2 Transient electronics: bioresorbable electronic systems dissolve in body and environment, Suk-Won HWANG, Korea Univ., Korea (Invited)

WS3.3 Bionic nanosystems, Manu Sebastian MANOOR, Stevens Institute of Technology, USA (Invited)

WS3.4 Skin-mounted electronic interfaces: from materials to circuit considerations, YuHao LIU, Univ. of Illinois, Urbana-Champaign, USA (Invited)

WS3.5 Soft electrode systems capable of integration on the auricle as a brain-computer interface, Woon-Hong YEO, Virginia Commonwealth Univ., USA (Invited)

WS3.6 Towards minimally invasive neural probes, Chong XIE, Univ. of Texas, Austin, USA (Invited)

WS3.7 Wireless optofluidic systems for programmable in vivo pharmacology and optogenetics, Jae-Woong JEONG, Univ. of Colorado, USA (Invited)

WS3.8 Taking electrons out of bioelectronics: biopolymer protonic transistors, resistive memories, and enzyme logic, Marco ROLANDI, Univ. of California, Santa Cruz, USA (Invited)

IEEE-NANOMED POSTER SESSIONS

PS1: 13:00 -18:00
Monday, November 16, 2015
Location: Convention Center Foyer

PS1.1 Synthesis and characterization of hydroxyapatite nanoparticles for medical applications, Maribel G. GUZMAN; Jean DILLE; Stéphane GODET, Pontificia Universidad Católica del Peru, Peru; Université Libre de Bruxelles, Belgium (Paper – 102)

PS1.2 Electrochemical biosensor based on MoS2/graphene for highly sensitive detection of human parathyroid hormone, Hyeyoun KIM; Kook-Nyung LEE; Min-Ho LEE, Korean Electronics Technology Institute, Korea (Paper – 103)

PS1.3 Imaging and mapping individual target proteins on clinical lymphoma cells by AFM, Mi LI; Lianqing LIU; Ning XI; Yuechao WANG; Wenxue WANG, Shenyang Institute of Automation, Chinese Academy of Sciences, China; Michigan State Univ., USA (Paper – 108)

PS1.4 Systemic delivery of anti-miRNA for suppression of triple negative breast cancer utilizing RNA nanotechnology, Dan SHU; Hui LI; Yi SHU; Gaofeng XIONG; Farzin HANQUE; Ren XU; Peixuan GUO, Univ. of Kentucky, USA (Paper – 109)

PS1.5 Infrared imaging of plant resources for phenotype analysis under environmental stress, Ghiseok KIM; En-Su PARK; Byoung-Kwan CHO; Geon-Hee KIM, Seoul National Univ., Korea; Chungnam National Univ., Korea; Korea Basic Science Institute, Korea (Paper – 111)

PS1.6 Wireless power transfer for flexible electronics: modularized epidermal RF energy harvester, YuHao LIU; John A. ROGERS, Univ. of Illinois, Urbana-Champaign,USA (Paper – 114)

PS1.7 Development of steroid releasing electrode using nanopatterning technique, Jeong Hun JANG; Jongmoon JANG; Hongsoo CHOI, Kyungpook National Univ., Korea; Daegu Gyeongbuk Institute of Science & Technology, Korea (Paper – 116)

PS1.8 Rapid electrical concentration and detection of cardiac biomarker Troponin I, Abhinav SHARMA; Chang-Ho HAN; Seongkyeol HONG; Jaesung JANG, Ulsan National Institute of Science & Technology, Korea (Paper – 118)

PS1.9 Droplets encapsulation for microalgae in microfluidic device, Min-Lung LEE; Da-Jeng YAO, National Tsing Hua Univ., Taiwan (Paper – 122)

PS1.10 Measuring Young's modulus of batch of zona pellucidas by micropipette aspiration, Yaowei LIU; Maosheng CUI; Qili ZHAO; Mingzhu SUN; Jingjing HUANG; Xin ZHAO, Nankai University, China; Tianjin Institute of Animal Sciences, China (Paper – 123)

PS1.11 Microparticles for multiplexed real-time PCR, Seung-Won JUNG; Jun-Sun KIM; Seok LEE; Sang Kyung KIM, Korea Institute of Science & Technology, Korea (Paper – 125)

PS1.12 Cyclone separator combined with micro-centrifugal tube used in PM2.5 sampling, Fang-Yu KUO; Hsu-Chao HAO; Da-Jeng YAO, National Tsing Hua Univ., Taiwan (Paper – 127)

PS1.13 Study on objective platform driven by piezoceramics for cell injection, Bowen ZHONG; Zongwei LI; Zhenhua WANG; Ziqi JIN; Lining SUN; Linsen CHEN, Soochow Univ., China; SIP Postdoctor Station of SVG Digitoptics, China (Paper – 131)

PS1.14 A microfluidic device for assessing the extravasation ability of cancer cells, Weijin GUO; Raymond H.W. LAM, City Univ. of Hong Kong, China (Paper – 133)

PS1.15 Disposable nanofluidic paper-based biomolecule preconcentrator, Sung Il HAN; Ki-baek LEE; Rhokyun KWAK; Jeong Hoon LEE, Kwangwoon Univ., Korea; Korea Institute of Science & Technology, Korea (Paper – 136)

PS1.16 Biomedical potentials of phlorotannins from biological and molecular structural aspects, Hyeon-Cheol SHIN; Hyejeong HWANG, State Univ. of New York, Korea; Botamedi USA Inc., USA (Paper – 156)

PS1.17 Repurposing ampicillin for photothermal therapy of bacterial infections using carbon nanotubes, Nalinikanth KOTAGIRI; Ju Seok LEE; Joshua SAKON; Haewook HAN; Vladimir P. ZHAROV; Jin-Woo KIM, Univ. of Arkansas, USA; Pohang Univ. of Science & Technology, Korea; Univ. of Arkansas for Medical Sciences, USA (Paper – 177)

PS1.18 Cerenkov radiation energy transfer (CRET) with gold nanoclusters for in vivo imaging, Su Woong YOO; Hyoyoung MUN; Gyungseok OH; Hee-Jae JEON; Jungmin HONG; Seung-Jae MYUNG; Min-Gon KIM; Euiheon CHUNG, Gwangju Institute of Science & Technology, Korea; Univ. of Ulsan College of Medicine, Korea (Paper – 198)

PS1.19 The effect of hydroxypropyl cellulose (HPC) on the drug absorption after nasal application of powder formulations to rats, Akiko TANAKA; Mayuko KAWAKAMI; Daisuke INOUE; Tomoyuki FURUBAYASH; Kosuke KUSAMORI; Hidemasa KATSUMI; Toshiyasu SAKANE; Akira YAMAMOTO, Kyoto Pharmaceutical Univ., Japan; Shujitsu Univ., Japan (Paper – 208)

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PS2: 8:00 - 13:00
Tuesday, November 17, 2015
Location: Convention Center Foyer

PS2.1 Effect of zinc oxide nanoparticles in kidney cells, Hui-Wen CHIU; Yuh-Feng LIN, Taipei Medical Univ., Taiwan (Paper – 138)

PS2.2 Induction of autophagy and cytotoxicity by different sized silver nanoparticles in NIH 3T3 cells, Yu-Hsuan LEE; Chun-Wan CHEN; Ying-Jan WANG, National Cheng Kung Univ., Taiwan; Institute of Labor, Occupational Safety & Health, Ministry of Labor, Taiwan (Paper – 140)

PS2.3 Single-transfer method for fabrication of linear array of graphene-based nanodevices, Hengkai ZHANG; Xin TANG; Guangfu WU; King Wai Chiu LAI, City Univ. of Hong Kong, China (Paper – 145)

PS2.4 Label-free miRNA detection using plasma-enable vertically oriented graphene nanowalls, Fabricio Frizera BORGHI; Shafique PINEDA; Timothy van der LAAN; Michael SEO; Kostya (Ken) OSTRIKOV, Plasma Nanoscience Laboratories, Manufacturing Flagship, CSIRO, Australia; Univ. of Sydney, Australia; Queensland Univ. of Technology, Australia (Paper – 146)

PS2.5 Crack-photolithography for controlled biological assays in micro and nanofluidic devices, Minseok KIM; Dogyeong HA; Taesung KIM, Ulsan National Institute of Science & Technology, Korea (Paper – 147)

PS2.6 A development of dissolving microneedle encapsulated donepezil HCl and study of pharmacokinetics with different two application method, Ji-Yeon KIM; Mee-Ree HAN; C. Junghwan PARK, Gachon Univ., Korea; Chung-Ang Univ., Korea (Paper – 148)

PS2.7 Bionic osteon microfluidic device, Li REN; Shenghang WANG; Lingwei HUANG; Peng SHANG, Northwestern Polytechnical Univ., China (Paper – 150)

PS2.8 Use of large amorphous calcium phosphate nanoparticles as a strategy for gastro-protection of orally delivered ultrafine therapeutic nanoparticles, Nuno FARIA; Laetitia C. PELE; Dora I. PEREIRA; Jonathan J. POWELL, Medical Research Council – Human Nutrition Research, United Kingdom (Paper – 160)

PS2.9 Coarse-grained simulation of DNA-linked nanoparticle building blocks, Charles ARMISTEAD; Jacob HENDRICKS; Tyler FOCHTMAN; Joseph BATTA-MPOUMA; Matthew PATITZ; Russell DEATON; Haewook HAN; Jin-Woo KIM, Univ. of Arkansas, USA; Univ. of Memphis, USA; Pohang Univ. of Science & Technology, Korea (Paper – 165)

PS2.10 An electrowetting-on-dielectric microfluidic device with a low-pressure chemical vapor deposited Si_3N_4 dielectric layer for reproductive medicine, Hsien-Hua SHEN; Lung-Yuan CHUNG; Da-Jeng YAO, National Tsing Hua Univ., Taiwan (Paper – 166)

IEEE-NANOMED POSTER SESSIONS

PS2.11 Quantitative analysis of dental caries structures using spectral domain optical coherence tomography, Ruchire Eranga WIJESINGHE; Sungjin LIM; Kibeom PARK; Mansik JEON; Jeehyun KIM, Kyungpook National Univ., Korea (Paper 173)

PS2.12 Synthesis and characterization of gold encapsulated and tamoxifen loaded PLGA nanoparticles for breast cancer theranostics, Deepak Singh CHAUHAN; Rohit SRIVASTAVA, Indian Institute of Technology Bombay, India (Paper – 187)

PS2.13 Multi-foci scattering lens using digital optical phase conjugation, Jihee RYU; Mooseok JANG; Joshua BRAKE; Abdul M SAFI; Ji Hyea YANG; Taejoong EOM; Changhuei YANG; Euiheon CHUNG, Gwangju Institute of Science & Technology, Korea; California Institute of Technology, USA (Paper – 201)

PS2.14 Detection of stress hormone using surface plasmon resonance effect in Au NPs sensor cube, Jihee JUNG; Dahye KWON; Hunsang JUNG; Yo-Han KIM; Bong-Geun KIM; Hyon Bin NA; Hyun Ho LEE, Myongji Univ., Korea (Paper – 207)

PS2.15 Gold Nanoshell reinforced positive hydrogel for glaucoma monitoring, Tamalika BHAKAT; Ajay AGARWAL; Niti Nipun SHARMA, Birla Institute of Science & Technology, India; Manipal Univ., India; CSIR-Central Electronics Engineering Research Institute, India (Paper – 101)

PS2.16 Synthesis of a novel hydrophobic probe for low density lipoprotein, Zheng-Zhi WU; Li-Hong DUAN; Chun-Bao WANG; Zhong-Qiu LI; Li WANG; Cui-Xi OU, Shenzen Univ., China; Sun Yat-sen Univ., China; Shenzhen Institute of Geriatrics, China (Paper – 143)

PS2.17 Solid state nanopore in thin silicon membrane to study lipid bilayer incorporated with transmembrane protein, ENaC, Muhammad S. KHAN; Noura S. DOSOKY; John D. WILLIAMS, Univ. of Alabama, Huntsville, USA (Paper – 194)

PS2.18 Upconversion fluorescent nanoparticles for cancer diagnosis and treatment, Yong ZHANG; Sasidharan Swarnalatha LUCKY, National Univ. of Singapore, Singapore (Paper – 203)

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PS3: 13:00 - 18:00
Tuesday, November 17, 2015
Location: Convention Center Foyer

PS3.1 Detection of epidermal growth factor using a shear horizontal surface acoustic wave immunosensor, Jen-Yu LI; Hsu-Chao HAO; Da-Jeng YAO, National Tsing Hua Univ., Taiwan (Paper – 126)

PS3.2 Exploring molecular distributed detection, Uri ROGERS; Min-Sung KOH, Eastern Washington Univ., USA (Paper – 141)

PS3.3 Amino acids separation in extended-nano space: on the way to single cell analysis, Adelina SMIRNOVA; Hishashi SHIMIZU; Kazuma MAWATARI; Takehiko KITAMORI, Univ., of Tokyo, Japan (Paper – 164)

PS3.4 Clinical efficiency of optical coherence tomography in otitis media, Kibeom PARK; Ruchire Eranga WIJESINGHE; Jeong Hun JANG; Mansik JEON; Jeehyun KIM, Kyungpook National Univ., Korea (Paper – 171)

PS3.5 Interrelated mechanoregulatory effects of substrate elastic modulus and cellular geometric confinements on cardiac muscle differentiation, Ki-Hwan NAM; Nima JAMILPOUR; Marcus DIMARCO; Cathleen COVER; Carol C. GREGORIO; Pak Kin WONG, Univ. of Arizona, USA; Korea Basic Science Institute, Korea (Paper – 172)

PS3.6 Development of high-aspect-ratio polymer column array for high performance liquid chromatography, Yi-Chueh SHIEH; Kuei-Tang CHANG; Wensyang HSU; Sung-Yueh WU; Hsin-Yun HSU; Xin Chun HUANG; Yu-Hsin LIN; Meng-Shiue LEE; Yi-Ting JIANG, National Chiao Tung Univ., Taiwan; National Applied Research Laboratories, Taiwan (Paper – 174)

PS3.7 Force curve classification using independent component analysis and support vector machine, Fuyuan ZHOU; Wenxue WANG; Mi LI; Lianqing LIU; Guangyong LI, Shenyang Institute of Automation, Chinese Academy of Science, China; Univ. of Chinese Academy of Sciences, China (Paper – 175)

PS3.8 Laser-induced "stealth" of nanoagents to phagocytosis by macrophages, Min KIM; Nalinikanth KOTAGIRI; Haewook HAN; Wen J. LI; Vladimir P. ZHAROV; Jin-Woo KIM, Univ. of Arkansas, USA; Williams College, USA; Pohang Univ. of Science & Technology, Korea; City Univ. of Hong Kong, China; Univ. of Arkansas for Medical Sciences, USA (Paper – 178)

PS3.9 A Novel design and topography optimization of dissolving polymer microneedle arrays: manufacture using inclined exposure technology, Kuo-Yung HUNG; Yun-Ju CHUANG; Yi-Cheng YANG; Chun-Yi LI; Pei-Ru CHEN, Ming Chi Univ. of Technology, Taiwan; Ming Chuan Univ., Taiwan (Paper – 179)

PS3.10 Microelectrode discretization (MED) method for a dielectrophoretic particle collector, Chang-Ho HAN; Hyun Wook HA; Jaesung JANG, Ulsan National Institute of Science & Technology, Korea; Busan Science High School, Korea (Paper – 181)

PS3.11 A novel graphene ink based organic thin film transistors for detecting tumor cells, Dong-Hoon LEE; Hee-Sang CHO; Rohit CHAND; Dawoon HAN; Tae-Jong YOON; Yong-Sang KIM, Sungkyunkwan Univ., Korea; Cha Univ., Korea (Paper – 184)

PS3.12 Protein kinase assay using a synthetic chemosensor on a flexible microchip with capacitive sensor, Rohit CHAND; Dawoon HAN; Dong-Hoon LEE; Ik-Soo SHIN; Yong-Sang KIM, Sungkyunkwan Univ., Korea; Soongsil Univ., Korea (Paper – 186)

PS3.13 A new approach to the development of nano digital circuits and its applications in molecular medicine, Amjad ALMATROOD; Harpreet SINGH, Wayne State Univ., USA (Paper – 192)

PS3.14 Bimolecules of neuro-transmitter conjugation effect for nanoparticle-based resistive switching device, Jihee JUNG; Dahye KWON; Hunsang JUNG; Yo-Han KIM; Songhun YOON; Hyun Ho LEE, Myongji Univ., Korea (Paper – 197)

PS3.15 Multi-channel fluorescence endoscopic system compatible with GI clinical endoscope, Gyungseok OH; Su Woong YOO; Youngrong PARK; Soon Joo HWANG; Ki Hean KIM; Sungjee KIM; Seung-Jae MYUNG; Euiheon CHUNG, Gwangju Institute of Science & Technology, Korea; Pohang Univ. of Science & Technology, Korea; Univ. of Ulsan College of Medicine, Korea (Paper – 200)

PS3.16 Efficient siRNA delivery system using micelle-templated dendritic gold nanocrystals, Min Sang LEE; Jung Eun LEE; Nak Won KIM; Bosung KO; Ji Hoon JEONG; Jiwon PARK, Sungkyunkwan Univ., Korea (Paper – 204)

PS3.17 Droplet-based single nucleotide polymorphisms (SNP) genotyping inside a temperature gradient microchannel for animal breeding, Fang-Wei LIU; Shih-Torng DING; En-Chung LIN; Yen-Wen LU, National Taiwan Univ., Taiwan (Paper – 209)

PS3.18 Label-free detection of DNA hybridization on MoS_2 using photoluminescence measurements, Chang-Hsiao CHEN, Feng Chia Univ., Taichung, Taiwan (Paper – 119)

The 9th IEEE International Conference on
Nano/Molecular Medicine and Engineering

2015 IEEE-NANOMED

Who should attend:

IEEE-NANOMED is one of the premier annual events organized by the IEEE Nanotechnology Council to bring together physicians, scientists and engineers alike from all over the world and every sector of academy and industry, working at advancement of basic and clinical research in medical and biological sciences using nano/molecular and engineering methods. IEEE-NANOMED is the conference where practitioners will see nano/molecular medicine and engineering at work in both their own and related fields, from essential and advanced scientific and engineering research and theory to translational and clinical research.

Suggested topics include:

- Nano and molecular technologies in medical theranostics
- Nanotechnology in drug delivery
- Biomedical imaging
- Bio/nano sensing
- Biochips and Bio-MEMS
- Biomechatronics
- Biological interface
- Cells at the nanoscale
- Frontiers in nanobiotechnology
- Translational medicine

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NOVEMBER 15-18, 2015
WAIKIKI, HAWAII, USA

Paper Publications:

Papers presented at IEEE-NANOMED 2015 will be selected to publish in a special issue of a peer-reviewed journal: *IEEE Transactions on Nanobioscience* (IF 1.768)
(Invitation only)
(http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=7728)

Accepted full papers for IEEE-NANOMED will be published in the Xplore database and are EI indexed (http://ieeexplore.ieee.org).

Conference Venue:

Hyatt Regency Waikiki Beach Resort and Spa
http://waikiki.hyatt.com

Two-Page Abstract Deadline (both Oral & Poster):
July 27, 2015 *

* Best paper competition:
A full paper (4 to 6 pages) is required by July 27, 2015 to enter best paper contests.

Notification of Acceptance: August 24, 2015

Final Abstract Submission Deadline: September 20, 2015
Full-Paper Submission Deadline: September 20, 2015
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2015

IEEE-NANOMED

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The 9th IEEE International Conference on Nano/Molecular Medicine and Engineering

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