2010 IEEE International Conference on
Nano/Molecular Medicine and Engineering

IEEE NANOMED 2010

Conference Digest

December 5-9, 2010
Hong Kong/Macau, China

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The University of Hong Kong

Message from Honorary Chair

It is my great honour to serve as Honorary Chair of the 4th IEEE International Conference on Nano/Molecular Medicine and Engineering (IEEE-NANOMED 2010). It is also a tremendous privilege to do so alongside two such distinguished educators, Professor Tsui Lap-chee of the University of Hong Kong and Professor Joseph Sung Jao-yiu of Chinese University of Hong Kong.

Nanotechnology, nominated as a key area of research and development by the Hong Kong SAR Government in 2001, is considered a science of the future, but that future is already here. The possibilities that nanoscience offers fill us with wonder, and I am certain IEEE-NANOMED 2010 will only add to our expectations.

World-class researchers in Hong Kong have been engaged in nanotechnology projects for more than a decade, conducting groundbreaking work and spearheading pioneering projects that create new knowledge. It is a field that relates directly to our mission: to pursue problem-driven research that will help develop society and improve the quality of life for people in Hong Kong, the region and beyond.

Judging by what we have witnessed so far, this exciting field of nano/molecular medicine and engineering is likely to produce revolutionary breakthroughs over the next fifty years. The ultimate goal is to find ways to prevent disease, alleviate pain and diagnose illness more efficiently. IEEE-NANOMED 2010 is an exciting stage of this journey.

I hope very much for the sake of our children and our children's children that we can achieve major advances and discover solutions to problems through innovation and creativity.

Congratulations to everyone involved in organising this superb conference!

Way Kuo

Honorary Chair of Conference

President, City University of Hong Kong

Forward

The 4th IEEE International Conference on Nano/Molecular Medicine and Engineering will be held on December 5-8, 2010 at the City University of Hong Kong, Hong Kong. This is an annual conference organized by the IEEE Nanotechnology Council to bring together world-leading researchers focusing on the advancement of basic and clinical research in medical and biological sciences using engineering methods related to MEMS**,** Nano and Molecular technologies. This year's conference theme is "Promoting good health". The conference will deliver essential and advanced scientific and engineering information in applications of MEMS/Nano/Molecular technologies in medicine and biology to its participants.

The field of Nanomedicine is still in a very infant stage. However, in the next few years there will surely be much more exciting developments across medical science, engineering, chemistry and physics in this area. The conference has received numerous submissions from many countries and regions, and from which we have selected part of works for oral and poster presentations in the conference. Supplementing the technical presentation, two plenary and six keynote speeches are given by outstanding research scholars. They are: Professor Pill-Hoon Choung, Professor Ronald Li, Professor Vladimir Zharov, Professor Gwo-Bin Lee, Professor Samuel Sia, Professor Joel Voldman, Dr Ye Fang, and Dr Chanmin Su. A post-conference workshop will be held in Macau on December 9, 2010.

We would like to express our sincere gratitude to the IEEE-NANOE 2010 Organizing Committee members. The conference will not be possible without their strong commitment and efforts. Last but not the least, our sincere gratitude go to all the authors and invited speakers, for your participation and providing the intellectual sharing on experiences. We hope you will enjoy Hong Kong experience while you find IEEE-NANOMED 2010 a fruitful, memorable conference.

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Jin-Woo Kim
Program Chair

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Vladimir P. Zharov

IEEE NANOMED 2010 Plenary Talk I

Bioengineering of the Teeth and Jaws to Clinical Practice

Professor Pill-Hoon Choung

Department of Oral and Maxillofacial Surgery, Tooth Bioengineering National Research Laboratory, BK21 Dental Research Institute, School of Dentistry, Seoul National University, Seoul, Korea

Abstract:
To bioengineer the mandible, we used a whole mandibular culture system via *in vitro* and *in vivo* organ culture in mouse. The whole mandibular explants were cultured and investigated whether artificial and controlled development of mandibular structures could be possible. In addition, to investigate the tooth development in the none-tooth bearing area, the tooth germs were transplanted into the toothless gap, diastema of the developing mandible. Also to study the effect of growth factors on the tooth development, some proteins were added during culture period. In this preliminary study, a combination of *in vitro* and *in vivo* culture techniques to attempt to fabricate the mandible could lead to the growth of the mandible, development of its supporting structures, and formation of the dental crown and root. The results of this study indicate that artificial development of mandibular structures is possible and in the future might be applied to jaw reconstruction. Furthermore, we isolated and cultured 4 dental stem cells from human teeth. As an *in vivo* study, a combination of calcium hydroxide and autologous dental pulp stem cells (DPSCs) was applied for the treatment of intentionally created tooth defects in beagle dogs. It was evident that calcium hydroxide increased recruitment, migration, proliferation, and mineralization of the DPSCs. Such results are valuable for future availability of DPSCs, which are recently focused as the stem cell reservoir for regeneration of dentin upon tooth injury. These dental stem cells seem to be applied to alveolar bone and periodontium reconstruction.

As a clinical practice, “the novel bioengineering methods for the maxillo-mandibular reconstruction" based on “auriculo-mastoid osteo-fascio-cutaneous flap” system will be introduced in this presentation. When vascularized skin and bone flap were required simultaneously, we designed a new method of auriculomastoid fascio-cutaneous (AMFC) island flap (*J. Oral and Maxillof. Surg.* 54:559-567, 1994) combined with the parietal osteofascial (POF) flap (*J. Cranio-Max.-Fac. Surg.* 19:235-242,1991) pedicled on a single base and named it "the auriculomastoid osteo-fascio-cutaneous (AMOFC) flap". Also a new bioengineering method of maxillo-mandibular cutaneous reconstruction based on the principle of the AMOFC flap system (11 cases, which have been followed-up for 10 years) will be presented compared with 63 vascularized bone grafts. These bioengineered composite flaps seem to be very useful in reconstruction of maxillofacial soft tissue and bony defects. It is reliable and does not require microvascular anastomosis, with many additional advantages and various modifications of compound designs. The potentials and opportunities of nanotechnology in this important and exciting field of research will also be discussed.

Biography:

1979. 2	Graduated from College of Dentistry, MSD (1982), PhD (1987), Seoul National University, Seoul, Korea
1985.6~1989.1	Associated Professor, Chairman Dept. of Dentistry, College of Medicine, Choongnam National University
1989.1~present	Professor Dept. of Oral & Maxillofacial Surgery, College of Dentistry, Seoul National University
1998.10~present	President Korean Association of Research and Charity on Cranio-facial Deformity
2004.6~present	Vice President Korean Tissue Engineering and Regenerative Medicine Society
2004. 8~present	Member The Korean Academy of Science and Technology
2004.12~2006.12	Dean School of Dentistry, Seoul National University
2006.8~present	Director of Tooth Bioengineering National Research Lab.
2007.10~present	Vice President Korean Association of Sports Dentistry
2009.12~present	President, Korean Society for Stem Cell Research
2008.12~Present	Dean School of Dentistry, Seoul National University

IEEE NANOMED 2010 Plenary Talk II

Engineering approaches for fixing the broken heart: From Protein & Tissue Engineering, Gene Therapy to Pluripotent Stem Cells

Professor Ronald Li

LKS Faculty of Medicine, The University of Hong Kong, Hong Kong

Abstract:

Heart diseases are a major cause of death worldwide, including developed countries. Loss of non-regenerative, terminally differentiated heart cells due to aging or diseases is irreversible. Current therapeutic regimes are palliative in nature; in the case of end-stage heart failure, transplantation remains the *last* and *only* resort. Unfortunately, there is a severe shortage of donor cells and organs, leading to substantial mortality and morbidity as well as socio-economical burdens. Recent advances in the isolation and identification of pluripotent or multipotent stem cells have enabled clinicians and scientists to pursue the revolutionary paradigm of Regenerative Medicine - *Heart Regeneration*. Human embryonic stem cells (hESCs), isolated from the inner cell mass of blastocyst, can propagate indefinitely while maintaining their ability to become all cell types of the body, including heart cells. Therefore, hESCs may serve as an unlimited factory of heart cells for transplantation therapies. More recently, direct reprogramming of adult somatic cells to become patient-specific pluripotent hES-like cells (a.k.a. induced pluripotent stem cells or iPSCs) has been accomplished, eliminating potential ethical concerns and making hES/iPS cell-based therapies one step closer to reality. In this presentation, an overview of our various cell- and gene-based approaches developed in the past decade or so for repairing the damaged heart will be given. Specific topics include bioartificial pacemaker (as an alternative or supplement to conventional electronic devices), heart cell engineering, construction of 2-D and 3-D human heart tissues, microRNA, etc. An emphasis will be on the translation of basic biological principles and findings into pre-clinical and even potential clinical applications.

Biography:

Professor Ronald Li is currently Director of the Stem Cell & Regenerative Medicine Consortium at HKU, with an appointment at the Cardiovascular Research Center at Mt Sinai School of Medicine, Manhattan, NY where leads a program in Cardiac Stem Cell Engineering and Electrophysiology. During 2005-9, Prof Li was a tenured Associate Professor at the University of California, Davis with cross appointments in Biomedical Engineering, Biophysics, Genetics, Physiology and Cell Biology, an Associate Investigator of the Institute of Pediatric Regenerative Medicine at the Shriners Hospital for Children, and an Adjunct Associate Professor of Medicine at HKU. At UC Davis, he led the Human Embryonic Stem Cell Consortium. Before his move to CA, Prof. Li was Assistant Professor of Medicine at the Johns Hopkins University (2002-5). He was the two-time recipient of the

Top Junior Faculty Research Award from JHU Dept of Medicine (2002 & 2004), and has also received such honors as the Young Investigator Award from the Heart Rhythm Society (2002), Career Development Award from the Cardiac Arrhythmias Research & Education Foundation (2001), Top Prize for Young Investigator Basic Research from JHU School of Medicine (2001), etc. His group focuses on electrophysiology and construction of an unlimited library of "custom-tailored" human heart cells. Their work on cardiac differentiation has been recognized by the American Heart Association as Best Basic Study of 2005, Ground-Breaking Study of 2006, and Late-breaking studies of 2003, 2004 and 2007. Dr Li has over 70 publications in the areas and his lab receives funding from the National Institute of Health, California Institute of Regenerative Medicine, etc.

IEEE NANOMED 2010 Keynote Speech I

Nanotechnology platform for *in vivo* early cancer metastasis diagnosis and personalized therapy

Professor Vladimir P. Zharov

Philips Classic Laser and Nanomedicine Laboratories, University of Arkansas for Medical Sciences, Little Rock, Arkansas 72205 USA

Abstract:

Most cancer deaths (up to 90%) are a result of metastatic spread of the primary tumor to distant organs through blood system. However, current nanotechnology approaches have been mainly focused on the treatment of primary tumor. We introduced a new nanotechnology-based theranostic platform with focus on diagnosis and treatment of deadly metastasis. Specifically, we developed *in vivo*, noninvasive, photoacoustic (PA) flow cytometry for real-time ultrasensitive detection of circuiting tumor cells (CTCs) as a marker of metastasis development, cancer recurrence, and therapeutic efficacy. The CTCs are targeted by conjugated nanoparticle cocktail directly in the bloodstream. The assessment of a large blood volume *in vivo,* potentially the patient's entire blood volume (~5 L in adults), allows significantly (100-fold) enhancing the sensitivity of CTC detection compared to the existing CTC assay *ex vivo.* Moreover, the requirements for the targeting of CTCs are much less strict than those for the targeting of primary tumors because of (1) lower (at least two order of magnitude) nanoparticle concentration required due to much lower CTC amount; (2) easy delivery of nanoparticles to targets (*i.e*., in the systematic circulation); (3) rapid and effective CTC labeling in flow (up to 5-10 min); and (4) easy optical access to a peripheral blood vessels. This presentation summarizes recent advances of this platform which include multispectral, high-pulse-repetition-rate laser array, ultra-fast signal acquisition algorithms, novel nanoparticles as multimodal photothermal (PT) and PA molecular contrast agents, multiplex targeting simultaneously several CTC markers, magnetic enrichment of CTC *in vivo*, and combination of PA detection with PT killing of CTCs. The study *in vivo* on tumor-bearing mouse models and spiked human blood samples demonstrated high detection sensitivity for melanoma and breast bulk and stem cancer CTCs prior to the development of distant metastases. Their early detection may inhibit or potentially prevent them by well-timed therapy, including PT nanotherapy. If oncoming pilot clinical trials are successful, this technology can provide breakthroughs for the early detection of CTCs as a diagnostic and therapeutic target.

Biography:

Vladimir Zharov is the director of the Phillips Classic Laser and Nanomedicine Laboratories and Professor of Biomedical Engineering (BME) at University of Arkansas for Medical Sciences (UAMS), USA. He received the engineer diploma, PhD, and DSc degrees at Moscow State Technical University (MSTU), completed a postdoctoral fellowship at

Lawrence Berkley National Laboratory at the University of California, and served as the Chairman of BME Department at MSTU (1989-2000). His research interests include laser spectroscopy, biophotonic, and nanomedicine. He is one of the pioneers of a photoacoustic spectroscopy, nanotherapy of cancer and infections with pulses lasers, and *in vivo* multicolor flow cytometry. He is the author of five books, 200 papers, and 40 patents, and the principle investigator on 14 NIH, NSF, and other agency grants. He 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.

IEEE NANOMED 2010 Keynote Speech II

A Microfluidic System for Systematic Evolution of Ligands Exponential Enrichment (SELEX) and Its Applications for Diagnosis

Gwo-Bin Lee

Distinguished Professor, Department of Engineering Science, National Cheng Kung University, Tainan, Taiwan

Abstract:
Systematic evolution of ligands by exponential enrichment (SELEX) technique has been extensively used to screen specific aptamers from combinatorial libraries of synthetic nucleic acids by an iterative process. Aptamers are usually screened and selected from a large random DNA or RNA pool, which have a high affinity to specific biomolecules, antibodies, or even cells. Therefore they have a variety of promising applications such as diagnosis and therapy. In this talk, a magnetic-bead-based, automatic microfluidic system is reported to select DNA-based aptamers. It has several advantages including rapid screening process, automation, and less consumption of samples/reagents. Utilizing an on-chip polymerase chain reaction (PCR) module, these selected aptamers can be further amplified in a shorter period of time. Experimental data showed that C-reactive protein (CRP)-specific aptamers can be screened continuously and isolated. In addition, a magnetic-bead based microfluidic system for fast detection of CRP by using screened aptamers was demonstrated. Experimental data show that the developed system can automate the entire process within 30 minutes with a detection limit of 0.0125 mg/L. This microfluidic system may be promising for the point-of-care applications for CRP detection in the future.

Biography:
Gwo-Bin Lee received his B.S. and M.S. degrees in Department of Mechanical Engineering from National Taiwan University in 1989 and 1991, respectively. He received his Ph.D. in Mechanical & Aerospace Engineering from University of California, Los Angeles, USA in 1998. Dr. Gwo-Bin Lee is currently a Distinguished Professor in the Department of Engineering Science at National Cheng Kung University. His research interests lie on nano-biotechnology, micro/nanofluidics and their biomedical applications. He is the directors of “MEMS Design and Microfabrication Lab” and “Microfluidic Biochip Lab”. Dr. Lee has been active in the field of micro/nanofluidic systems, and is developing integrated micro/nano systems incorporated with nano/biotechnology for biomedical applications. He has developed several micro/nano-scale platforms for cell, protein, and DNA manipulation and detection. Dr. Lee has published over 160 SCI journal papers, 380 conference papers, and filed 97 patents (47 patents granted). His works have been highly cited. He has served as a technical or organizing committee member in many international conferences, including APCOT 2010, SNDT 2010, MNC 2010, IEDMS 2010, Future Tech 2010, ISMM 2010, IEEE

NEMS 2009, MNHMT 2009, Transducers 2009, ICMAT 2009, IEEE NANO 2009, IEDMS 2009, MNC 2009, IEEE MEMS 2008, IEEE NEMS 2008, ICONBS, IEEE NEMS 2007, AIM 2007, IEEE ICMA 2007, MNC 2007, IEEE NANO 2007, IEEE NANOMED 2007, IEEE TENCON 2007, OWLS9 2006, IEEE NEMS 2006, IMU2 2006, ROBIO 2005, ICM 2005, AIM 2005, IMμ2 2004, IS3M 2000 etc. He will be the general chair of IEEE NEMS 2011 and general co-chair of IEEE MEMS 2013. He has received several academic awards, including Dragon Thesis Award (2002), Distinguished Research Award from Engineering School of National Cheng Kung University (2002), Distinguished Young Engineer Award from Chinese Engineering Society (2003), K. T. Lee Research Award from K. T. Lee Foundation (2004), Distinguished Mechanical Engineer Award from Chinese Mechanical Engineering Society (2004), Distinguished Young Electrical Engineer Award from Chinese Electrical Engineering Society (2005), Young People of the Year (2006), Distinguished Engineering Professor from Chinese Mechanical Engineering Society (2006), Engineering Professor Award from Southern Division of Chinese Engineering Society (2007), Excellent Research Award from National Science Council in Taiwan (2007), National Innovation Award (2008), Distinguished Engineering Professor Award from Chinese Engineering Society (2009), Distinguished Kuo-Ting Lee Researcher Award from Kuo-Ting Lee Foundation (2009). He has been invited in various conferences for plenary and keynote talks. Currently, he is Editor of several journals, including IET Bionanotechnology, Micro and Nanosystem, Micro and Nano Letters and Recent Patents on Nanotechnology.

IEEE NANOMED 2010 Keynote Speech III

Microfluidics for 3D tissue engineering and global health diagnostics

Professor Samuel K. Sia

Molecular and Microscale Bioengineering Laboratory, Department of Biomedical Engineering, Columbia University, New York, USA

Abstract:
One of the key missions of science and engineering today is to bring powerful developments in instrumentation and engineering to benefit the world's most vulnerable and underserved populations to achieve social and clinical impact. Simple but robust technologies like microfluidic systems have shown a potential promise. Microfluidic techniques are used for two different applications in our lab: controlling 3D microenvironments of cells and tissues, and for developing low-cost point-of-care diagnostics for use in U.S. and in developing countries. We focus on microvascularization, tumor metastasis, and stem-cell differentiation studies by developing a number of microfluidic techniques as well as the advanced techniques in spatial positioning of cells, extracellular matrix, and growth factors for controlling the 3D microenvironments of cells and tissues to high resolution. Our second major focus is to use the powerful techniques of MEMS and microfluidics to build low-cost handheld devices for performing sophisticated medical diagnostic tests on a small credit card-sized chip. Lab-on-a-chip devices are developed for improving the health of people in developing countries, which require unique and challenging design criteria; for example, low-cost, simple to use, or portable. We are developing new lab-on-a-chip diagnostic devices specifically for use in resource-poor settings such as developing countries. Our lab's current efforts, in conjunction with partners in industry, public health, and local governments, to develop new rapid diagnostic tests for use in sub-Saharan Africa will be discussed.

Biography:
Dr. Sia is an Assistant Professor at the Department of Biomedical Engineering at Columbia University. His lab's current work focuses on using microfluidics for global health diagnostics and for controlling cellular microenvironments in 3D tissues. He obtained his B.S. in biochemistry at the University of Alberta in Edmonton, Canada. Samuel then obtained his Ph.D. at Harvard University as a Howard Hughes Medical Institute Predoctoral Fellow and National Science and Engineering Council of Canada Fellow, with Peter Kim (located at MIT and the Whitehead Institute); his thesis examined the use of protein design to improve the structural properties of anti-HIV peptide inhibitors. As a Canadian Institute of Health postdoctoral fellow with George Whitesides at Harvard, Samuel worked on a number of projects at the interface of materials science and biology, with a focus on developing simple but powerful microfluidic techniques for biomolecular detection. He is a founder of Claros Diagnostics, a venture capital-backed company that is developing novel point-of-care

diagnostics products; its first product on prostate cancer diagnostics obtained European Union regulatory approval. His lab's work has been supported by the NIH, NSF, Wallace H. Coulter Foundation, American Heart Association, World Health Organization, and he has been received a young innovator award from MIT Technology Review.

IEEE NANOMED 2010 Keynote Speech IV

Microscale manipulation of cells and their environment for cell biology and regenerative medicine

Professor Joel Voldman

Department of Electrical Engineering and Computer Science, Massachusetts Institute of Technology, Cambridge, MA, USA

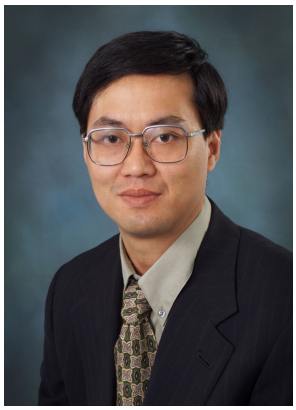
Abstract:

Microsystems have the potential to impact biology & medicine by providing new ways to manipulate cells and the microenvironment around them. Simply physically manipulating cells or their environment—using microfluidics, electric fields, or optical forces—provides new ways to separate cells and organize cell-cell interactions. Our lab is focused on using cell manipulation to sort cells following imaging and to study cell-cell interactions in stem cell self-renewal, differentiation, and nuclear reprogramming. Our lab has developed methods that use optical forces to sort cells following microscopic imaging, enabling screens based upon dynamical and localization-based phenotypes. We have also developed a fast, specific, and sensitive microfluidic electrical cell sorting technology with which we have screened the genetic basis of electrical properties. We have developed arrays of microfluidic perfusion culture chambers to provide a more controlled soluble microenvironment for embryonic stem cells, and have been using this system to uncover diffusible signaling in self-renewal and neuronal differentiation. Together, these tools provide news ways to exploit cells' potential for both basic science, applied biotechnology, and medicine.

Biography:

Joel Voldman received the B.S. degree in electrical engineering from the University of Massachusetts, Amherst, in 1995, and the M.S and Ph.D. degrees in electrical engineering from the Massachusetts Institute of Technology (MIT), Cambridge, in 1997 and 2001. Following this, he was a postdoctoral associate at Harvard Medical School, where he studied developmental biology. Since 2002, he has been with the Massachusetts Institute of Technology, Cambridge, where he is currently Associate Professor. His research interests include microscale manipulation of cells for cell sorting, dielectric cell analysis, and stem cell biology. Dr. Voldman has received several awards, including an NSF CAREER award and the ACS Young Innovator Award.

IEEE NANOMED 2010 Keynote Speech V



Live Cell Optical Sensing for Drug Discovery

Dr. Fang Ye

Cellular Biophysics, Corning Incorporated

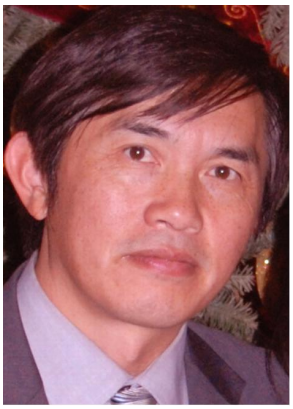
Abstract:

Drug discovery campaigns have undergone tremendous make-over in the recent years. Modern drug development embraces the "one gene, one drug, one disease" philosophy. As a result, traditional phenotypic assays (e.g., tissue-based measurements) have yielded to high throughput screening (HTS)-compatible molecular characterization assays. However, searching maximally selective drugs for single target-based therapies ("magic bullets") using HTS has failed to deliver its promise – identification of the best in class drug molecules is mostly achieved by serendipity, rather than rational drug design. To exacerbate this is that many diseases such as cancers are related to pathways; and many drugs if not all have intrinsic ability to bind to multiple targets. To overcome the weakness of current molecular characterization assays, we have been developing live cell optical sensing technologies that enable drug discovery using native cells without any manipulations. The whole cell sensing is made possible by a nano-grating waveguide-based resonant waveguide grating (RWG) biosensor. In this presentation, current drug discovery process will be reviewed. Our various biosensor instrumentations will be presented, and specific applications of live cell optical sensing will be discussed, including discovery of signaling pathways mediated by a mitochondria ion channel, high throughput screening of G-protein-coupled receptor ligands, assessment of biased agonism of drug molecules, and characterization of cancer cells.

Biography:

Ye Fang is a senior research manager of Cellular Biophysics, Science and Technology Division, Corning Inc. He began his career as a chemist. He earned his B.S. in Chemistry Education in 1989 from Hubei University, his M.S. in Physical Chemistry in 1992 from Wuhan University, and his Ph.D. in Physical Chemistry in 1995 from the Institute of Chemistry, Chinese Academy of Sciences in Beijing, China. After one-year postdoctoral research in Physics at University of Vermont, and four year postdoctoral research in Biophysics at Johns Hopkins University School of Medicine, he joined Corning Inc. as a Senior Research Scientist in 2000. He is an author or co-author of 2 books, 14 book chapters, and ~80 research papers and review articles. He also holds 9 patents and has 56 pending patent applications.

IEEE NANOMED 2010 Keynote Speech VI



In-Vitro Quantitative Mechanical Mapping of Biomolecules and Cells by Atomic Force Microscope

Dr. Chanmin Su

Bruker Nano, Inc. 112 Robin Hill Road, Santa Barbara, CA 93117

Abstract:

Though atomic force microscopy (AFM) interrogates biological materials through mechanical interactions, attaining quantitative mechanical information such as modulus and adhesion at high resolution has been a challenging task. This presentation reports progress in atomic force microscopy in achieving single molecule resolution during in-vitro imaging of various protein membranes, collagen and DNA. In addition to high resolution imaging the recent technology advance, quantitative nanomechanical measurement (QNM), also enables simultaneous mechanical mapping at the molecular scale, presenting quantitative or semi-quantitative physical property data for individual molecules. When the probe is functionalized with a known molecule (e.g. biotin), the high special resolution measurement of adhesion force becomes a tool for specific interaction mapping which selectively recognizes the binding proteins on a surface. Extending to larger scale, QNM can also provide live cell stiffness and adhesion maps. These mechanical maps have aided the study of the cancer cell apoptosis.

Biography:

Chanmin Su received his Ph.D in solid-state physics from the Chinese Academy of Sciences in 1988. Afterwards, he pursued post-doctoral research at KFA Forschunszentrum in Germany. In 1991, he came to the US and worked for the University of Maryland as a research associate and then as an assistant research professor. Moving to industrial research in 1998, Chanmin took the position of principal scientist at Raytheon Systems, developing MEMS barometer for millimeter infrared detector arrays. Chanmin Su subsequently joined Veeco in 2000 as a senior staff scientist. He is now serving as Director of Technology in AFM business of Bruker Nano Inc. (formerly Veeco Metrology), overseeing technology development, licensing, collaborations, and intellectual property management.

Chanmin Su is one of the inventors of Peak Force Tapping technology, as well as 16 other patents used in AFM systems. In Chanmin Su's tenure with Veeco, he has initiated and lead many product developments leading to new applications of scanning probe technologies. Among them are the Torsional Resonance AFM, TR-TUNA, Adaptive Scanner control, Quantitative Nanomechanical Property Characterization, HarmoniX, and recently Peak Force Tapping, which fundamentally changed AFM control. Chanmin Su was the co-principal investigator of the NIST-funded Advanced Technology Program (ATP) for quantitative nanomechanics/high speed AFM and the principal investigator for a current ATP project on Nanoscale Subsurface Metrology. Chanmin has published over 50 papers and two book

chapters on the topics of the mechanical properties of bulk/thin film materials and AFM instrumentations. He was co-organizer of several international conferences on scanning probe microscopy and chaired sessions in scanning probe-related international conferences. Chanmin has served as a panelist for several national and international reviews on future technologies and has given many invited speeches to various scientific events.

Conference Registration

Conference registration will be at the City University of Hong Kong (LT-401). The registration desk will be open from December 5 (pm) to December 8 (am), 2010. For the new onsite registration, only cash payment is accepted at the registration desk.

Social Events

The social events organized by the IEEE-NANOMED 2010 include Conference Reception, Social Lunch, Conference dinner, and Conference Banquet.

- **Conference Reception:** The Conference Reception will be held from 18:00 to 19:30 on December 5, 2010 at City Top, 9/F, Amenities Building, City University of Hong Kong. All the conference participants are free to join this event.

- **Social Lunch:** The conference will provide social lunch to all registered participants on December 6 and 7.

- **Conference Dinner:** The Conference Dinner (by invitation) will be held for those people who have made particular contributions to organizing conference. It is held from 18:00pm to 20:30pm on December 6, 2010.

- **Conference Banquet**: The Conference Banquet will be held from 19:30 to 21:30 on December 7, 2010.

Workshop

A post-conference workshop will be held at the University of Macau on December 9, 2010.

1. Donna Wang, Professor, Michigan State University, USA
   Counter Regulatory Mechanisms in Hypertension: a TRP to find hope?
2. Dong Sun, Professor, City University of Hong Kong, Hong Kong
   Robotics Manipulation of Cells for Biomechanical Characterization
3. Chanmin Su , Ph.D., Bruker Nano, Inc., USA
   In-Vitro Quantitative Mechanical Mapping of Biomolecules and Cells by Atomic Force Microscope
4. Lianqing Liu, Associate Professor, Chinese Academy of Science, China
   Using Nanorobot to Study the Molecular Mechanism of Clinical Difference in Lymphoma Targeting Therapy
5. Wen J. Li, Professor, Chinese University of Hong Kong, Hong Kong
   Towards Digital-Force-Field-Assisted Endocytosis of Fluorescent Nanoparticles
6. Jin-Woo Kim, Associate Professor, University of Arkansas, USA
   Nanoparticles and Self-Assembled Nanocomposites for Biomedical Sensing and Therapy
7. Vladimir P. Zharov, Professor, University of Arkansas, USA
   Nanotechnology for Cancer Therapy
8. Feng Gao, Professor, Shanghai Jiaotong University, China
   Design of Nano and Micro Parallel Manipulators
9. Fang Ye, Ph.D., Senior Research Manager, Corning Incorporated, USA
   Label-free Optical Biosensors for Drug Discovery: Past, Present and Future
10. Lixin Dong, Assistant Professor, Michigan State University, USA
    Towards Molecule Detection and Injection by Nanoplumbing

Conference Venue

City University of Hong Kong
83 Tat Chee Avenue
Kowloon Tong
Hong Kong

Opening ceremony and plenary/keynote talks: Lecture Theatre (LT)-401

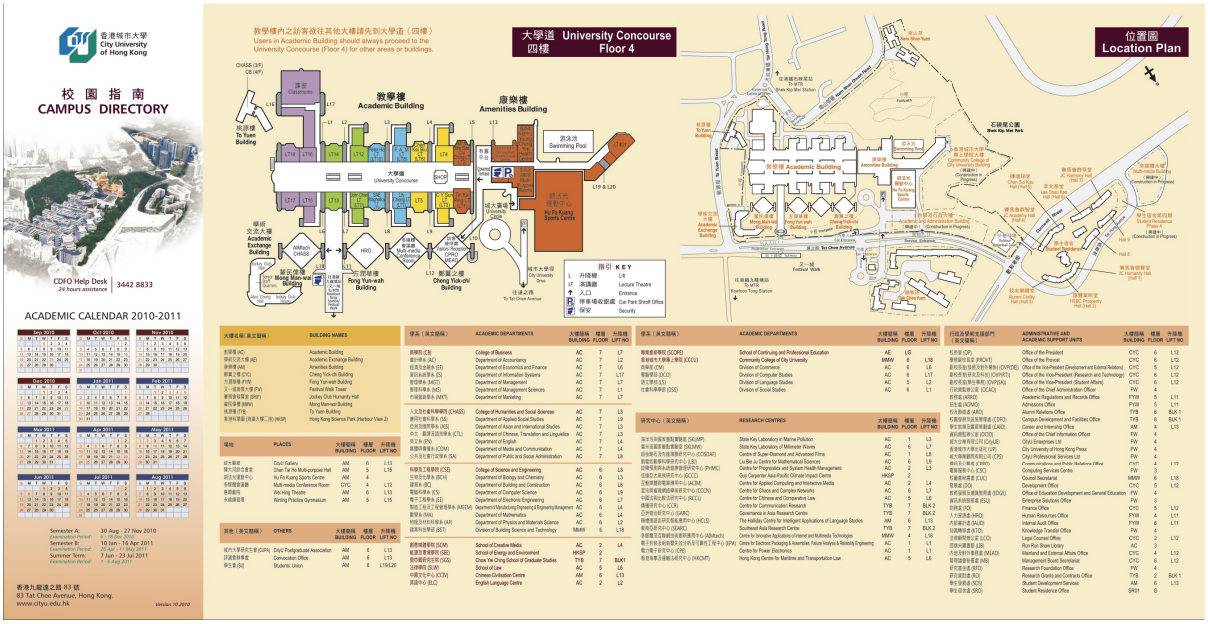
Other technical sessions: Academic building B5-208, B5-209, B5-210, B5-211

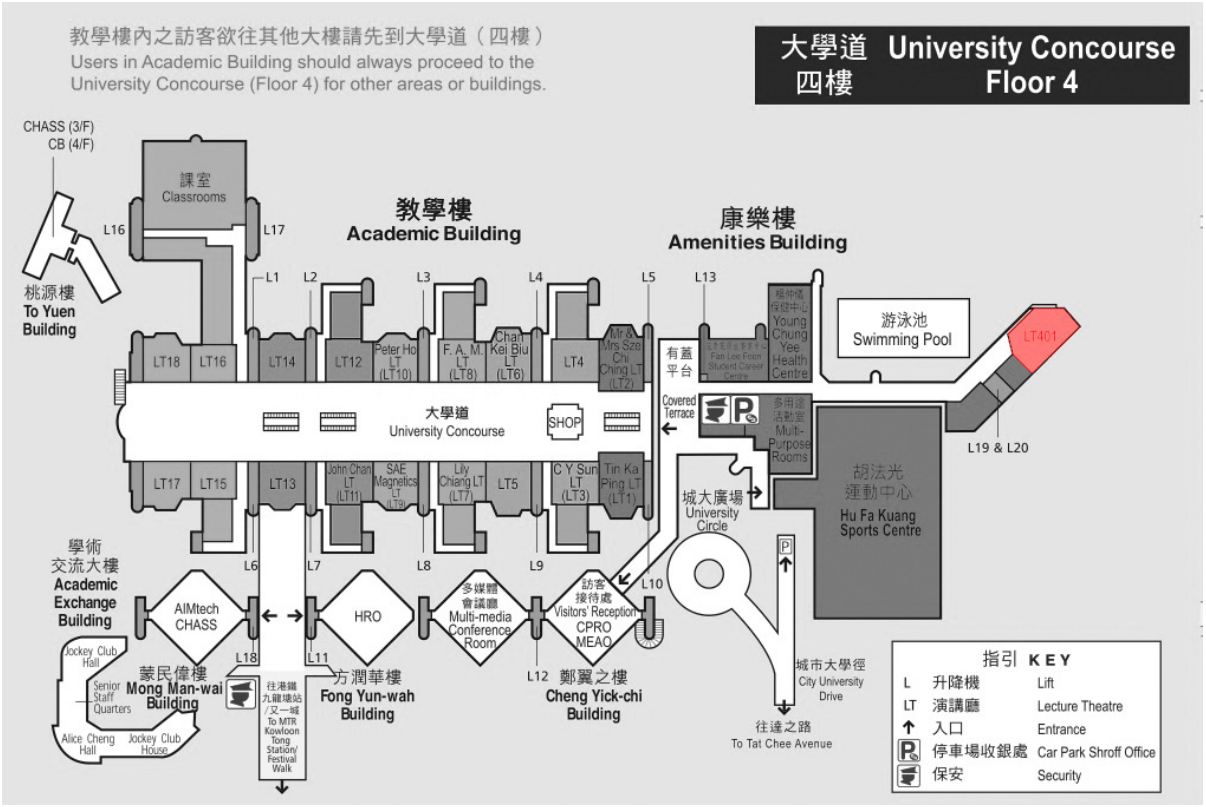
Wireless network information

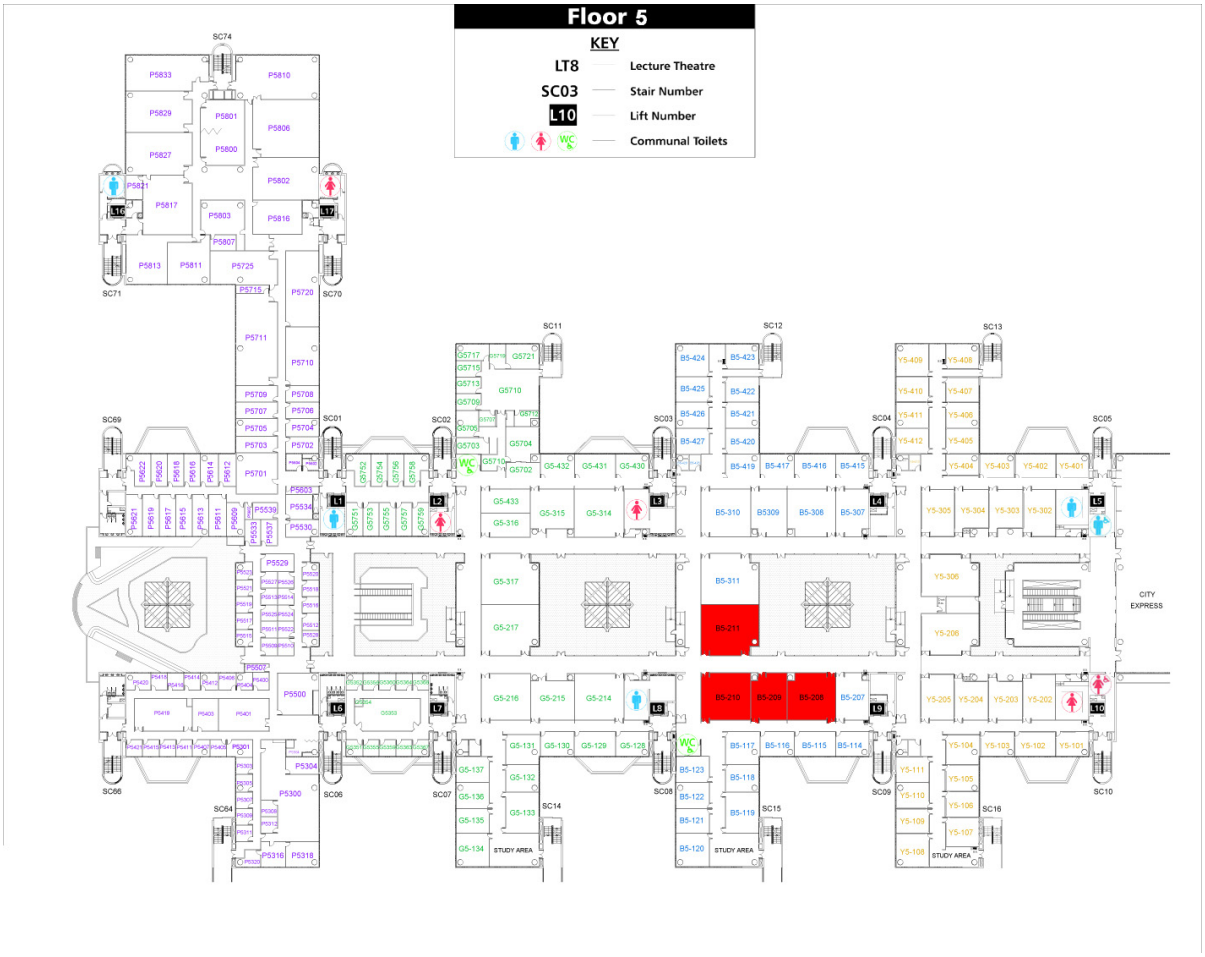
A wireless network service will be provided to all conference participants for their internet access. The login information is see as follows:

Access point: CityU Guest
Account: nanomed
Password: 33bhmqx5

Campus Map




教學樓內之訪客欲往其他大樓請先到大學道（四樓）
Users in Academic Building should always proceed to the University Concourse (Floor 4) for other areas or buildings.
大學道 四樓 University Concourse Floor 4
CHASS (3/F)
CB (4/F)
課室 Classrooms
教學樓 Academic Building
康樂樓 Amenities Building
桃源樓 To Yuen Building
游泳池 Swimming Pool
大學道 University Concourse
SHOP
Covered Terrace
多用途活動室 Multi-Purpose Rooms
胡法光運動中心 Hu Fa Kuang Sports Centre
L19 & L20
城大廣場 University Circle
學術交流大樓 Academic Exchange Building
AIMtech CHASS
HRO
多媒體會議廳 Multi-media Conference Room
訪客接待處 Visitors' Reception CPRO MEAO
蒙民偉樓 Mong Man-wai Building
方潤華樓 Fong Yun-wah Building
鄭翼之樓 Cheng Yick-chi Building
城市大學徑 City University Drive
往達之路 To Tat Chee Avenue
往港鐵九龍塘站 / 又一城 To MTR Kowloon Tong Station / Festival Walk
指引 KEY
L 升降機 Lift
LT 演講廳 Lecture Theatre
入口 Entrance
停車場收銀處 Car Park Shroff Office
保安 Security


Floor 5
KEY
LT8 Lecture Theatre
SC03 Stair Number
L10 Lift Number
Communal Toilets
CITY EXPRESS
STUDY AREA

Local Information

Hong Kong is simply dazzling. Experience the distinctive blend of East and West in this dynamic city. Feel the rush as you indulge in shopping. Savor culinary delicacies. Open your senses to Hong Kong amazing skyline, bustling harbor and peaceful countryside. Come discover the diversity and sophistication that is Hong Kong. You'll love it!

- Hong Kong Tourism Board

Hong Kong is located in the Far East, just south of the Tropic of Cancer. Hong Kong Island is 32km east of the mouth of Pearl River and 135km southeast of Canton. It is separated from the mainland by a good natural harbour. Hong Kong Island was ceded to Britain in 1842 by the Treaty of Nanking; and the Kowloon Peninsula (south of Boundary Street and Stonecutters Island) in 1860 by the Convention of Peking. The area of Boundary Street to Shenzhen River and a group of 260 islands, now known as the New Territories, were leased to Britain in 1898 for a period of 99 years. The New Territories (plus the 260 islands) comprise 891 km^2. Shortage of land suitable for development has led to reclamation from the sea, principally from the seafronts of Hong Kong Island and Kowloon.

Hong Kong is one of the busiest cities and ports in the world. Yet it is not the hectic pace of life that will leave you breathless. Instead, it is the very serenity of the city that will make you catch your breath. Also, Hong Kong is one of the great centers for international cooking. Apart from Chinese food, which is superb, there are also many Indian, Vietnamese, Singapore/Malaysian and Thai restaurants. Further, Hong Kong as a whole is just like a gigantic shopping mall under one roof, you can find different interesting products at every corner of the streets: boutiques, brand-name products, street stalls, factory outlets, jewellery shops, arts & crafts, etc.

Area: 1097 km^2
Population: 6,980,000
Population Density: 6096 per km^2
Government: Special Administrative Region of China

- **Language:** Chinese and English are the official languages with Cantonese most widely spoken. Engish is spoken by many, particularly in business circles.

- **Public Transportation:** Hong Kong is so compact that getting around is quick and easy. An efficient public transport system – network of urban underground trains (MTR), numerous routes of trams, buses and ferries – enable visitors to explore Hong Kong conveniently and safely on their own.

- **Currency and Credit Card:** The Hong Kong Dollar (HK$) is the unit currency used in Hong Kong. One US dollar is about HK$ 7.76. Most foreign currencies and traveler's cheques can be changed over banks, hotels and moneychangers. There are no restrictions on the type or amount that can be brought into or taken out of Hong Kong. All major credit cards are widely accepted in Hong Kong and can be used to obtain cash advances at banks and automatic teller machines (ATMs). ATMs can be found almost everywhere and provide 24-hour cash withdrawal (HK$).

- **Time:** GMT +8 hours.

- **Electricity:** 220 volts AC, 50 Hz.

- **Telephone:** Directory enquiries services are computerized. For directory enquiries, dial 1081 (English) or 1083 (Chinese). Full IDD is available. Country code: 852. Outgoing international code: 001. Local public telephone calls can be made either with phone cards or coins. Local calls are free from private phones.

- **Hotlines:** Police, Fire, Ambulance: 999. For urgent requirement regarding to the conference matter, you can also contact the conference secretariat: Dr. Jian Chen by 5398-5305 or 3442-5276.

- **Weather Information:** Dominated by the Asian Monsoon, Hong Kong experiences the seasonal reversal of wind direction that brings the wet season from May to September and the dry season from October to March. Early December tends to be the most pleasant time period to visit Hong Kong. The temperature is around average 15-20°C.

- **Famous Scenes in Hong Kong**

➢ Disneyland Park

Hong Kong Disneyland is located on Lantau Island, surrounding by mountains at three sides and facing the South China Sea. As the fifth Disneyland Park built in the mode of Disneyland and the eleventh theme park of Disney land in the world, Hong Kong Disneyland Park is the first one take California Disney as the base. On entering the park, you will be captured by the feeling of being in another world with countless excitement and adventures.

The park consists of four themed lands similar to other Disneyland parks: Main Street, U.S.A., Fantasyland, Adventureland and Tomorrowland. The theme park's cast members use English and Chinese, including Cantonese and Mandarin dialects, to communicate verbally. Guide maps are printed in traditional and simplified Chinese as well as English, French, and Japanese.

➢ Ocean Park

Ocean Park Hong Kong, commonly known as Ocean Park, is a marine mammal park, oceanarium, and animal theme park, situated in Wong Chuk Hang and Nam Long Shan in the Southern District of Hong Kong. Founded in 1977 by the then Governor of Hong Kong Sir Murray MacLehose, Ocean Park has now grown to about 35 attractions and rides.

The park has won several awards, including The World's Seventh Most Popular Amusement Park and 33rd Most Visited Tourist Attractions in the World by Forbes.

➢ Victoria Peak

Victoria Peak is the highest peak in Hong Kong Island with an altitude of 554 meters and has been considered as a landmark of the island. It is the best spot to have a bird's eye view of the Victoria Harbor and the whole thriving island.

With some seven million visitors every year, the Peak is a major tourist attraction of Hong Kong. It offers spectacular views of the city and its harbours. The number of visitors led to the construction of two major leisure and shopping centres, the Peak Tower and the Peak Galleria, situated adjacent to each other.

The Peak Tower incorporates the upper station of the Peak Tram, the funicular railway that brings passengers up from Hong Kong's Central district, whilst the Peak Galleria incorporates the bus station used by the Hong Kong public buses and green minibuses on the Peak. The Peak is also accessible by taxi and private car via the circuitous Peak Road, or by walking up the steep Old Peak Road from near the Zoological Botanical Gardens.

➢ Lantau Island

Lantau Island, with a size twice as big as Hong Kong Island, is the biggest island to the west of Hong Kong Island. Visitors can take a bus or the mass transit railway and reach the heartland of Lantau within 30 minutes from the city center. With wild countryside, monasteries, old fishing villages and seriously secluded beaches, Lantau Island, for those who are tired of the noise and polluted city life, is definitely a place to visit or even to live with. There are a lot of outdoor activities that people can do such as hiking, mountain biking, camping, fishing and etc.

➢ HK Conference and Exhibition Centre

Hong Kong is a major conference and exhibition center. Hundreds of international exhibitions are held annually. The Hong Kong Conference and Exhibition Center (HKCEC, operated by the governmental Hong Kong Trade Development Council), has approximately 500,000 square feet of exhibition space, including 300,000 square feet added in a major expansion completed in the summer of 1997.

HKCEC is one of the two major convention and exhibition venues in Hong Kong, along with AsiaWorld-Expo. It is located in Wan Chai North, Hong Kong Island. Built along the Victoria Harbour, it is linked by covered walkways to nearby hotels and commercial buildings.

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TB3: Nano and molecular technologies in medical diagnosis and therapy (II)

Room: ***B5-210***

Chairs: Hun-Kuk Park and Zhe Yu

TB4: Stem cell

Room: ***B5-211***

Chair: Ronald Li

WP: Poster session

Room: ***B5-311***

Chair: Bing Lam Luk

IEEE NANOMED 2010 Program at a Glance

December 5, Sunday, City University of Hong Kong				
16:00–18:00	**Registration**			
18:00–19:30	**Welcome reception, City Top, 9/F, Amenities Building, City University of Hong Kong**			
December 6, Monday, City University of Hong Kong				
9:00–9:30	**Opening Ceremony (Lecture Theatre 401)**			
9:30–10:30	**Plenary Talk I (Lecture Theatre 401)** **Bioengineering of the Teeth and Jaws to Clinical Practice** Professor Pill-Hoon Choung, Seoul National University, Korea			
10:30–10:50	**Tea Break**			
10:50–11:50	**Plenary Talk II (Lecture Theatre 401)** **Engineering Approaches for Fixing the Broken Heart: From Protein & Tissue Engineering, Gene Therapy to Pluripotent Stem Cells** Professor Ronald Li, The University of Hong Kong, Hong Kong			
12:00–13:30	**Lunch (City Top, 9/F, Amenities Building, CityU)**			
13:50–15:30	**MA1 (B5-208)** **Biomechatronics and application**	**MA2 (B5-209)** **Cell mechanics at the nanoscale**	**MA3 (B5-210)** **Biomedical imaging and sensing (I)**	
15:30–15:50	**Tea Break**			
15:50–17:30	**MB2 (B5-208)** **Frontiers in nanobiotechnology**	**MB2 (B5-209)** **Bio-MEMS and microfluidics for medical applications**	**MB3 (B5-210)** **Biomedical imaging and sensing (II)**	
18:00–20:30	**Conference Dinner (by invitation)**			
December 7, Tuesday, City University of Hong Kong				
9:00–9:40	**Keynote I (Lecture Theatre 401)** **Nanotechnology Platform for in vivo Early Cancer Metastasis Diagnosis and Personalized Therapy** Professor Vladimir Zharov, University of Arkansas, USA			
9:40–10:20	**Keynote II (Lecture Theatre 401)** **A Microfluidic System for Systematic Evolution of Ligands Exponential Enrichment (SELEX) and Its Applications for Diagnosis** Professor Gwo-Bin Lee, National Cheng Kung University, Taiwan			
10:20–10:40	**Tea Break**			
10:40–11:20	**Keynote III (Lecture Theatre 401)** **Microfluidics for 3D Tissue Engineering and Global Health Diagnostics** Professor Samuel Sia, Columbia University, USA			
11:20–12:00	**Keynote VI (Lecture Theatre 401)** **Microscale Manipulation of Cells and Their Environment for Cell Biology and Regenerative Medicine** Professor Joel Voldman, Massachusetts Institute of Technology, USA			
12:00–13:30	**Lunch (City Top, 9/F, Amenities Building, CityU)**			
13:40–15:20	**TA 1 (B5-208)** **Novel nanomaterials for biomedical imaging and therapeutic agent (I)**	**TA 2B(5-209)** **Physiological study at cellular level using nanomanipulation and nanodevices (I)**	**TA3 (B5-210)** **Nano and molecular technologies in medical diagnosis and therapy (I)**	**TA4 (B5-211)** **Nanotechnology in drug delivery**
15:20–15:40	**Tea Break**			
15:40–17:00	**TB1 (B5-208)** **Novel nanomaterials for biomedical imaging and therapeutic agent (II)**	**TB2 (B5-209)** **Physiological study at cellular level using nanomanipulation and nanodevices (II)**	**TB3 (B5-210)** **Nano and molecular technologies in medical diagnosis and therapy (II)**	**TB4 (B5-211)** **Stem cell**
17:10–18:00	**Keynote V (Lecture Theatre 401)** **Live Cell Optical Sensing for Drug Discovery** Dr. Fang Ye, Cellular Biophysics, Corning Incorporated			
18:00–18:50	**Keynote IV (Lecture Theatre 401)** **In-Vitro Quantitative Mechanical Mapping of Biomolecules and Cells by Atomic Force Microscope** Dr. Chanmin Su, Bruker Nano Inc.			
19:00–21:30	**Conference Banquet (Shing Hin Restaurant, 8/F, Amenities Building, CityU)**			
December 8, Wednesday, City University of Hong Kong				
9:30–11:30	**Technical Sessions (Poster)**			
Afternoon	**Workshop participants depart to Macau**			
December 9, Thursday, University of Macau				
Workshop in Macau				