



Society for Physical Regulation  
in Biology and Medicine

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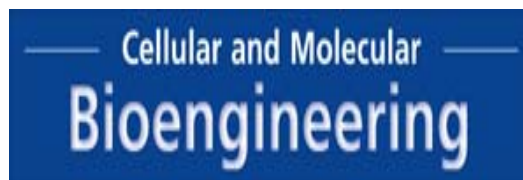
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## WELCOME MESSAGE



On behalf of the Society for Physical Regulation in Biology and Medicine (SPRBM), I welcome you to the 28<sup>th</sup> Annual SPRBM Scientific Meeting in Tucson, Arizona. We are pleased and excited to have you contribute your scientific work to this meeting here at the JW Marriott Starr Pass Resort.

The theme of this year's conference is Cell Engineering Paradigms in Aging, Cancer, and Regenerative Medicine. The goal of this conference is to highlight the challenges and common paradigms in aging, cancer and regenerative medicine that could be addressed via cell and molecular engineering approaches. My vision is to address regenerative processes associated with aging and cancer at the cell and molecular level by developing novel electro-mechanical devices and instrumentations. With the advent of the femtosecond lasers, sophisticated micro-nano raman spectroscopy, nanowire based evanescent wave sensors, nano-mechanical resonator devices, and characterization of plasmon resonances of nanostructures, we are in a unique position to combine the known microstructural and molecular knowledge in cell biology and biophysics with the new technologies to build the next generation of devices that will help us learn the control switches of the cells below the limit of what we know now, that is at the pico to femto scales, and translate this knowledge into the clinical applications for regenerative medicine.

We hope that the discussion amongst the speakers and the attendees will facilitate a new common paradigm that would help the research progress in these areas. Attendees will be exposed to innovative and stimulating topics with a well-balanced program of keynote speakers, oral presentations, poster sessions and educational workshops regarding the NIH granting process, FDA device approval process, and atomic force microscopy for cell imaging.

SPRBM is pleased to have seven distinguished keynote speakers, two special invited speakers, and invited speakers from the NIH and FDA. The keynote speakers are Drs. Brian Harfe, John Harper, George Truskey, David Odde, Isaiah J. Fidler, Lola Reid, and Jed Macosko. With an excellent program of submitted abstracts, these keynote speakers will address pertinent topics such as Repair and Regeneration, Biomaterials and Regenerative Tissue Engineering, Molecular Cell Engineering, Cellular and Molecular Mechanics, Cancer Therapy and Cell-Cell Interactions, Stem Cells and Differentiation, and Single Molecule Biophysics.

This year we are honored and fortunate to have Dr. Stuart Hameroff from The University of Arizona-Tucson welcoming us to Tucson with an exciting presentation on Quantum Phenomena in Biological Systems. His talk hints at the future of cellular and molecular engineering and how it will address the biology of aging, cancer, and regenerative medicine in common ways.

The Gala Dinner will be held at the Kitt Peak National Observatory near Tucson. The dinner will be highlighted by an exciting talk by Dr. Martin Bojowald, a quantum theoretical physicist. In the backdrop of the Observatory amongst Orion Nebula, Beehive Cluster, and Andromeda Galaxy Dr. Bojowald will discuss the physics behind his theory of quantum loop cosmology and its applications beyond and within the cosmos.

Two workshops from federal agencies given by Dr. Jean Sipe from the National Institutes of Health (NIH) and Dr. Mark Lee from the Food and Drug Administration (FDA) will discuss the changes to the NIH grant application process and the device and biologics approval process, respectively. Dr. Andrea Slade from Veeco Instruments will give a workshop on the Atomic Force Microscopy for cell imaging and biophysics at the molecular scale.

In addition to the exciting scientific program, don't forget to enjoy the elegant desert location of Tucson. JW Marriott Starr Pass Resort and Spa is the winner of the 2008-2009 Travel+Leisure Magazine World's Best Hotels and 2008 Conde Nast Magazine top 100 Golf Resorts. Also, have fun at the Old Tucson Studios, explore nature at the Catalina State Park and Kartchner Caverns State Park, and finally the arts and heritage at the Amerind Foundation. There are many more activities to explore in Tucson.

SPRBM council and officers are dedicated to promoting interactive discussions during presentations and around posters. We also support networking and exchange of scientific ideas and hope it flourishes in the calming environment of Tucson, Arizona. We would like to thank our sponsors: MD Anderson Cancer Center (Quantum), Veeco Instruments (Platinum), LifeCell Corporation (Gold), Covidien, Bose, and Springer (Silver), and Taylor and Francis (Bronze).

I would also like to acknowledge the support of the Department of Plastic Surgery at MD Anderson Cancer Center. I am extremely grateful to the administrative support of Ms. Miquelyn (Micky) Harris, Ms. Leanne Frazer, and Ms. Melanie Lopresto of MD Anderson Cancer Center. The organizing committee from the Tissue Regeneration and Molecular Cell Engineering Labs are supporting the on-site registration and audio-visual. I am especially grateful for the support of our President Dr. Franklin Garcia-Godoy and Dr. Christopher Jacobs for facilitating the online registrations. Their dedication and hard work have made this conference possible. In conclusion, SPRBM acknowledges the support of all attendees and speakers. I look forward to meeting everyone in the elegant desert of Tucson.

## Keynote Speakers



**Brian Harfe** has his undergraduate degree from the University of Glasgow in Glasgow, Scotland. After having a lot of fun traveling all over Europe I returned to the United States and obtained a Ph.D. in investigating muscle development in the nematode *C. elegans* in the laboratory of Dr. Andrew Fire (2006 Nobel Prize winner for his discovery of RNAi) at The Johns Hopkins University/Carnegie Institute, Department of Embryology. After obtaining my Ph.D. in 1998, I moved to Emory University and began my first postdoctoral position in the laboratory of Dr. Sue Jinks-Robertson working on DNA damage pathways in yeast.

In 2000, I moved to Boston where I began my second postdoctoral position in the laboratory of Dr. Cliff Tabin at Harvard Medical School working on the molecular pathways responsible for limb formation using the mouse and chick model systems. In 2003, I became an Assistant Professor in the Molecular Genetics and Microbiology Department at the University of Florida (UF) College of Medicine in Gainesville, Florida. Currently, I am an Associate Professor (tenured) in the UF College of Medicine and Director of the Program in Developmental Genetics. My lab uses the mouse, chick and *C. elegans* model systems to investigate any area of development that either I, or someone in the lab finds interesting. Currently, projects investigating limb and intervertebral disc development are ongoing in my lab.



**John Harper** received his Ph.D in Biomedical Science from The University of Texas, M.D. Anderson Cancer Center in Houston. After completing 5 years of post-doctoral training in cancer biochemistry and cell biology at Scripps Clinic in La Jolla, California and the National Cancer Institute, Dr. Harper served as assistant professor of immunology at Scripps Research Institute. He joined LifeCell in 1994 as Vice President of R&D and for the 5 years prior Dr. Harper led a research team at Telios Pharmaceuticals studying antagonists of growth factors involved in scar formation. He currently serves as Vice President of Clinical Sciences and holds an Adjunct Professorship at the University of Texas Graduate School of Biomedical Sciences.



**George A. Truskey** is the Professor and Chair of the Department of Biomedical Engineering at Duke University. He also directs the department's Translational Research Partnership with the Coulter Foundation. He received a B.S.E. in Bioengineering, magna cum laude, from the University of Pennsylvania in 1979 and a Ph.D. in Chemical Engineering from the Massachusetts Institute of Technology in 1985. Prior to joining the faculty at Duke in 1987 he was a Research Fellow in Experimental Pathology, Brigham and Women's Hospital, Harvard Medical School and an Assistant Professor, Department of Chemical Engineering, Tufts University.

Dr. Truskey's research interests are in cardiovascular engineering, tissue engineering, cell-material interactions and cell adhesion. He is the author of over 80 research papers, a textbook entitled Transport Phenomena in Biological Systems, four book chapters, and over 100 research abstracts and presentations. He is a Fellow of the Biomedical Engineering Society (BMES), the American Institute for Medical and Biological Engineering (AIMBE) and a Fellow of the American Heart Association. He has served on review panels for the NIH, NSF, North Carolina Biotechnology Center and the Whitaker Foundation. He has served as a member of the Board of Directors of the BMES and AIMBE and is currently president of BMES. He has consulted for a number of medical device companies and start-ups. His research has been funded by NIH, NSF, NASA, the Whitaker Foundation, the American Heart Association and Medtronic Corporation.



**David Odde** received his bachelor's degree in Chemical Engineering from the University of Minnesota in 1988, and master's and doctorate degrees in Chemical & Biochemical Engineering from Rutgers, the State University of New Jersey in 1992 and 1995, respectively. His expertise is in the area of cellular engineering, and specific research interests are in the area of cell growth and division, especially in understanding the role of mechanical forces and the cytoskeleton in these processes. Dr. Odde has served on the faculties of Michigan Technological University (1995-1999) and the University of Minnesota (1999-present), and has helped establish bachelor degree programs in Biomedical Engineering at both institutions.

He was recently elected a Fellow of the American Institute for Medical and Biological Engineering (AIMBE), and serves as Co-Editor-In-Chief of the journal Cellular and Molecular Bioengineering, an official publication of the Biomedical Engineering Society. He currently holds the rank of full professor in the Department of Biomedical Engineering at the University of Minnesota, where he also currently serves as Director of Undergraduate Studies.

Dr. Odde was the recipient of a National Science Foundation Career Award, a McKnight Land-Grant Professorship, the Institute of Technology Student Board Award as Outstanding Professor in Biomedical Engineering, and has held the James and Lorna Mack Endowed Chair in Cellular and Molecular Bioengineering at Michigan Tech.



**Dr. Isaiah J. Fidler**, a native of Jerusalem, Israel, earned his veterinary medicine degree in 1963 from Oklahoma State University, and his doctorate in human pathology from the University of Pennsylvania School of Medicine in 1970. After serving as an Assistant and then Associate Professor of Pathology at the University of Pennsylvania, Dr. Fidler was named head of the Biology of Metastasis Section at the NCI's Frederick Cancer Research Facility in Maryland in 1975. In 1983, Dr. Fidler joined the University of Texas M. D. Anderson Cancer Center as Professor and Chairman, Department of Cancer Biology; and in 1998, he was named Director of the Cancer Metastasis Research Center. In June, 2008, Dr. Fidler retired as Department Chair, but continues as Director of the CMRC.

Research in Dr. Fidler's laboratory is focused on the biology and therapy of cancer metastasis, angiogenesis, and the pathogenesis of brain metastasis.

Dr. Fidler is the past President of the American Association for Cancer Research and the International Society of Differentiation. He has authored or co-authored more than 795 scientific publications. Throughout his career, Dr. Fidler has been honored and recognized for his pioneering work in the field of metastasis, receiving prestigious awards from national and international organizations.

Dr. Fidler is the R. E. "Bob" Smith Distinguished Chair in Cell Biology, Professor, Departments of Cancer Biology and Urology, and Director, Cancer Metastasis Research Center, The University of Texas M. D. Anderson Cancer Center, in Houston, Texas.



**Lola M Reid** was born and raised in North Carolina and obtained a PhD from UNC in 1974 in neuroendocrinology. From 1974-1977, she did postdoctoral studies at the University of California in San Diego (UCSD) with Gordon Sato in cell biology and with John Holland in virology. She also did short training stints in genetics with Kenneth Paigen at Jackson Laboratories and in cell biology with Francois Jacob at the Pasteur Institute in Paris. She started her faculty career in September, 1977 at the Albert Einstein College of Medicine in the Departments of Molecular Pharmacology and in Microbiology and Immunology. Her early career was focused on natural killer (NK) cells in their regulation of tumors, on extracellular matrix molecules regulating growth and differentiation of epithelia, and on rodent hepatic progenitors. She was at Einstein until January, 1995 at which time she and her family moved to North Carolina in order for her husband to accept an executive position in biotechnology in the Research Triangle Park, NC.

Dr. Reid transferred to the faculty of the UNC School of Medicine and was hired as a full professor in the Departments of Cell and Molecular Physiology and Biomedical Engineering. The move enabled her to make many new contacts and collaborations in her research and also offered opportunities to interface with industry. In the spring of 1995, she formed a company, Renaissance Cell Technologies, focused on translating her lab's technologies in matrix biology and in liver stem cell biology to commercial and clinical programs. It was financed in 1997 and then purchased outright in 2001 by Incara Pharmaceuticals. In 2003 Incara sold the liver program to Toucan Capital, a venture firm; it was renamed Vesta Therapeutics that currently is financing clinical trials of liver cell therapies in India and elsewhere. The focus of her lab since moving to North Carolina has been on human hepatic stem cell and maturational lineage biology and most recently on other forms of endodermal stem cells. In 2008 she was given an adjunct professorship at the Wake Forest Institute of Regenerative Medicine (Winston Salem, NC).



**Jed C. Macosko**, an assistant professor of physics at Wake Forest University, graduated MIT with the Merck award for outstanding scholarship and earned a Ph.D. at the University of California, Berkeley in 1999. He was an assistant professor at Wheaton College (Illinois) and then returned to Berkeley after winning an NIH postdoctoral fellowship in the laboratory of Carlos Bustamante. His research on molecular machinery continued as an adjunct assistant professor working with David Keller at the University of New Mexico in 2003 and 2004.

Since August of 2004 the Macosko Lab at Wake Forest has used novel, NIH-funded microscopy techniques to study cellular transport machinery, and has developed and patented a new drug discovery platform. Most recently Macosko has won two educational grants for explaining molecular machines to children. The first grant from the MacArthur Foundation funds a video game called "CellCraft" in which players can build their own cell as if it was a city in the classic game SimCity. The second grant funds a 3-minute long Pixar-quality computer animated music video that chronicles the High School Musical inspired love story between two BioBotz: a rough-and-tumble molecular machine named Kenny Kinesin and a beautiful-but-sheltered strand of DNA named DeeNA. Macosko hopes that these two projects and his talented collaborators can help open up a new world of educational entertainment, just as the launch of Sputnik in 1957 ushered in a new wave of film, television, and games that captured kids' imagination about outer space.

## WELCOME RECEPTION INVITED SPEAKER



**Stuart Hameroff**, Stuart Hameroff MD is Professor of Anesthesiology and Psychology, and Director of the Center for Consciousness Studies at the University of Arizona in Tucson, Arizona. In medical school in the early 1970s, Hameroff became interested in microtubules, protein structures which organize mitosis and other intra-cellular activities. Struck by their lattice structure and seeming intelligence, Hameroff and colleagues in the 1980s developed a theory of microtubules as information processing devices – as self-organizing molecular automata. In 1987 he authored *Ultimate Computing: Biomolecular Consciousness and Nanotechnology*, a survey of microtubule capabilities and potentials. Coming to doubt computation *per se* could solve the problem of conscious experience, in the early 1990s Hameroff teamed with Sir Roger Penrose to develop the controversial Penrose-Hameroff "Orch OR" model of consciousness based on quantum computation in microtubules within neurons, a notion bolstered by recent discoveries of quantum coherence in warm biology, as well as megahertz coherence and ballistic conductance in microtubules. In 2004 Hameroff proposed that normal mitosis and differentiation (and avoidance of malignancy) depended on quantum optical properties of centrioles and microtubules. More recently, Hameroff developed the 'conscious pilot', a theory supportive of Orch OR involving spatiotemporal envelopes of dendritic synchrony moving through the brain as a conscious agent, and is collaborating on a molecular model of memory involving microtubules and CaMKII. A full-time clinical anesthesiologist, Hameroff also organizes the well-known interdisciplinary conferences 'Toward a Science of Consciousness'. His research website is [www.quantumconsciousness.org](http://www.quantumconsciousness.org)

## GALA DINNER INVITED SPEAKER



**Martin Bojowald**, a faculty member of the Institute for Gravitation and the Cosmos at The Pennsylvania State University, is a leading researcher on the implications of quantum gravity for cosmology. After having received his physics PhD in 2000 at the University of Aachen, Germany, he has worked as a postdoc at Penn State and at the Albert-Einstein-Institute (AEI) in Potsdam, Germany, then joined the faculty of Penn State's Department of Physics in 2006. In these years, he has pioneered the application of one approach, loop quantum gravity, to cosmological questions, showing in the process how quantum effects can resolve the big bang singularity. His current work focuses on potentially observable effects of quantum gravity in the very early universe. For his work, he has received the First Award of the Gravity Research Foundation Essay Competition in 2003, the Xanthopoulos Prize of the International Society for General Relativity and Gravitation in 2007, an NSF CAREER Award in 2008, and a Teaching Award from the Penn State Society of Physics Students in 2009. Outside physics, he enjoys reading classical literature and long-distance running in the Appalachian Mountains of central Pennsylvania.

## **WORKSHOP INVITED SPEAKERS**

**Mark H. Lee** is a product reviewer at the Office of Cellular, Tissue and Gene Therapy (OCTGT) in FDA's Center for Biologics Evaluation and Research (CBER). He received his Ph.D. in Bioengineering from the University of Pennsylvania in 2005 and completed a post-doctoral fellowship in Matrix/Integrin Biology at the Institute of Medicine and Engineering of the University of Pennsylvania prior to joining the FDA in 2008. He also holds an M.S. in Polymer Science from the University of Connecticut Polymer Program (2000). His scientific expertise includes biomaterial design and characterization, physical/chemical interactions at the cell-material/cell-matrix interface and tissue engineering/regenerative medicine. As a part of OCTGT, he has extensive experience reviewing the chemistry, manufacturing and controls (CMC) for biologic, medical device and combination products regulated through the investigational device exemption (IDE) and investigational new drug (IND) application process.

**Jean D. Sipe** is from the National Institutes of Health (NIH), Division of Translational and Clinical Sciences, Center for Scientific Review. She is a Scientific Review Officer for the Musculoskeletal Oral and Skin Sciences (MOSS) and Musculoskeletal Tissue Engineering (MTE) study sections.

**Andrea L. Slade** received her Ph.D. in Biochemistry / Biomedical Engineering in 2004 from the University of Toronto, Canada. Under the supervision of Prof. Christopher M. Yip, Andrea's graduate work focused on the integration of optical microscopy and spectroscopy with AFM and applying these combined techniques to the study of biological membranes and membrane proteins. Andrea continued this work in her Post Doctorate position at Sandia National Laboratories, Albuquerque, using AFM to study biological toxins for biosensor development. Over the past 4 years at Veeco, Andrea has held the position of Life Science Applications Scientist and has worked closely with our Customers, as well as Veeco's own Engineering, Sales Applications and Customer Service teams in the development and education of AFM in biological research. Andrea has 11 years experience in AFM with 12 peer-reviewed publications, as well as numerous seminars and presentations given worldwide.

**SCIENTIFIC CONFERENCE PROGRAM  
JANUARY 13-16, 2010**

**WEDNESDAY, JANUARY 13, 2010**

- 7:00 AM Continental Breakfast, Tucson Ballroom E, JW Marriott Starr Pass
- 7:45 AM **Welcome/Introduction**  
Program Chair: Anshu B. Mathur PhD, The University of Texas, M. D. Anderson Cancer Center  
Program Co-Chair: Charles E. Butler MD, The University of Texas, M. D. Anderson Cancer Center
- 8:00-10:35 AM SESSION I – REPAIR AND REGENERATION**  
(Moderator: Kristin T Campbell MD and Vishal Gupta PhD)
- 8:00 AM KEYNOTE SPEAKER: Brian Harfe PhD** (University of Florida, Gainesville)  
**The Notochord: Back Pain, Stem Cells, and Cancer**
- 8:45–9:15 AM **Properties of bioprosthesis mesh effect outcomes of abdominal wall reconstructions**  
Charles E. Butler, *The University of Texas M. D. Anderson Cancer Center.*
- 9:15–9:35 AM **The use of a specific pulsed electromagnetic field (PEMF) in treating early knee osteoarthritis**  
Fred R Nelson, R Zvirbulis, AA Pilla, *Henry Ford Hospital and Columbia University.*
- 9:35–9:55 AM **The effect of static and dynamic loading on energy metabolism of annulus fibrosus cells**  
Hanan Fernando, J. Czamanski; T-Y Yuan, WY Gu, C-YC Huang, *University of Miami.*
- 9:55–10:15 AM **Non-crosslinked porcine acellular dermal matrix versus human acellular dermal matrix: Fibrovascular remodeling and mechanical repair strength**  
Kristin Turza Campbell, NK Burns, CN Rios, AB Mathur, CE Butler, *The University of Texas M. D. Anderson Cancer Center.*
- 10:15–10:35 AM **Silk fibroin and chitosan scaffold for tracheal cartilage tissue engineering**  
Mengqing Zang, Q Zhang, GL Davis, M Jaffari, CN Rios, V Gupta, AB. Mathur, P Yu, *The University of Texas M. D. Anderson Cancer Center.*
- 10:35-10:45 AM Coffee Break
- 10:45-1:20 PM SESSION II – BIOMATERIALS AND REGENERATIVE TISSUE ENGINEERING**  
(Moderator: Charles E. Butler MD and Roman J. Skoracki MD)
- 10:45 AM **KEYNOTE SPEAKER: John Harper PhD** (LifeCell Corp.)  
**Biological Scaffolds in Reconstructive Surgery**
- 11:30–12:00 PM **Rotator cuff repair using the covidien collagen repair patch: The scientific evidence.**  
Nilay Mukherjee, *Covidien.*
- 12:00–12:20 PM **Agarose and poly(ethyleneglycol) interpenetrating network hydrogels for cartilage tissue engineering**  
Brandon J. DeKosky, NH Dormer, CH Roatch, MS Detamore and SH Gehrke, *University of Kansas.*

- 12:20–12:40 PM **Future biocompatibility screening methods for dental materials**  
Peter E Murray and F Garcia-Godoy, *Nova Southeastern University and University of Tennessee.*
- 12:40–1:00 PM **The immunomodulatory effect of cryopreservation in rat tracheal allotransplantation**  
Qixu Zhang, M Zang, J Gao, G Zhou, AB Mathur, GL Robb, P Yu, *The University of Texas M.D. Anderson Cancer Center and Peking Union Medical College.*
- 1:00–1:20 PM **Novel colloidal gels as tissue engineering scaffolds**  
Sayed A Jamal, Q Wang, C Berkland, MS Detamore, *University of Kansas.*
- 1:20–2:30 PM Afternoon Break
- 2:30-3:30 PM NIH Workshop**, Tucson Ballroom E, JW Marriott Starr Pass  
Jean Sipe PhD, National Institutes of Health, NIH/NIAMS, NIH Granting Process
- 3:30- 4:30 PM FDA Workshop**, Tucson Ballroom E, JW Marriott Starr Pass  
**Regulation of Tissue Engineered and Regenerative Medicine Products**  
**Mark H. Lee, PhD, FDA/Center for Biologics Evaluation and Research**  
Office of Cellular, Tissue and Gene Therapies, Division of Cellular and Gene Therapies
- 6:00 PM WELCOME RECEPTION**, San Luis Room, 3<sup>rd</sup> Floor, JW Marriott Starr Pass  
**SPECIAL INVITED SPEAKER: Stuart Hameroff, MD, University of Arizona**  
**Microtubules and Centrioles: Biological Quantum Computers and Optical Devices**  
**Regulating Cell Function?**

### THURSDAY, JANUARY 14, 2010

- 7:15 AM Continental Breakfast, Tucson Ballroom E, JW Marriott Starr Pass
- 8:00-10:40 AM SESSION III – MOLECULAR CELL ENGINEERING**  
(Moderator: X. Edward Guo PhD, Columbia University)
- 8:00 AM KEYNOTE SPEAKER: George A. Truskey PhD** (Duke University)  
**Effect of Mechanical Stimulation on microRNA Expression in Skeletal Muscle Myoblasts**
- 9:00-9:20 AM **Matrix synthesis and cellular deformations in fibrous engineered heart valve scaffolds**  
John A. Stella, NJ Amoroso, JE Mayer, Jr., WR Wagner, MS Sacks, *University of Pittsburgh and Children's Hospital of Boston.*
- 9:20-9:40 AM ***In vitro* osteogenic differentiation of GNAS1 siRNA transfected mesenchymal stem cells**  
Carmen N Ríos, V Gupta, M Aliru, RJ Skoracki, AB Mathur, *The University of Texas M. D. Anderson Cancer Center, Rice University.*
- 9:40-10:00 AM **Oscillatory shear stresses promote engineered heart valve tissue development *in-vitro***  
Sharan Ramaswamy, D Gottlieb, GC Engelmayer Jr., E Aikawa, JE Mayer Jr., MS Sacks  
*University of Pittsburgh, Children's Hospital Boston, Penn State University, Massachusetts General Hospital Harvard Medical School.*
- 10:00-10:20 AM **Mechanotransduction in osteoblasts: The role of phosphorylation in focal adhesion kinase mediated response to fluid shear stress**

Jennifer T Blundo, AB Castillo, HG Lee, S Kumar, NR Yereddi, CR Jacobs, *Columbia University and Stanford University*.

- 10:20–10:40 AM **Differential gene expression and ECM organization in the aortic and pulmonary valves**  
Chris A Carruthers, CM Alfieri, KE Yutzey, and MS Sacks, *University of Pittsburgh and Cincinnati Children's Medical Center*.
- 10:40-11:00 AM Coffee Break
- 11:00-1:20 PM SESSION IV– CELLULAR AND MOLECULAR MECHANICS**  
(Moderator: Kenith Meissner PhD, Texas A&M University)
- 11:00 AM KEYNOTE SPEAKER: David Odde PhD** (University of Minnesota)  
**What's Your Sleep Number? Cellular Sensing of Environmental Mechanical Stiffness**
- 12:00-12:20 PM **Acoustic mechanotransduction on osteoblasts and in vivo remodeling**  
Y-X. Qin, S. Zhang, S. Ferreri, J. Cheng, *Stony Brook University*.
- 12:20-12:40 PM **Determining the mechanisms of primary cilia bending in response to fluid shear stress**  
David A. Hoey, J Geraedts, CR. Jacobs, *Columbia University*.
- 12:40-1:00 PM **Activation of NF- $\kappa$ B by fluid shear stress, but not TNF- $\alpha$ , requires focal adhesion kinase in osteoblasts**  
Suzanne R.L. Young, R Gerard-O'Riley, M Harrington, FM Pavalko, *Indiana University School of Medicine*.
- 1:00-1:20 PM **Dynamic, pseudo-3D tracking of osteocytes whole-cell and actin/microtubule network deformation under flow**  
Andrew D. Baik, XL Lu, EM Hillman, C Dong, X Edward Guo, *Columbia University and Penn State University*.
- 1:20-2:45 PM Afternoon Break
- 2:45 PM Board Bus to Kitt Peak National Observatory Tohono O'Odham Reservation near Tucson, AZ, for the Gala Dinner.
- 5:00-9:30 PM GALA DINNER**  
Kitt Peak National Observatory, Tohono O'Odham Reservation near Tucson, AZ
- SPECIAL INVITED SPEAKER: Martin Bojowald PhD, Penn State University**  
**What Happened Before the Big Bang?**

## **FRIDAY, JANUARY 15, 2010**

- 7:15 AM Continental Breakfast, Tucson Ballroom E, JW Marriott Starr Pass
- 8:00-11:00 AM** **SESSION V – CANCER THERAPY AND CELL-CELL INTERACTIONS**  
(Moderator: Anshu B. Mathur PhD, The University of Texas M. D. Anderson Cancer Center and Peter Murray PhD, Nova Southeastern University)
- 8:00 AM** **KEYNOTE SPEAKER: Isaiah J. Fidler PhD** (The University of Texas M. D. Anderson Cancer Center)  
**The Biology and Therapy of Brain Metastasis**
- 9:00-9:20 AM **The effects of *in vivo* mechanical forces on morphology, proliferation, and protein expression of lung cancer cells**  
Sarah Schmitt, PJ Morales, P Hendricks, G .Vielhauer, GS Sittampalam, VS Nirmalanandhan, *The University of Kansas and The University of Kansas Medical Center.*
- 9:20-9:40 AM **Drug loaded silk fibroin-chitosan scaffold composite for tissue regeneration and cancer therapy**  
Vishal Gupta, G-H Mun, B Choi, M Lopez, A Aseh, A Patel, Q Zhang, D Chang, GL Robb, AB Mathur, *The University of Texas M. D. Anderson Cancer Center.*
- 9:40-10:00 AM **Differentiation of mesenchymal stem cells into vascular lineages under biomimetic vascular environments**  
SW Lee, JY Jang, JY Jeong, JY Han, SH Park, SH Kim, JW Shin, *Inje University.*
- 10:00-10:20 AM **The effects of intermittent hydrostatic pressure on the differentiation of mesenchymal stem cells co-cultured with chondrocytes in alginate beads**  
DH Kim, SJ Heo, YG Kang, SH Kim, JW Shin, SH Park, JY Han, JW Shin, *Inje University.*
- 10:20-10:40 AM **Normal cell function from high information pathways**  
RA Gatenby and BR Frieden, *Moffitt Cancer Center, University of Arizona.*
- 10:40-11:00 AM **Simulation of *in vivo* mechanical forces for *in vitro* screening of lung cancer drugs.**  
Peter Hendricks, S. Schmitt, G. Vielhauer, GS Sittampalam, VS Nirmalanandhan, *The University of Kansas Medical Center, The University of Kansas.*
- 11:00-11:20 AM Coffee Break
- 11:20-1:40 PM** **SESSION VI – STEM CELLS AND DIFFERENTIATION**  
(Moderator: James H-C Wang PhD, University of Pittsburg and Fredrick Pavalko PhD, Indiana University School of Medicine)
- 11:20 AM** **KEYNOTE SPEAKER: Lola Reid PhD** (University of North Carolina at Chapel Hill, UNC School of Medicine)  
**Stem Cells and Maturation Lineage Biology in Livers**
- 12:20-12:40 PM **Mechanical stretching regulates self-renewal of tendon stem cells in a stretching magnitude-dependent manner**  
Jianying Zhang and James H.-C. Wang, *University of Pittsburg.*
- 12:40-1:00 PM **Enhanced osteogenic differentiation of human mesenchymal stem cells in peptide hydrogel via periodic heat shock**

J Chen and S Wang, *City University of New York/City College*.

- 1:00-1:20 PM **Platelet-rich plasma induces differentiation of tendon stem cells into active tenocytes.**  
Jianying Zhang and James H.-C. Wang, *University of Pittsburg*.
- 1:20-1:40 PM **The effects of mechanical straining and substrate surface morphologies on differentiation of mesenchymal stem cells without biochemical reagents**  
JY Jang, SW Lee, SH Park, JW Shin, JY Jeong, DH Kim, JY Han, JW Shin, *Inje University*.
- 2:30-4:00 PM AFM Workshop**, (Tucson Ballroom E, JW Marriott Starr Pass)  
Steve Minne PhD, Senior Director Applications Development & Training, Veeco Instruments.
- 4:00-6:00 PM POSTER SESSION** (Tucson Ballroom E, JW Marriott Starr Pass)

**SATURDAY, JANUARY 16, 2010**

- 7:15 AM Continental Breakfast, Tucson Ballroom E, JW Marriott Starr Pass
- 8:00-10:00 AM SESSION VII – SINGLE MOLECULE BIOPHYSICS**  
(Moderator: Christopher Jacobs PhD, Columbia University)
- 8:00 AM KEYNOTE SPEAKER: Jed Macosko PhD** (Wake Forest University)  
**The Future of Single-Molecule Research and Drug Discovery: A Physicist's Point of View**
- 9:00-9:20 AM **Nmp4/CIZ inhibits mechanically-induced  $\beta$ -catenin signaling activity in osteoblasts**  
Z Yang, JP Bidwell, SLR Young, R Gerard-O'Riley, H Wang, FM Pavalko, *Indiana University School of Medicine and Northwestern Polytechnical University, China*.
- 9:20-9:40 AM **Combining AFM and FRET for studies at the cellular level**  
Kenith E. Meissner, Z Sun, A Juriani and GA Meininger, *Texas A&M University and University of Missouri*.
- 9:40-10:00 AM **The effects of fluid flow on the expressions of intracellular calcium in MG-63**  
SH Park, SH Kim, JW Shin, DH Kim, SW Lee, JY Jang, JY Jeong, JY Han, JW Shin, *Inje University*.
- 10:00-10:30 AM Break
- 10:30 AM Annual Business Meeting and Awards Ceremony**

## **ANNUAL BUSINESS MEETING AND AWARDS CEREMONY**

**PRESIDENT'S REPORT: Franklin-Garcia Godoy, DDS MS**

**SECRETARY/TREASURER REPORT: Kent Hoffman**

**IWAO YASUDA AWARD:** The Society annually seeks to present the Iwao Yasuda Award to an individual who has made an excellent contribution to the field of biomedical research, based upon current research achievements in the area of physical regulation in biology and medicine. The award selection process is based upon an evaluation of abstracts and presentations at the scientific conference.

**NEW CLINICAL INVESTIGATOR AWARD:** The Society annually seeks to present the New Clinical Investigator Award to a clinically trained individual (M.D., D.D.S., D.M.D., D.V.M.) who had made an excellent contribution to the field of biomedical research, based upon current achievements in the area of biological effects of physical interaction and related physiology. The research may be in a clinical or basic science area. The award selection process is based upon an evaluation of abstracts and presentations at the scientific conference. In order to be considered for the Iwao Yasuda or New Clinical Investigator Awards, abstracts must be of the highest quality, substantially describing completed work of scientific significance. Abstracts must include Introduction, Materials and Methods, Results and Discussion sections with sufficient detail, including statistical analysis, to allow the Program Committee to evaluate the scientific quality of the work. In addition, presentation must be clear, focused, and must adhere to the Program Committee's guidelines for length.

**BEST PRESENTATION AWARD:** Awards are presented in both Graduate Student and Postdoctoral Fellow categories.

**ELECTIONS: Christopher Jacobs**

### **WELCOME RECEPTION**

SPRBM will host a Welcome Reception for all the attendees on Wednesday, January 13, 2010 at 6:00 pm in San Luis Room, 3<sup>rd</sup> Floor, JW Marriott Starr Pass Resort.

### **GALA DINNER**

SPRBM will host the Gala Dinner for all attendees on Thursday, January 14, 2010 at 5:00 pm at Kitt Peak National Observatory Tohono O'Odham Reservation near Tucson, AZ. The Bus to Kitt Peak National Observatory will begin boarding at 2:45 pm.

**POSTER SESSION**  
**January 15, 2010, 4:00 pm – 6:00 pm**

EXPRESSION AND LOCALIZATION OF FOCAL ADHESION-ASSOCIATED PROTEINS IN OSTEOBLASTS AND OSTEOCYTES IN RESPONSE TO OSCILLATORY FLUID FLOW

JT Blundo, NR Yereddi, S Kumar, CR Jacobs  
*Columbia University and Stanford University*

MECHANICAL STRETCHING OF ADIPOSE DERIVED STROMAL CELLS CAUSES CELL ALIGNMENT

DA Gonzales, CP Geffre, GV Orsinger, JM Watson, AM Urbina, MK Wanat, JA Szivek  
*University of Arizona*

GRAFTS OF HUMAN HEPATIC STEM CELLS (hHpSCs) in HYALURONAN HYDROGELS FOR USE IN LIVER THERAPIES

RA.Turner, WS. Turner, GL Mendel, EWauthier, L Samuleson, D Gerber, LM. Reid  
*UNC School of Medicine*

EFFECTS OF POLYMER SCAFFOLDING AND EXTRACELLULAR MATRIX PROTEINS ON MUSCLE SATELLITE CELL DIFFERENTIATION

W Pavalko, A Angione, J Li, R Shi, S Kuang  
*Purdue University*

THE EFFECTS OF TGF- $\beta$ 1 AND CULTURE MEDIUM ON DIFFERENTIATION OF HUMAN MESENCHYMAL STEM CELLS INTO CARDIOMYOCYTES

JW Shin, NR Kim, SH Park, JY Jang, DH Kim, SJ Heo, JY Han, YG Kang, SH Kim, JW Shin  
*Inje University, Korea*

MECHANICAL REGULATION OF Wnt/ $\beta$ -CATENIN SIGNALING IN BONE CELLS

JM Hum, SRL Young, R Gerard-O'Riley, FM Pavalko  
*Indiana University School of Medicine*

HUMAN ADIPOSE DERIVED STEM CELLS ON COLLAGEN-CHITOSAN SCAFFOLDS WITH PLGA-ENCAPSULATED-VEGF FOR SOFT TISSUE REPAIR

GL Davis, K Turza Campbell, V Gupta, A Mathur, E Beahm  
*The University of Texas M. D. Anderson Cancer Center*

THE EFFECTS OF PDMS SURFACE PATTERN ON DIFFERENTIATION AND PROLIFERATION OF MSCs UNDER INTERMITTENT HYDROSTATIC PRESSURE

JY Jeong, SW Lee, JY Jang, DH Kim, SH Park, JW Shin, JY Han, JW Shin  
*Inje University, Korea*

SILK FIBROIN DERIVED CURCUMIN NANOPARTICLES FOR CANCER TREATMENT

R Baeza, A Aseh, V Gupta, AB Mathur  
*The University of Texas M. D. Anderson Cancer Center*

THE EFFECT OF STATIC AND DYNAMIC LOADING ON ENERGY METABOLISM OF ANNULUS FIBROSUS CELLS

Fernando Hanan, J. Czamanski; T-Y Yuan, WY Gu, C-YC Huang  
*University of Miami*