2002 NASA CELL SCIENCE CONFERENCE

- Annual Investigators Working Group Meeting -

February 26 - 28, 2002

Hyatt Rickeys
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Sponsored by the Cellular Biotechnology Program, NASA Johnson Space Center (JSC), and the Fundamental Biology Program, NASA Ames Research Center (ARC), in cooperation with the Physical Sciences Division and the Fundamental Space Biology Division of the Office of Biological and Physical Research, NASA Headquarters.

Program Overview

Monday, February 25	**Tuesday, February 26**	**Wednesday, February 27**	**Thursday, February 28**
	Registration & Continental Breakfast 7:30 - 8:30 am	Registration & Continental Breakfast 7:30 - 8:00 am	Continental Breakfast 7:30 - 8:30 am
	Session 1: Opening remarks, **Tissue Modeling I** 8:30 - 10:00 am	Session 5: **Proliferation & Differentiation** 8:00 - 9:45 am	Session 8: **Cell Movement/ Cytoskeleton** 8:30 - 10:00 am
	Session 2: **Tissue Modeling II** 10:15 am - 11:45 pm	Session 6: **Biological Responses to Physical Forces** 10:00 am - 12:00 pm	Session 9: **Gene Expression/** Closing 10:15 am - 11:45 pm
	Lunch 11:45 - 1:00 pm	Lunch 12:00 - 1:15 pm	Lunch 11:45 - 1:00 pm
	Session 3: ARC Remarks, **Immunology** 1:00 – 3:15 pm	Session 7: **Cell Culture Technology** 1:15 – 3:30 pm	Tour of Ames Research Center 1:00 – 4:00 pm
	Session 4: **Models in Lower Organisms** 3:30 – 5:00 pm	**Business Meeting** 4:00 – 5:00 pm	
	Exhibit/Social 5:30 - 7:00 pm	Fundamental Space Biology **Grantsmanship** 5:00 – 6:00 pm	
Registration 7:00 - 9:00 pm	**Plenary Lecture & Dinner** 7:00 - 9:00 pm		

February 26 – Tuesday

8:30 - 8:45 am Welcome & Introductions

Session 1: Tissue Modeling I 8:45 - 10:00 am
Co-chairs: N.D. Searby and K.C. O'Connor

8:45 – 9:00 am
K.C. O'Connor, R.M. Enmon, D.J. Lacks and D.K. Schwartz
Tulane University and Medical School, New Orleans, LA
Spheroid Self-Assembly of Well and Poorly Differentiated Prostate Cancer Cells

9:00 – 9: 15 am
L.E. Freed and G. Vunjak-Novakovic
Division of Health Sciences and Technology, M.I.T. Cambridge, MA
Cartilage Tissue Engineering: Interactive Use of Regulatory Factors, Biomaterial Scaffolds, and Bioreactors

9:15 – 9:30 am
G. Vunjak-Novakovic and L.E. Freed
Division of Health Sciences and Technology, M.I.T. Cambridge, MA
Cardiac Tissue Engineering: Modulation of Tissue Properties by Local Environmental Conditions

9:30 – 9:45 am
Q. Liu, T. Yin and P.W. Zandstra
Institute of Biomaterials and Biomedical Engineering, University of Toronto, Canada
Production of Cardiomyocytes from Embryonic Stem Cells in a Suspension Culture System

9:45 – 10:00 am
V. Chopra[1], E.V. Hannigan[1] and N.R. Pellis[2]
[1]Department of Ob-Gyn, UTMB, Galveston, and [2]Cellular Biotechnology Program, NASA JSC, Houston, TX
A Ground-Based Model to Study the Effect of Analogue Microgravity Environment on Cellular Responses

10:00-10:15 am Break

Session 2: Tissue Modeling II 10:15-11:45 pm
Co-chairs: J.M. Jessup and H. Vandenburgh

10:15 – 10:30 am
J.M. Jessup and K. Krueger
University of Texas Health Science Center, San Antonio, TX, and Georgetown University Medical Center, Washington, D.C.
Rotating Wall Vessel (RWV) Models the Role of Ischemia-Reperfusion in Liver Metastasis by Colorectal Carcinoma (CRC)

10:30 – 10:45 am
W.M. Saltzman, M.J. Mahoney and E.G. Habisch
School of Chemical Engineering, Cornell University, Ithaca, NY
Transplantable Tissues Assembled Around Programmable, Synthetic Microenvironments: Cell Assembly in Bioreactors and Function in the Brain

10:45 – 11:00 am
L. Rutzky[1], S. Bilinski[2], M. Kloc[1], T. Phan[1], H. Zhang[1], S. Katz[1] and S. Stepkowski[1]
[1]Department of Surgery, The University of Texas Medical School, Houston, TX, and [2]Institute of Zoology, The Jagiellonian University, Crakow, Poland
Effect of Simulated Microgravity Conditions on Mouse Pancreatic Islets

11:00 – 11:15 am **H. Vandenburgh[1,2], P. Lee[1], B. Creswick[1] and P. Kosnik[1,2]**
[1]Department of Pathology, Brown University School of Medicine, The Miriam Hospital, and [2]Cell Based Delivery, Inc. Providence, RI
Tissue Engineered Skeletal Muscle Atrophy in a Ground-Based Model

11:15 – 11:30 am **P.I. Lelkes[1] and B. R. Unsworth[2]**
[1]Drexel University, Philadelphia PA, and [2]Marquette University, Milwaukee, WI
Engineering Functional Neuroendocrine Tissue in Rotating Wall Vessel (RWV) Bioreactors

11:30 – 11:45 pm **S. Saporta[1,2], A.E. Willing[1,2], J. Hushen[2], L. Colina[1] and D. F. Cameron[1]**
Departments of Anatomy[1] and Neurosurgery[2], University of South Florida College of Medicine, Tampa, FL
Development of Sertoli-Neuron-Aggregated Cell (SNAC) Tissue Constructs for Parkinson's Disease Transplantation Therapy – Initial Observations

11:45-1:00 pm Lunch

1:00 – 1:15 ARC Remarks, Scott Hubbard

Session 3: Immunology 1:15 – 3:00 pm
Co-chairs: N.R. Pellis and M. Hughes-Fulford

1:15 – 1:30 pm **S.K. Dey**
Eastern Illinois University
Computational Modelling of the Immune System with Applications to Breast Cancer

1:30 – 1:45 pm **W. Fitzgerald[1,2], S. Chen[1,2], J-C Grivel[2], L. Margolis[2] and J. Zimmerberg[2]**
[1]Wyle Laboratories, Houston, TX, [2]NASA/NIH Center for Three Dimensional Tissue Culture, LCMB, NICHD, Bethesda, MD
Lymphocyte Responses in Modeled and True Microgravity

1:45 – 2:00 pm **B.W. McIntyre, S.A. Lopez and J.S. Mitchell**
Department of Immunology, University of Texas M.D. Anderson Cancer Center, Houston, TX
Effects of Simulated Microgravity on Integrin Function in Human Lymphocytes

2:00 – 2:15 pm **A.D. Kulkarni[1], K. Yamauchi[1], G.T. Ramesh[1], A. Sundaresan[2] and N.R. Pellis[3]**
[1]Surgery UTHSC-H, Texas Southern University, [2]Wyle Laboratories and JSC/NASA[3], Houston, TX
Inflammatory and Immunomodulatary Studies in Stimulated Microgravity

2:15 – 2:30 pm **M. Hughes-Fulford[1], E. Sugano[1] and G. Cogoli[2]**
[1]Lab of Cell Growth, UCSF, NCIRE and VAMC, San Francisco, CA and [2]Space Biology, ETH Zurich, Switzerland
Evidence for PKA Regulation of Early T-Cell Activation

2:30 – 2:45 pm **M.A. Morrow**
Department of Biology, SUNY New Paltz, New Paltz, NY
The Effect of Modeled Microgravity on T-Cell Signaling

2:45 – 3:00 pm **M. Nelman-Gonzalez[1], M. Alexander[2] and C.F. Sams[3]**
[1] Wyle Life Sciences, [2]National Research Council, Johnson Space Center, [3] NASA/Johnson Space Center, Houston, TX
Dynamics of Human T-Cell Activation in Cells Maintained in Suspension

3:00 – 3:15 pm **R.K. Globus[1], J-H Yu[1,2], M.L. Delute[1,2] and S.L. Weinstein[2]**
[1]NASA Ames Research Center, Moffett Field, CA, [2]San Francisco State University, San Francisco, CA
Effects of Centrifugation on the Immune Response of Macrophages

3:15– 3:30 pm Break

Session 4: Models in Lower Organisms 3:30 – 4:00 pm
Co-chairs: C. A. Nickerson and B.H. Pyle

3:30 – 3:45 pm **C. A. Nickerson[1], T. Goodwin[2], C. Ott[3], K. Buchanan[1], W. Uicker[1], K. Emami [3], C. LeBlanc[1], R. Ramamurthy[1], J. Wilson[1], M. Clarke[4], C. Vander-burg [5], K. Höner zu Bentrup[1], T. Hammond[1] and D. Pierson[2]**
[1]Tulane University School of Medicine, New Orleans, LA; [2]NASA-JSC, Houston, TX; [3]EASI/Wyle Laboratories, JSC, Houston, TX; [4]Universities Space Research Association, Division of Space Life Sciences, Houston, TX; [5]Massachusetts General Hospital, Boston, MA
Pathogens and Hosts: Role of Microgravity in Modeling Infectious Disease

3:45 – 4:00 pm **J. M. O'Donnell, Z. Wang and K. Lackey**
Dept. of Biological Sciences, University of Alabama, Tuscaloosa, AL
Catecholamine Regulation and Response to Hypergravity in Drosophila Melanogaster

4:00 – 4:15 pm **B.H. Pyle[1], M.A. Juergensmeyer[2], J.T. Lisle[3] and S.C. Broadway[1]**
[1]Dept. of Microbiology, Montana State Univ., Bozeman, MT, [2]Illinois Institute of Technology Research Institute, [3]Lockheed Martin, Houston, TX
Determining Microgravity Effects on Pseudomonas Aeruginosa *Virulence and Physiology*

4:15 – 4:30 pm **A.K. Chopra, D.W. Niesel and V. Chopra**
Departments of Microbiology & Immunology and Obstetrics & Gynecology, UTMB, Galveston, TX
Alteration in Bacterial Virulence and Host Responses in Microgravity

4:30 – 4:45 pm **M.E. Marsh, A.L. Ridall and P.J. Duke**
Univ. Texas Dental Branch, Houston, TX
A Sulfated Galacturonomannan and the Golgi Membrane are Directly Linked to the Shaping of Biogenic Calcite

4:45 – 5:00 pm **P.J. Duke[1], V. Chheda[1], D. Montufar-Solis[1] and M. Marsh[2]**
[1]Departments of Orthodontics and [2]Basic Sciences, Dental Branch, University of Texas Health Science Center at Houston, Houston, TX
Bioconvection and Gravitaxis in the Calcifying Alga Pleurochrysis Carterae

5:30 – 7:00 pm Exhibit/Social
Presentations by Exhibitors will last 2 – 3 minutes each, starting at 6:00 pm

7:00 – 9:00 pm Plenary Lecture & Dinner - Ballroom
Carlo Montemagno
Nanotechnology, Biotechnology and Complexity: Building Blocks for the Fabrication of Hybrid Living/Non-living Devices at the Micro and Nano Scales

February 27 – Wednesday

Session 5: Proliferation & Differentiation 8:00 – 9:45 am
Co-chairs: E. Almeida and A.J. Sytkowski

8:00 – 8:15 am
C. Ontiveros, R. Irwin and L.R. McCabe
Department of Physiology, Michigan State University, East Lansing, MI
Gravitational Force Alters Intracellular Signaling and Gene Transactivation

8:15 – 8:30 am
E. Almeida[1,2], C. Damsky[2] and R. Globus[1,2]
[1]NASA Ames Research Center, Moffett Field, CA and [2]University of California San Francisco, CA
Matrix-Integrin-Kinase Signaling Activation in Response to Gravity Stimulation: Effects on Cell Survival and Cell Proliferation Pathways

8:30 – 8:45 am
P.A. Plett, S.M. Frankovitz and C.M. Orschell-Traycoff
Indiana University School of Medicine, Division of Hematology/Oncology, Indianapolis, IN
Effects of Modeled Microgravity on Cyclins and Migration of Bone Marrow CD34+ Cells

8:45 – 9:00 am
W. Ma[1], K. Shaffer[1], T.J. O'Shaughnessy[1], S. O'Connor[1], J. Kelly[1], D. Maric[2], J.L. Barker[2] and D.A. Stenger[1]
[1]Center for Bio/Molecular Science and Engineering, Naval Research Laboratory, Washington, D.C.; [2]Laboratory of Neurophysiology, National Institute of Neurological Disorders and Stroke, NIH, Bethesda, MD
Stem Cell-Derived Neurogenesis in Three-Dimensional Matrices

9:00 – 9:15 am
A.J. Sytkowski and C. Chen
Laboratory for Cell and Molecular Biology, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA
Erythropoietin Activates Two Distinct Signaling Pathways Required for the Initiation and the Elongation of c-myc

9:15 – 9:30 am
R. S. Nowakowski and N.L. Hayes
Department of Neuroscience and Cell Biology, UMDNJ-Robert Wood Johnson Medical School, Piscataway, NJ
The Effects of Loss of Buoyancy on Cells and Developmental Errors: Methods for Measurements In Vivo

9:30 – 9:45 am
G. Almeida-Porada, D. ElShabrawy, C. Porada and E.D. Zanjani
VAMC, University of Nevada, Reno, NV
Clonally Derived Marrow Stromal Cells Are Able To Differentiate Into Blood, Liver, And Skin Cells

9:45 -10:00 am Break

Session 6: Biological Responses to Physical Forces 10:00 – 12:00 pm
Co-chairs: J. DiRuggiero and R.K. Globus

10:00 – 10:15 am
J.M. Belovich[1], D.L. Feke[2], M. Grossner[2], D. Rusinko[2], Z. Wang[1], and P. Grabenstetter[1]
[1]Cleveland State University, [2]Case Western Reserve University, Cleveland, OH
Retention of Mammalian Cells by Ultrasonic Resonant Fields

10:15 – 10:30 am

J. DiRuggiero, R. Nandakumar and R. Lewis
Dept of Cell Biology and Molecular Genetics, University of Maryland, College Park, MD
Survival of Microorganisms Exposed to Space Vacuum and Extreme UV Radiations

10:30 – 10:45 am

S. Sukharev
Department of Biology, University of Maryland, College Park, MD
A Tension-Induced Gating Transition In the Bacterial Mechanosensitive Channel MscL

10:45 – 11:00 am

P.L. McNeil, R.E. Godt, S.S. Vogel and K. Miyake
Cellular Biology and Anatomy & IMMAG, Medical College of Georgia, Augusta, GA
Surface Tears in Mouse Skeletal Muscle: Lysosomes to the Rescue

11:00 – 11:15 am

D.J. Morré[1], A. Scheeline[3] and D.M. Morré[2]
[1]Medicinal Chemistry, and [2]Foods and Nutrition, Purdue University, Lafayette, IN and [3]Chemistry, University of Illinois, Urbana-Champaign, IL
Studies on the Mechanism of Oscillation of a Gravity-Responsive, Time-Keeping Protein of the Animal and Plant Cell Surface Consistent with Conservation of Energy

11:15 – 11:30 am

R.K. Globus[1,2], C. Damsky[2], T. J. Wronski[3,] Amblard[1,2], Y. Nishimura[1,2] and M. vd Meulen[4]
[1]NASA Ames Research Center, Moffett Field, CA, [2]University of California, San Francisco, CA, [3]University of Florida, Gainesville, FL, [4]Cornell University, Ithaca, NY
Hindlimb Unloading of Transgenic Mice: In Vivo Model to Test the Physiological Significance of Mechanotransduction via Integrins

11:30 – 11:45 pm

F.D. Sack, V. Kern and J. Schwuchow
Dept. Plant Biology, Ohio State Univ., Columbus, OH
Statolith-Based Sensing in the Gravitropic Control of Moss Tip Growth

11:45 – 12:00 pm

J. Kizito[1], E. Nelson[2], F.Donovan[3], N. Searby[4], I. Alexander[1], M. Nall[2], and D. Vandendriesche[4]
[1]National Center for Microgravity Research for Fluids and Combustion and [2]NASA Glenn Research Center, Cleveland, OH; [3]Lockheed Martin and [4]NASA Ames Research Center, Moffett Field, CA
Uncoupling Mass Transport Issues from the Decrease of Forces on Cells in Microgravity: Predicting the Mass Transport and Forces on Cells in a Perfused and Stirred Culture System

12:00 – 1:15 pm Lunch

Session 7: Cell Culture Technology 1:15– 3:30 pm
Co-chairs: D.W. Murhammer and J. W. Hines

1:15 – 1:30 pm

F. G. Gao[1], A. S. Jeevarajan[1], J. M. Fay[1] and M. M. Anderson[2]
[1]Wyle Life Sciences, Houston, TX; [2]Cellular Biotechnology Program, NASA JSC, Houston, TX
Performance of an Optical Oxygen Sensor in Perfused Rotating Wall Bioreactors

1:30 – 1:45 pm

D.W. Murhammer[1], M.A. Arnold[2] and M.B. Cohen[3]
Departments of Chemical and Biochemical Engineering[1], Chemistry[2], and Pathology[3], The University of Iowa, Iowa City, IA
Monitoring and Control of Rotating Wall Vessels and Application to the Study of Prostate Cancer

1 :45 – 2:00 pm

C.E. Helmstetter, M. Thornton, K.L. Eward and A. Romero
Department of Biological Sciences, Florida Institute of Technology, Melbourne, FL
Cell Culture System for Cell Cycle Analyses during Minimally Disturbed Steady-State Growth and in A Rotating Vessel

2 :00 – 2 :15 pm

A. Folch
Department of Bioengineering, University of Washington, Seattle, WA
Microarrays of Cellular Membrane Patches for In-Flight Studies of Ion Channel Function

2:15 – 2:30 pm

D.W. Murhammer[1], V.G.J. Rodgers[1], and L.W. Oberley[2]
[1]Department of Chemical and Biochemical Engineering and [2]The Free Radical and Radiation Biology Program, The University of Iowa, Iowa City, IA
Evaluating Odative Stress in Virally-Infected Cells in a HARV Bioreactor

2:30 – 2:45 pm

I. Rivera and S. Kleis
Department of Mechanical Engineering, University of Houston, Houston, TX
Convective Mass Transport to Cell Assemblages in Microgravity

2:45 – 3:00 pm

D.W. Griffin[1], S.M. Moti[1] and E.A. Hovenac[2]
[1]Microgravity Science Division, NASA GRC, Cleveland, OH; [2]Northrop Grumman Information Systems, Cleveland, OH
The Light Microscopy Module: A Potential On-Orbit Resource for Biological Research

3:00 – 3:15 pm

N.L. Cowger, L.A. Brown, A.P. Miller, S.M. Hartley, L. Arterburn, P.M. Silber and A.P. Li
StelSys, LLC., Baltimore, MD
Long-Term Cultivation of Functional Hepatocyte Spheroids in Rotating Wall Vessel

3:15 – 3:30 pm

J. W. Hines
NASA Ames Research Center, Moffett Field, CA
In situ, Autonomous, Miniaturized Technologies for Fundamental Biology Research

3:30 – 4:00 pm Break

4:00 – 5:00 pm Business Meeting

Neal Pellis, Biotechnology Program
Mel Averner, Fundamental Space Biology Program

5:00 – 6:00 pm Presentation on Grantsmanship

Charles D. Liarakos
Science Director, InDyne Inc., NASA Peer Review Services

February 28 – Thursday

Session 8: Cell Movement/Cytoskeleton 8:30 – 10:00 am
Co-chairs: N. Wang and D. Risin

8:30 – 8:45 am

N. Wang[1], E. Ostuni[2], D.E. Ingber[3] and G.M. Whitesides
[1]Physiology Program, Harvard School of Public Health, Boston, MA; [2]Department of Chemistry and Chemical Biology, Harvard University, Cambridge, MA; [3]Departments of Surgery and Pathology, Children's Hospital and Harvard Medical School, Boston, MA
Micropatterning Tractional Forces in Living Cells

8:45 – 9:00 am

P.G. Allen, B. D. Matthews and M. Biernacki
Hematology Division, Brigham and Women's Hospital and Dept. of Med., Harvard Med. School, Boston, MA
Restructuring the Actin Cytoskeleton in Response to Mechanical Force

9:00 – 9:15 am

B.B. Hashemi[1], J.E. McClure[1], M.L Marquette[2], T.D. Fitting[2], E.A. Hess[2], E. Salas[2], E. Stenseng[2] and D.L. Pierson[1]
[1]Life Science Research Laboratories/SD3, NASA Johnson Space Center, Houston, TX, [2]Harlingen High School, Harlingen, TX
The Role of the Actin Cytoskeleton in Gravity Sensitvity of T-Cell Activation

9:15 – 9:30 am

A. Sundaresan[1], D. Risin[2] and N.R. Pellis[2]
[1]Wyle laboratories, NASA Johnson Space Center, [2]Cellular Biotechnology, NASA Johnson Space Center, Houston, TX
Modeled Microgravity Selectively Inhibits Signaling Pathways in Lymphocyte Locomotion

9:30 – 9:45 am

N.D. Searby[1], C.R. Steele[2] and R.K. Globus[2]
[1]Stanford University Mechanics and Computation Division, Stanford, CA, [2]NASA Ames Research Center, Moffett Field, CA
Cytoskeletal and PGE_2 Responses of Osteoblasts to Hypergravity

9:45 – 10:00 am

A. Fertala[1], W.B. Han[2] and F.K. Ko[2]
[1]Department of Dermatology and Cutaneous Biology, Thomas Jefferson University, Philadelphia, PA; [2]Department of Material Engineering, Drexel University, Philadelphia, PA
Mapping Critical Sites in Collagen II for Rational Design of Gene Engineered Collagen-Like Proteins for Cell Supporting Materials

10:00 -10:15 am Break

Session 9: Gene Expression 10:15 – 11:45 pm
Co-chairs: E. Wang and L. Sundaresan

10:15 – 10:30 am

E. Wang[2], A. Semov[1], J. Tang[2], N. Semova[1], R. Marcotte[1] and P. Zhao[2]
[1]Bloomfield Center for Research in Aging, Lady Davis Inst. for Medical Research, Jewish General Hosp., McGill Univ., Montréal, PQ; [2]Dep't of Biochemistry & Molecular Biology, U. of Louisville (KY) AN
Unique Microarray Approach to Identifying Gene Expressions Shared Between Space Flight and Replicative Senescence on Earth

10:30 – 10:45 am

C.P. Donahue[1], J. Ventura[2], P. A. Dizzio[2] and K.S. Kosik[1]
[1]Center for Neurologic Disease, Brigham & Women's Hospital, Boston MA, [2] Ashton Graybiel Spatial Orientation Laboratory, Brandeis University, Waltham, MA
Effects of Hypergravity on Primary Neuronal Cultures

10:45 – 11:00 am

T.G. Hammond, L.A. Cubano, E. Benes, J. Love, T. Baker, T.J. Goodwin and P.L. Allen
Nephrology Section, Department of Medicine, and Tulane/VA Environmental Astrobiology Center, Center for Bioenvironmental Research, VA Medical Center, New Orleans LA, Wyle Life Sciences, Houston TX & NASA, Johnson Space Center, Houston, TX
Mechanical Culture Conditions Effect Renal Cell Gene Expression: Production of Vitamin D and Urokinase

11 :00 – 11:15 am

J.H. D. Wu, Y.G. Chen and A. Mantalaris
Department of Chemical Engineering, University of Rochester, Rochester, NY
Circadian Rhythm of Hematopoiesis

11:15 – 11:30 am

H. Jo, M. Sykes, G. Sorescu, J. Hwang and N. Boyd
Department of Biomedical Engineering, Georgia Tech and Emory University
Effects of Mechanical Forces on Gene Expression Profiles in Mouse Aortic Endothelial Cells (MAEC)

11:30 – 11:45 Closing

11:45 – 1:00 pm Lunch

1:00 – 4:00 pm Tour of NASA Ames Research Center
Buses will be leaving from Hyatt Rickeys promptly at 1:00