



2015

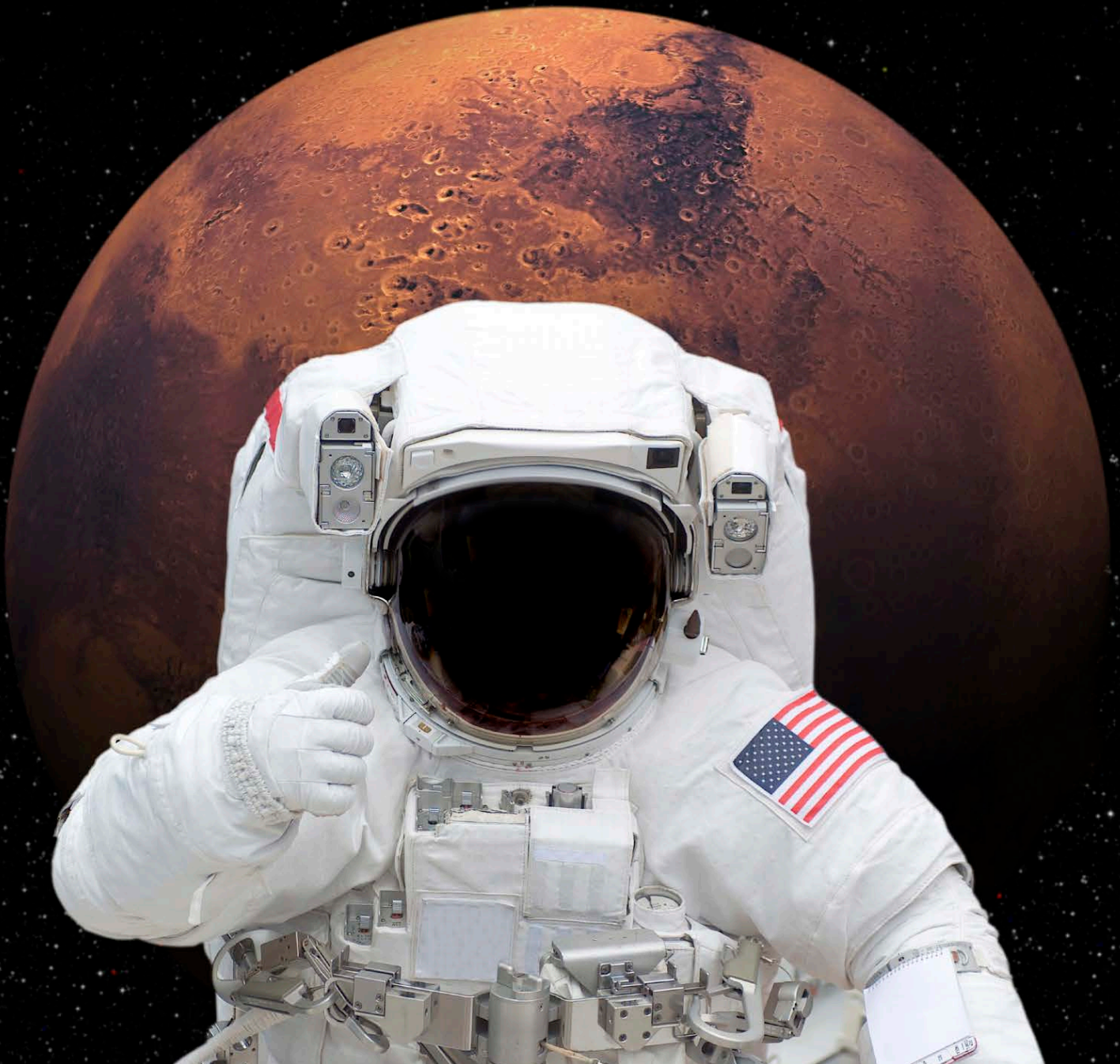
HUMAN RESEARCH PROGRAM

INVESTIGATORS' WORKSHOP

INTEGRATED PATHWAYS TO MARS

JANUARY 13 - 15, 2015

*In conjunction with Space Radiation Investigators' Workshop and
Behavioral Health and Performance Working Group
January 12-15, 2015*



NASA Human Research Program Investigators' Workshop Integrated Pathways to Mars

**January 13-15, 2015
Galveston Island Convention Center
Galveston, TX**

In conjunction with
**Space Radiation Investigators' Workshop and
Behavioral Health and Performance Working Group**

January 12-15, 2015

Sponsors

NASA Human Research Program
National Space Biomedical Research Institute

Steering Committee

Maneesh Arya, Ph.D.
Barbara Corbin
Ronita Cromwell, Ph.D.
Janice Huff, Ph.D.
Victor Hurst IV, Ph.D.
Craig Kundrot, Ph.D.
Lauren Leveton, Ph.D.
Peter Norsk, M.D.

William Paloski, Ph.D.
Michele Perchonok, Ph.D.
Clarence Sams, Ph.D.
Graham Scott, Ph.D.
Ronak Shah, D.O.
Mark Shelhamer, Sc.D.
Lisa Simonsen, Ph.D.
Mihriban Whitmore, Ph.D.

Conference logistics, administration, technical and publications support provided by All Points, LLC.

NASA Human Research Program Investigators' Workshop Integrated Pathways to Mars

In conjunction with Space Radiation Investigators' Workshop and Behavioral Health and Performance Working Group

Monday, January 12

8:00 a.m.	Galleon I	Space Human Factors and Habitability Retreat (closed)
11:00 a.m.		Space Radiation Investigators' Workshop Registration Opens
1:00 p.m.	Galleon II & III	Space Radiation - Welcome and Introduction; Hematologic Cancers
2:40 p.m.		Break
3:00 p.m.	Galleon II & III	Radiation Quality Effects on Cancer Processes I
4:00 p.m.		Break
4:15 p.m.	Galleon II & III	Radiation Quality Effects on Cancer Processes II

Tuesday, January 13

General Session (8:00 a.m. – 12:00 p.m.)

8:00 a.m.	Grand Ballroom A & B	<i>Welcome – M Shelhamer</i>
8:05 a.m.		<i>Human Research Program Introductory Remarks</i> – W Paloski and M Porterfield
8:10 a.m.		<i>National Space Biomedical Research Institute (NSBRI) Introductory Remarks – J Sutton</i>
8:15 a.m.		Plenary: <i>Update on HRP Research Plans – M Shelhamer</i>
9:00 a.m.		Plenary: <i>Twin Sons: HRP's First Integrated Omics Study – C Kundrot</i> M Snyder
9:40 a.m.	Ballroom Foyer (2 nd floor)	COFFEE BREAK
10:00 a.m.	Grand Ballroom A & B	Plenary: <i>Human Research Analogs</i> <i>Introduction to Human Research Analogs – R Cromwell</i> <i>Immunology Ground-based Analogs – B Crucian</i> <i>Neurocognitive Assessment in Ground-based Analogs – M Basner</i>
11:00 a.m.		Plenary: <i>Visual Impairment and Intracranial Pressure</i> <i>Introduction to Visual Impairment and Intracranial Pressure</i> – P Norsk <i>One Carbon Metabolism: A potential pathway to understanding</i> <i>spaceflight vision issues – S Smith</i> <i>Effects of Microgravity on Intracranial Pressure – B Levine</i> <i>Astronaut Preflight Cardiovascular Health Is Highly Correlated</i> <i>With Postflight Eye Outcome Measures in the Visual Impairment</i> <i>Intracranial Pressure Syndrome Following Long Duration</i> <i>Spaceflight – C Otto</i>
12:00 p.m.	Exhibit Hall A Grand Ballroom A & B	LUNCH Lunch Plenary: <i>Spaceflight Analogs: Can we do better than the</i> <i>South Pole? – S Aunon</i>

1:00 p.m.	Grand Ballroom A & B Yacht Galleon I Galleon II & III	Visual Impairment and Intracranial Pressure Flight Experiments Exercise and Functional Performance Advanced Food Technology Space Radiation and Behavioral Health and Performance – Joint Session on Inflight Cognitive and Behavioral Impacts of Spaceflight BREAK
2:30 p.m.		
3:00 p.m.	Grand Ballroom A & B Yacht Galleon I Galleon II & III	Visual Impairment and Intracranial Pressure Ground Experiments Sensorimotor Space Human Factors Data and Tools Late Effects of Space Radiation on the Central Nervous System
4:30 p.m.	Exhibit Hall B	Poster Session A

Wednesday, January 14

8:00 a.m.	Grand Ballroom A & B Grand Ballroom C Yacht Galleon I Galleon II & III	Cardiovascular Behavioral Health and Performance Countermeasures Extravehicular Activity Advanced Environmental Health/Advanced Food Technology Physics and Space Radiation Technologies
9:30 a.m.	Ballroom Foyer (2 nd floor)	COFFEE BREAK
10:00 a.m.	Grand Ballroom A & B Grand Ballroom C Yacht Galleon I Galleon II & III	Translational Research: Oxidative Stress and Damage, and Immunology I Behavioral Health and Performance Monitoring Tools Human Exploration Research Analog (HERA) Automation and Robotics NASA Space Radiation Laboratory User's Group Meeting
11:30 a.m.	Exhibit Hall A Grand Ballroom A & B	LUNCH <i>Lunch Plenary: Medical Considerations for Participants in Commercial Space Flights – J Vanderploeg</i>
12:30 p.m.	Grand Ballroom A & B Grand Ballroom C Yacht Galleon I Galleon II & III	Translational Research: Oxidative Stress and Damage, and Immunology II Behavioral Health and Performance Risk Assessment Bone Exploration Medical Capability: Evidence Base Galactic Cosmic Ray Simulator I
2:00 p.m.	Grand Ballroom C	BREAK Presentation of the JSC Director's Innovation Team Award: Establishing the flexible Space Station Lighting Assembly for the ISS Presentation of the Group Achievement Award: The Impact of Sex and Gender on Adaptation to Space
2:30 p.m.	Grand Ballroom A & B Grand Ballroom C Yacht Galleon I Galleon II & III	Translational Research: Oxidative Stress and Damage, and Immunology III Behavioral Health and Performance Standards Occupant Protection Exploration Medical Capability: Integrated Medical System Galactic Cosmic Ray Simulator Panel Discussion
4:00 p.m.	Exhibit Hall B	Poster Session B

Thursday, January 15

8:00 a.m.	Grand Ballroom C	Behavioral Health and Performance Working Group (see detailed schedule on page 78)
8:00 a.m.	Grand Ballroom A & B	Countermeasures and Functional Testing in 70-days of Bed Rest: Next Generation ISS Exercise Protocol I Computational Modeling and Simulation I Exploration Medical Capability: Non-Invasive Imaging I Space Radiation Systems Biology Modeling
9:30 a.m.	Yacht Galleon I Galleon II & III Ballroom Foyer (2 nd floor)	COFFEE BREAK
10:00 a.m.	Grand Ballroom A & B	Countermeasures and Functional Testing in 70-days of Bed Rest: Next Generation ISS Exercise Protocol II Computational Modeling and Simulation II Exploration Medical Capability: Non-Invasive Imaging II/Mixed Topics
	Yacht Galleon I	
	Galleon II & III	New Investigations – Space Radiation
11:30 a.m.	Grand Ballroom A & B	<i>Dr. David Watson Poster Competition Awards</i> – J Sutton
11:40 a.m.		<i>NSBRI Pioneer Award</i> – G Scott D Dinges
11:50 a.m.	Exhibit Hall A	LUNCH
12:00 p.m.	Clipper	NSBRI Society of Fellows Luncheon
1:00 p.m.	Grand Ballroom A & B	Human Health Countermeasures Science for the Future
	Yacht	Education and Outreach I
	Galleon I	Exploration Medical Capability: Mixed Topics
	Galleon II & III	Space Radiation Carcinogenesis NSCOR I
2:30 p.m.	BREAK	
2:50 p.m.	Galleon II & III	Space Radiation Carcinogenesis NSCOR II
3:00 p.m.	Grand Ballroom A & B	How We Do Business
	Yacht	Education and Outreach II
	Galleon I	Exploration Medical Capability Discussion (closed)
4:30 p.m.	Grand Ballroom A & B	Plenary: <i>Outbriefs of NSBRI Workshops</i> – G Scott
5:15 p.m.		Plenary: <i>Why is it so difficult to go to Mars?</i> – S Love
6:00 p.m.		<i>Closing Comments</i> – M Shelhamer
6:30 p.m.		ADJOURN

Monday, January 12, 2015
SPACE RADIATION WELCOME AND INTRODUCTION
HEMATOLOGIC CANCERS
1:00 p.m. Galleon II & III

Chairs: **Amy Kronenberg**
 Michael Weil

- 1:00 p.m. Simonsen L.
 Welcome And Introduction [#0383]
- 1:10 p.m. Weil M. M. Gerson S. L.
 [Hematologic Cancer Working Group](#) [#0439]
 The Hematologic Cancer Working Group (HCWG) is a recently formed panel focused on understanding the risks of hematologic malignancies and bone marrow failure from space radiation exposures.
- 1:20 p.m. Weil M. M. Ray A. Bacher J. W. Steffen L. S. Ding L. Genik P. C. Yu Y. Nilsson C.
 Emmet M. Vargas G. McCarthy M. Fallgren C. M. Story M. D. Ullrich R. L.
 [The Radiation Carcinogenesis NSCOR](#) [#0398]
 The Radiation Carcinogenesis NSCOR consists of three projects supported by three cores.
- 1:50 p.m. Rodman C. Almeida-Porada G. Walker S. J. Wilson P. Porada C. D.
 [The Role of the Bone Marrow Microenvironment in Space Radiation-Induced Leukemogenesis](#) [#0365]
 Space radiation exerts direct effects on HSC and indirectly affects hematopoiesis by altering the supportive microenvironment.
- 2:05 p.m. Rithidech K. N. Honikel L. Jangiam W. Tungjai M. Gordon C. Whorton E. B.
 [Acute- and Late-Occurring Effects of 48Ti Ions on Hematopoietic Stem/Progenitor Cells \(HSPCs\) after a Whole Body Exposure of CBA/Cal Mice](#) [#0371]
 To increase the reliability of predicting risk for myeloid leukemia, a much improved understanding of space radiation-induced changes in the target cells, i.e. hematopoietic stem/progenitor cells, is critically important.
- 2:15 p.m. Young E. Smilenov L.
 [The Effect of High LET Radiation on Differentiation and Tumorigenesis in the Human Hematopoietic System: Modeling In Vitro and In Vivo for Risk Assessment](#) [#0386]
 The results show some of the early and late effects of high LET radiation on reconstituted human hematopoietic system.
- 2:25 p.m. Patel R. Qing Y. Gerson S. L. Welford S. M.
 [The Contribution of GCR Exposure to Hematopoietic Stem Cell Dysfunction and Oncogenesis](#) [#0406]
 The effect of high LET radiation on hematopoietic stem cells that exhibit increased genomic instability due to loss of mismatch repair function characteristic of individuals of astronaut age is tested in the context of stem cell function and tumorigenesis.
- 2:40 p.m. BREAK

Monday, January 12, 2015
RADIATION QUALITY EFFECTS ON CANCER PROCESSES I
3:00 p.m. Galleon II & III

Chairs: **Amy Kronenberg**
 Michael Weil

- 3:00 p.m. Grygoryev D. Gauny S. Ohlrich A. P. Lasarev M. Grossi G. Turker M. Kronenberg A.
 [Genotoxic Effects of Ions with Intermediate Z and LET in Mouse Kidney Epithelial Cells and Tissue](#)
 [\[#0333\]](#)
 Intermediate Z ions are toxic and mutagenic to murine kidney epithelial cells.
- 3:15 p.m. Yu L. Lima F. Goetz W. Yang A. J. Baulch J. E.
 [High LET Irradiation Induces Tissue Specific Changes in DNA Methylation in the Mouse](#) [\[#0419\]](#)
 Exposure to high LET radiations result in locus specific, dose-, time- and tissue-dependent changes in
 DNA methylation levels.
- 3:30 p.m. Mori E. Su F. Asaithamby A.
 [Multiple Roles for Rad51 in Cellular Response to Space Radiation](#) [\[#0277\]](#)
 Homologous Recombination plays a critical role in the suppression of space radiation induced
 carcinogenesis.
- 3:45 p.m. Morita T.
 ["Stem Cells" Project to Analyze Space Radiation Effects to Frozen Mouse Embryonic Stem Cells in](#)
 [International Space Station](#) [\[#0347\]](#)
 In order to evaluate the effects of space radiation to mammalian cells, we will analyze frozen mouse
 ES cells kept in ISS for several years.
- 4:00 p.m. BREAK

Monday, January 12, 2015
RADIATION QUALITY EFFECTS ON CANCER PROCESSES II
4:15 p.m. Galleon II & III

Chairs: **Amy Kronenberg**
 Michael Weil

- 4:15 p.m. Krishnan M. Mohan S. Aravindan N. Blakely E. A. Natarajan M.
 [*Tumorigenic Bystander Effect after 56Fe-Ion Particle Radiation Exposure Is Mediated through Sustained Cross Talk between Pro-Inflammatory Cytokine, TNF- \$\alpha\$ and Rel Family Proteins*](#) **[#0342]**
 In this study we investigated whether sustained amplification of TNF- α and Rel family proteins (RelA and p50) leads to a positive feedback loop that influences stimulation of predisposing factors for radiation-induced carcinogenesis and potentiates pro-tumorigenic cells to the pre-malignant phenotype.
- 4:30 p.m. Dynan W. S. Li Z. Wang Y. Zheng X.
 [*Non-Targeted Effect of HZE Particle Radiation on the DNA Double Strand Repair Machinery*](#) **[#0304]**
 Co-culture with HZE-irradiated cells promotes use of alternative, error-prone pathways of double-strand break repair in non-irradiated bystander cells.
- 4:45 p.m. Cornforth M. N. Kittler R. Loucas B. D. Ray F. A. Robinson E. Bedford J. S. Goodwin E. H. Spellman P. Anur P. Peto M. Gray J. W. Bailey S. M.
 [*Molecular Characterization of Transmissible Chromosome Aberrations Produced by Ions of Intermediate and High Atomic Number*](#) **[#0294]**
 This is a new project designed to sequence DNA surrounding the breakpoints of radiation-induced chromosome translocations and inversions.
- 5:00 p.m. ADJOURN

Tuesday, January 13, 2015
VISUAL IMPAIRMENT AND INTRACRANIAL PRESSURE FLIGHT EXPERIMENTS
1:00 p.m. Grand Ballroom A & B

Chair: Christian Otto

- 1:00 p.m. Kramer L. A. Otto C. Hasan K. M. Sargsyan A. Hamilton D. Riascos R.
[*Magnetic Resonance Derived Cerebral Spinal Fluid Hydrodynamics as a Marker and a Risk Factor for Intracranial Hypertension in Astronauts Exposed to Microgravity*](#) **[#0331]**
Increased CSF production in post-flight astronauts with positive posterior globe flattening is compatible with the hypothesis of microgravity-induced intracranial hypertension.
- 1:18 p.m. Patel N. B. Pass A. F. Gibson C. R. Otto C.
[*Pre and Post Flight Evaluation of the Optic Nerve Head Using OCT after Long Duration Microgravity Exposure*](#) **[#0356]**
Optic nerve head analysis using OCT would suggest changes in morphology corresponding to disc edema post flight
- 1:36 p.m. Otto C. Barr Y. Platts S. Ploutz-Snyder R. Sargsyan A. Alexander D. Riascos R. Gibson C. Patel N.
[*Prospective Observational Study of Ocular Health in ISS Crews – The Ocular Health Study*](#) **[#0355]**
Preliminary data indicates that compliance, retroorbital pressure and IOP affect retinal nerve fiber layer swelling.
- 1:54 p.m. Van Baalen M. Mason S. S. Taiym W. Wear M. L. Moynihan S. Alexander D. Hart S. Tarver W.
[*Visual Impairment/Intracranial Pressure Risk Clinical Care Data Tools*](#) **[#0344]**
A postflight chart review is conducted to determine crewmember's visual impairment and intracranial pressure status postflight based on changes from preflight to in-flight test results and ensures a smooth transition from flight to ground for clinical care. We will describe the data tools that have been developed to facilitate these chart reviews.
- 2:12 p.m. Marshall-Bowman K. Terlevic R. Rittweger J.
[*Cerebral and Ocular Fluid Balance as a Function of Hydrostatic Pressure Gradients and Environmental Factors: Insights into the VIIP Syndrome \(the enVIIP Study\)*](#) **[#0343]**
Various measurements of cerebral and ocular fluids were taken under 5 interventions: -6° head down tilt (HDT), -12° HDT, -18° HDT, -12° HDT + 1% CO2 atmosphere, and -12° HDT + lower body negative pressure (LBNP).
- 2:30 p.m. BREAK

Tuesday, January 13, 2015
EXERCISE AND FUNCTIONAL PERFORMANCE
1:00 p.m. Yacht

Chair: Lori Ploutz-Snyder

- 1:00 p.m. Ade C. J. Broxterman R. M. Barstow T. J.
[*Standardized "Pre-Flight" Exercise Tests to Predict Performance During Extravehicular Activities in a Lunar Environment* \[#0274\]](#)
Studies to determine if a fitness threshold could be detected and used to identify individuals as Finishers or non-Finishers of a Martian-based EVA field test.
- 1:30 p.m. Ploutz-Snyder L. Ryder J. English K. Buxton R. Bloomberg J. Ploutz-Snyder R.
[*Strategies for Identification of Strength Thresholds for Exploration Tasks* \[#0362\]](#)
We present the research plan for identification of functionally relevant strength thresholds.
- 1:50 p.m. Bloomberg J. J. Batson C. D. Buxton R. E. Feiveson A. H. Kofman I. S. Laurie S. S. Lee S. M. C. Miller C. A. Mulavara A. P. Peters B. T. Phillips T. Platts S. H. Ploutz-Snyder L. L. Reschke M. F. Ryder J. W. Stenger M. B. Taylor L. C. Wood S. J.
[*Treadmill Exercise with Increased Body Loading Enhances Postflight Functional Performance* \[#0288\]](#)
This presentation will investigate if there is a relationship between the load experienced during inflight treadmill exercise (produced by a harness and bungee system) and postflight functional performance.
- 2:10 p.m. Reschke M. F. Kozlovskaya I. B. Kofman I. S. Tomilovskaya E. S. Cerisano J. M. Bloomberg J. J. Stenger M. B. Platts S. H. Rukavishnikov I. V. Fomina E. V. Lee S. M. C. Wood S. J. Mulavara A. P. Feiveson A. H. Fisher E. A.
[*Pilot Sensorimotor and Cardiovascular Results from the Joint Russian/U.S. Field Test* \[#0370\]](#)
The primary goal of this research is to determine functional abilities associated with long-duration space flight crews beginning as soon after landing as possible (< 2 hours) with an additional two follow-up measurements sessions on the day of landing.
- 2:30 p.m. BREAK

Tuesday, January 13, 2015
ADVANCED FOOD TECHNOLOGY
1:00 p.m. Galleon I

Chair: Grace Douglas

- 1:00 p.m. Cooper M. R. Douglas G. L.
[*Integration of Product, Package, Process, and Environment: A Food System Optimization* \[#0226\]](#)
A combination of processing, packaging, and environmental adjustments will likely be required to achieve a five-year shelf life for spaceflight food.
- 1:15 p.m. Hunter J. B. Binsted K. Drago R. E.
[*Nutritional Intake of Analog Subjects Consuming Prepackaged or Crew-Prepared Foods* \[#0227\]](#)
Will Mars explorers eat better if they cook for themselves?
- 1:30 p.m. Barrett A. H. Froio D. Richardson M.
[*Stabilized Foods for Use in Extended Spaceflight: Preservation of Shelf-Life, Nutrient Content and Acceptability* \[#0225\]](#)
Strategies for ensuring multi-year survival of vitamin activity in foods are being pursued.
- 1:45 p.m. Massa G. D. Richards J. T. Spencer L. E. Hummerick M. E. Stutte G. W. Wheeler R. M.
[*Selection of Leafy Green Vegetable Varieties for a Pick-and-Eat Diet Supplement on ISS* \[#0228\]](#)
Several varieties of leafy vegetables were evaluated with the goal of selecting those with the best growth, nutrition, and organoleptic acceptability for ISS.
- 2:00 p.m. DISCUSSION
- 2:30 p.m. BREAK

Tuesday, January 13, 2015
SPACE RADIATION AND BEHAVIORAL HEALTH AND PERFORMANCE:
JOINT SESSION ON INFLIGHT COGNITIVE AND BEHAVIORAL HEALTH IMPACTS OF SPACEFLIGHT
1:00 p.m. Galleon II & III

Chairs: **Mathias Basner**
 Greg Nelson

- 1:00 p.m. Britten R. A. Machida M. Wellman L. Sanford L. D.
 [*A Pilot Study on the Impact that Exposure To 20 cGy 1 GeV/Nucleon 56Fe Particles Has on Delta and Theta Wave Activity and Sleep Homeostasis*](#) **[#0291]**
 We discuss impact of HZE radiation on sleep EEG activity.
- 1:15 p.m. Davis C. M. Roma P. G. Guida P. M. Hienz R. D.
 [*Dopaminergic Modulation of Neurobehavioral Susceptibility of Individuals Following Proton Radiation*](#) **[#0319]**
 The current work was designed to determine the degree to which pre-existing individual differences in behavioral responses to dopaminergic drugs may be predictive of the observed differential neurobehavioral susceptibility of individuals following proton radiation.
- 1:30 p.m. Rabin B. M. Shukitt-Hale B. Carrihill-Knoll K. L. Bielinski D. F. Poulose S. M. Heroux N. A.
 [*Acute Changes in Oxidative Status, Neuroinflammation and Behavior following Exposure to 56Fe and 16O Particles*](#) **[#0368]**
 The present experiment was designed to determine the acute effects of exposure to space radiation on performance of a cognitive task (novel object recognition) and the relationship to radiation-induced changes in neuronal function.
- 1:45 p.m. Davis C.M. Guida P. M. Hienz R. D.
 [*Using the Rodent Psychomotor Vigilance Test as a Tool for Understanding Radiation-Induced Impairments in Behavioral Performance & CNS Function*](#) **[#0298]**
 Data is presented that supports the use of the rodent psychomotor vigilance test as an animal model for characterizing neurobehavioral deficits following exposure to space radiation.
- 2:00 p.m. Basner M. Dinges D. F. McGuire S. Nasrini J. Mollicone D. J. Mott C. G. McCann T. Port A. Savitt A. P. Moore T. M. Gur R. C.
 [*Cognitive Performance in Space Flight: Update on the Development and Validation of the Cognition Test Battery*](#) **[#0252]**
 An update on critically needed, state-of-the-art, brief, comprehensive, and sensitive computerized neurocognitive test battery for space flight (Cognition) is provided.
- 2:20 p.m. DISCUSSION
- 2:30 p.m. BREAK

Tuesday, January 13, 2015
VISUAL IMPAIRMENT AND INTRACRANIAL PRESSURE GROUND EXPERIMENTS
3:00 p.m. Grand Ballroom A & B

Chairs: Christian Otto
Graham Scott

- 3:00 p.m. Macias B. R. Grande-Gutierrez N. Liu J. H. K. Hargens A. R.
[*Moderate Lower Body Negative Pressure Counters Headward Fluid Shifts in the Brain and Eye* \[#0341\]](#)
Lower body negative pressure attenuates head-down tilt -induced increases in IOP and ICP.
- 3:18 p.m. Ethier C. R. Feola A. Mulugeta L. Myers J. G. Nelson E. Raykin J. Samuels B.
[*Finite Element Modeling of VIIP Syndrome* \[#0307\]](#)
Finite element modeling of elevated intracranial pressure observed changes in the strains of the posterior eye and optic nerve sheath which may induce visual impairment and connective tissue changes in VIIP syndrome.
- 3:36 p.m. Swan J. G. Phillips S. D. Kattamis N. T. Knaus D. A. Zegans M. E. Fellows A. M. Buckey J. C.
[*Effect of Posture and Microgravity on the Eye and Cranial Vascular System* \[#0292\]](#)
The eye is affected by changes in posture and microgravity.
- 3:54 p.m. Williams M. A. Malm J. Eklund A. Voss S. E. Hamilton D. R. Ebert D. Levine B. D.
[*Comparison of Continuous Noninvasive and Invasive ICP Measurement* \[#0410\]](#)
We will demonstrate the results of simultaneous recording of invasive ICP with 2 noninvasive methods (TMD and DPOAE).
- 4:12 p.m. Bershad E. M. Gosdin L. M. Calvillo E. Donoviel D. Maldonado N. Damani R. Tan B. C. Gupta P. Anand A. Dunham S. R. Foroozan R. DeSantis S. M. Yang M. Tang R. A. Cajavilca C. Lee A. G. Venkatasubba Rao C. P. Suarez J. I.
[*Evaluation of the Vittamed Two Depth Transcranial Doppler for Non-Invasive Intracranial Pressure Monitoring in the Astronauts* \[#0286\]](#)
The results of phase 2 clinical validation study determination of accuracy of Vittamed compared to Invasive ICP measurement will be reported.

Tuesday, January 13, 2015
SENSORIMOTOR
3:00 p.m. Yacht

Chairs: **Millard Reschke**
 Rachael Seidler

- 3:00 p.m. Seidler R. D. Mulavara A. P. Koppelmans V. Kofman I. S. De Dios Y. E. Szecsy D. L.
 Riascos-Castaneda R. F. Wood S. J. Bloomberg J. J.
 [*The Effects of Long Duration Head Down Tilt Bed Rest on Neurocognitive Performance: Extent, Longevity, and Neural Bases* \[#0380\]](#)
 We evaluated changes in behavior, brain structure and function, in response to long duration head down tilt bed rest.
- 3:15 p.m. Moore S. MacDougall H. Beltran E. Wood S.
 [*Assessment of Operator Proficiency after Long-Duration Spaceflight* \[#0449\]](#)
 This flight project compares pre-flight and post-flight astronaut performance on a cognitive/sensorimotor test battery and three full motion simulations.
- 3:30 p.m. Mulavara A. P. Kofman I. S. De Dios Y. E. Galvan R. Goel R. Miller C. Peters B. Cohen H. S.
 Jeevarajan J. Reschke M. Wood S. Bergquist F. Seidler R. D. Bloomberg J. J.
 [*Improving Sensorimotor Adaptation Following Long-Duration Spaceflight by Enhancing Vestibular Information Transfer* \[#0175\]](#)
 We are developing a method, based on stochastic resonance, to enhance information transfer by improving the brain's ability to detect vestibular signals (vestibular stochastic resonance, VSR) especially when the method is combined with balance training exercises such as sensorimotor adaptability (SA) training for rapid improvement in functional skill for standing and for mobility.
- 3:45 p.m. Diaz A. Beckers N. W. M. Clark T. K. Sherwood D. Oman C. Young L. R. Karmali F.
 [*Development of a Countermeasure to Enhance Sensorimotor Adaptation to Altered Gravity Levels* \[#0414\]](#)
 The overall objective of this research effort is to investigate and quantify sensorimotor adaptation to altered gravity levels using a short-radius centrifuge.
- 4:00 p.m. Boyle R. Popova Y. Varelas J.
 [*Influence of Gravity on Mouse Inner Ear Otoconia* \[#0290\]](#)
 Is the structure of otoconia remodeled by the intensity and duration of gravity loading?
- 4:15 p.m. Schubert M. C. Beaton K. H. Haworth J. Montgomery R.
 [*Head Impulse Dynamic Visual Acuity Is Worse When Viewing Near Targets* \[#0378\]](#)
 Yaw and pitch head impulse visual acuity is worse when viewing near targets, which may serve as a functional measure of canal-otolith integration.

Tuesday, January 13, 2015
SPACE HUMAN FACTORS DATA AND TOOLS
3:00 p.m. Galleon I

Chair: Kritina Holden

- 3:00 p.m. Adolf J. Vos G. Beard B. Litaker H.
[Human Performance Data Project \[#0275\]](#)
The Human Performance Data Project (HPDP) was created to pursue methods of identifying and acquiring operational data and to document the challenges and possibilities associated with accessing the human performance data.
- 3:15 p.m. Young K. S. Reid C. R. Rajulu S.
[Quantification of In-Flight Physical Changes: Anthropometry and Neutral Body Posture \[#0413\]](#)
For developing future planetary and reduced-gravity suits, NASA needs to quantify the impacts of microgravity on anthropometry and body posture to ensure optimal crew performance, fit, and comfort.
- 3:30 p.m. Schreckenghost D. Kusy K.
[Semantic Language and Tools for Reporting Human Factors Incidents \[#0434\]](#)
We report results of the feasibility study using incident reporting software to catalog human factors observations from HERA.
- 3:45 p.m. Sebok A. L. Andre T. S.
[Human Factors Analysis Support Tool \[#0435\]](#)
This presentation describes the H-FAST knowledge management tool for providing access to human factors research, methods, and lessons learned.
- 4:00 p.m. DISCUSSION

Tuesday, January 13, 2015
LATE EFFECTS OF SPACE RADIATION ON THE CENTRAL NERVOUS SYSTEM
3:00 p.m. Galleon II & III

Chair: Richard Britten

- 3:00 p.m. Nelson G. Vlkolinsky R. Limoli C. Soltesz I. Raber J. Fike J. Rosi S. Allen A.
[CNS NSCOR Highlights \[#0351\]](#)
Recent studies by the CNS NSCOR team have shown that space relevant doses of charged particles can elicit structural and functional changes in the mouse brain associated with cognitive impairment and these responses show complex dose and LET dependencies.
- 3:20 p.m. Parihar V. K. Chmielewski N. Allen B. Giedzinski E. Limoli C. L.
[Charged Particle Effects in the CNS: Dissecting Structure Function Relationships after HZE Ion Exposure \[#0427\]](#)
We have undertaken an extensive investigation of the effects of HZE ion exposure on neurons throughout different regions of the brain known to be critical for learning, memory and executive function.
- 3:35 p.m. O'Banion M. K. Olschowka J. A. Williams J. P.
[Space Radiation Induced Neuroinflammation in Alzheimer's and Parkinson Disease Pathogenesis \[#0354\]](#)
Genetic mouse models of Alzheimer and Parkinson disease are being examined for to establish effects of HZE and proton irradiation on behavioral and histopathological endpoints.
- 3:50 p.m. Raber J. Rosi S. Zuloaga D. Jopson T. Marzulla T. Turcker M. Impey S.
[The Relation Between Cognitive Injury, Network Stability, and Epigenetic Change following Exposure to Space Radiation \[#0367\]](#)
This project focuses on how changes in hippocampal network stability including and DNA methylation contribute epigenetic mechanisms into the development of cognitive dysfunction after space irradiation.
- 4:05 p.m. Miry O. Gopaul K. R. Zhang X. L. Tagge C. A. Moncaster J. A. Goldstein L. E. Stanton P. K.
[Long-Term Effects of Galactic Cosmic Radiation on Adult Neurogenesis, Hippocampal Plasticity, and Learning and Memory \[#0391\]](#)
Galactic cosmic radiation produces long-lasting alterations in learning and underlying activity-dependent synaptic plasticity in the hippocampus, a region of active neurogenesis throughout life.
- 4:20 p.m. Rudobeck E. Bonnick K. Bellone J. A. Hartman R. E. Szucs A. Vlkolinsky R.
[Effects of Proton Radiation on the Hippocampus and Cortex of APP/PSEN1 Transgenic Mice \[#0402\]](#)
Low doses of proton radiation induce distinct and qualitatively different electrophysiological changes in the hippocampus and cortex of wild-type and APP/PSEN1 transgenic mice.

Tuesday, January 13, 2015
POSTER SESSION A: CARDIOVASCULAR
4:30 p.m. Exhibit Hall B

Arbeille P. Provost R. Zuj K. Vincent N.

[Peripheral Arterial and Vein Adaptation to 6 Month Spaceflights Onboard ISS \[#0001\]](#)

The study objectives are to determine if 6 months in microgravity affects conduit artery diameter and wall thickness, and to check if 6 months in microgravity change significantly the major central and peripheral vein cross section area or volume by redistribution of the venous blood flow.

Jain I. Charvat J. M. VanBaalen M. Lee L. R. Wear M. L.

[Evaluation of Cardiovascular Risk Scores Applied to NASA's Astronaut Corps \[#0002\]](#)

This analysis evaluates and compares the applicability of multiple CVD risk scores to the NASA Astronaut Corps, which is extremely healthy at selection.

Grabham P. Sharma P.

[Combined Effects of Space Radiation and Microgravity on the Function of Human Capillaries: Implications for Degenerative Disorders \[#0005\]](#)

This new project is aimed at determining the effects of space radiation combined with microgravity on the function of human blood vessels and capillaries.

Lee S. M. C. Westby C. M. Stenger M. B. Smith S. M. Zwart S. R. Rana B. Ploutz-Snyder R. J. Platts S. H.
[Defining the Relationship Between Biomarkers of Oxidative and Inflammatory Stress and the Risk for Atherosclerosis in Astronauts during and after Long-Duration Spaceflight \[#0003\]](#)

The purpose of this investigation is to determine whether biomarkers of oxidative and inflammatory stress are elevated during and after long-duration spaceflight and determine if a relation exists between levels of these biomarkers and structural and functional indices of atherosclerotic risk measur

Prisk G. K. Lejeune L. Migeotte P. F.

[Three Dimensional Ballistocardiogram and Seismocardiogram – Interchangeable? \[#0004\]](#)

Ballistocardiogram and Seismocardiogram are not interchangeable measurements.

Tuesday, January 13, 2015
POSTER SESSION A: VISUAL IMPAIRMENT AND INTRACRANIAL PRESSURE
4:30 p.m. Exhibit Hall B

Alperin N. Barr Y. Lee S. H. Mason S. Bagci A. M.

[*Analyses of Magnetic Resonance Imaging of Cerebrospinal Fluid Dynamics Pre and Post Short and Long-Duration Space Flights*](#) **[#0006]**

Changes in CSF flow following long-duration spaceflights are more pronounced than changes in CBF.

Anderson A. Fellows A. Buckey J.

[*Feasibility of DPOAE Mapping as an In-Flight Measure of Intracranial Pressure in Space*](#) **[#0023]**

In summary, these set of experiments and statistical analyses will allow us to evaluate the feasibility of DPOAE level/phase maps as an in-flight assessment of ICP by isolating and evaluating the effects of fluid shift and hydrostatic gradient.

Cromwell R. L. Taibbi G. Zanello S. B. Yarbough P. O. Ploutz-Snyder R. J. Vizzeri G.

[*Ocular Outcomes Comparison between 14- and 70-Day Head-down Tilt Bed Rest*](#) **[#0447]**

Although 14-day HDTBR did not seem to induce clinically relevant ocular changes, a systematic evaluation and comparison with the 70-day HDTBR study results will elucidate whether the magnitude of ocular structural and functional changes is affected by the time spent in the recumbent position.

DiPasquale D. M. Muza S. R. Gunn A. M. Li Z. Zhang Q. Harris N. S. Strangman G. E.

[*Cerebral Edema, Cerebral Perfusion and Intracranial Pressure Elevations in Acute Mountain Sickness*](#) **[#0007]**

Near-infrared neuromonitoring suggests AMS is associated with cerebral edema and elevated perfusion and ICP. Therefore, AMS may provide an analog condition for studying certain aspects of SAIH.

Gompf H. Hoban-Higgins T. M. Murphy C. J. Theriot C. A. Zanello S. B. Fuller C. A.

[*Head-Down Tilt as a Model For Intracranial and Intraocular Pressures, and Retinal Changes during Spaceflight*](#) **[#0008]**

We will provide the status update of our ongoing program.

Hawks J. A. Twedt M. Pfeifer C. Bashford G. Gigantelli J. Thorell W.

[*In Vivo Testing of Noninvasive ICP Monitoring Methodology in a Porcine Model*](#) **[#0009]**

In vivo experiments in a porcine model show potential feasibility in monitoring ICP by measuring blood flow dynamics while applying a small force to the cornea.

Kolecki R. Ritlop R. Reyes M. Samadani U.

[*Eye Movement Tracking is Disrupted by Elevated Intracranial Pressure*](#) **[#0010]**

Eye movement abnormalities are demonstrated in patients with elevated intracranial pressure.

LaPelusa M. B. Mason S. S. Taiym W. F. Sargsyan A. Lee L. R. Wear M. L. Van Baalen M.

[*Evaluation of a De-Identification Process for Ocular Imaging*](#) **[#0011]**

The development of a de-identification protocol of sagittal MRI brain images for analysis by NASA and external researchers interested in VIIP and/or structural changes within the brains of astronauts.

Laurie S. S. Taibbi G. Lee S. M. C. Martin D. S. Zanello S. Ploutz-Snyder R. Hu X. Stenger M. B. Vizzeri G.

[Effects of Mild Hypercapnia during Head-Down Bed Rest on Ocular Structures, Cerebral Blood Flow, and Visual Acuity in Healthy Human Subjects](#) [#0012]

We seek to determine if the combination of mild CO₂ exposure, similar to that occurring on the ISS, with the cephalad fluid shift induced by head-down tilt, will induce ophthalmic and cerebral blood flow changes similar to those described in the VIIP syndrome.

Mason S. S. Foy M. Sargsyan A. Garcia K. Wear M. L. Bedi D. Ernst R. Van Baalen M.
[Optic Nerve Sheath Diameter: Translating a Terrestrial Focused Technique into a Clinical Monitoring Tool for Space Flight](#) [#0446]

Data will be presented characterizing the distribution of baseline optic nerve sheath diameter (ONSD) in the astronaut corps, longitudinal trends in-flight, and the predictive power of this measure related to increased intracranial pressure outcomes.

Méndez C. M. Foy M. Mason S. Wear M. L. Meyers V. Law J. Alexander D. Van Baalen M.
[Challenges in Evaluating Relationships Between Quantitative Data \(Carbon Dioxide\) and Qualitative Data \(Self-Reported Visual Changes\)](#) [#0013]

The purpose of this analysis is to describe the evaluation of a possible association between visual changes and CO₂ levels on ISS and to discuss challenges in developing an appropriate analysis plan.

Parsons-Wingert P. A. Vizzeri G. Taibbi G. Zanello S. B. Ploutz-Snyder R.
[Mapping by VESGEN of Blood Vessels in the Retinas of ISS Crew Members and Bed Rest Subjects for Increased Understanding of VIIP](#) [#0014]

The remodeling status of retinal blood vessels in crew members before and after ISS missions, and in healthy human subjects before and after head-down tilt bed rest, will be analyzed by NASA's innovative VESGEN software to help develop successful diagnostics and countermeasures for VIIP.

Riascos-Castaneda R. Hasan K. Alperin N. Hakimelahi R. Barr Y. Sargsyan A. Kramer L.
[Association of Diffusion Tensor Imaging Parameters of Optic Tracts and Cerebral White Matter Tracts with Visual Impairment and Structural Changes of the Eyes and Optic Nerves in Long-Duration Microgravity Exposure](#) [#0015]

This study is the first to evaluate brain microstructures in astronauts beyond anatomical characterization and may offer improved understanding of the mechanism of ICP elevation and vision changes in a subset of crewmembers.

Ribeiro L. Laurie S. Lee S. Martin D. Ploutz-Snyder R. Stenger M. Westby C. Platts S.
[Effects of Long-Duration Spaceflight on Venous and Arterial Compliance](#) [#0016]

Our primary objective is to determine whether vascular compliance is altered by spaceflight and whether such adaptations are related to the incidence of VIIP.

Zhu X. Duffy E. W. Brown T. R. Roberts D. R.
[Gravitational Effects of Prolonged Bedrest on the Brain, an MRI Study](#) [#0017]

In this study we used MRI to demonstrate movement of the brain as a whole within the skull in response to gravity changes with widespread regions of brain tissue redistribution in long-term bedrest subjects.

Scott J. M. Westby C. Martin D. Stenger M. Ploutz-Snyder R. Ploutz-Snyder L. L.
[Influence of Exercise Modality on Cerebral-Ocular Hemodynamics and Pressures](#) [#0018]

Upon completion of this study, we expect to characterize the impact of three exercise modalities on cerebral-ocular hemodynamics and pressures.

Simon C. L. Moses H. R.

[*Evaluation of a Wearable Carbon Dioxide Sensor*](#) [#0019]

The WEAR Lab at NASA JSC has developed and evaluated a wearable carbon dioxide sensor to gather long term data on individual crew CO2 exposure.

Stenger M. Hargens A. Dulchavsky S. Ebert D. Lee S. Laurie S. Garcia K. Sargsyan A. Martin D. Lui J. Macias B. Arbeille P. Danielson R. Chang D. Gunga H. Johnston S. Westby C. Ploutz-Snyder R. Smith S.

[*Fluid Shifts*](#) [#0020]

The purpose of this study is to characterize fluid distribution and compartmentalization associated with long-duration spaceflight and to correlate these findings with vision changes and other elements of the visual impairment and intracranial pressure syndrome.

Taiym W. Wear M. L. Locke J. Mason S. VanBaalen M.

[*Changes in Near Visual Acuity over Time in the Astronaut Corps*](#) [#0021]

We hypothesized that visual impairment due to intracranial pressure would increase the rate of which presbyopia would occur in the astronaut population, with long durations flyers at an especially high risk.

Wotring V. E.

[*Are Medications Involved in Vision and Intracranial Pressure Changes Seen in Spaceflight?*](#) [#0024]

The Food and Drug Association Adverse Event Reports (FDA AER) from 2009-2011 were used to explore the possibility of medication involvement in crew VIIP symptoms.

Zanello S. B. Carter B. Skog J.

[*Brain Gene Expression Signatures from Cerebrospinal Fluid Exosome RNA Profiling*](#) [#0022]

Comparative gene expression profiling of cerebrospinal fluid exosomes from normal and elevated intracranial pressure patients as a way to investigate ICP effects on brain neurophysiology.

Theriot C. A. Rivera A. Chevez-Barrios P. Zanello S. B.

[*Identification and Localization of Choroid Plexus and Arachnoid Villi in the Rat Brain: A Pilot Study towards the Characterization of the Effects of Hindlimb Suspension on Cerebrospinal Fluid Production and Drainage*](#) [#0025]

Preliminary characterization of the choroid plexus and arachnoid villi in the rat in order to study the effects of hindlimb suspension on the localization and expression of molecules involved in CSF production and drainage.

Tuesday, January 13, 2015
POSTER SESSION A: BONE
4:30 p.m. Exhibit Hall B

Nalavadi M. O. Shirazi-Fard Y. Castillo A. B. Alwood J. S.

[*The Effects of Combined Zolendronate Treatment and Mechanical Loading during Simulated Weightlessness on Bone Structure*](#) **#0030**

What are the skeletal side effects of zolendronate treatment for astronauts exercising at high-force levels during weightless conditions?

Beck C. E. Rovekamp R. N. Neuhaus P. D.

[*The Hopper: A Wearable Robotic Device Testbed for Micro-Gravity Bone-Loading Proof-of-Concept*](#) **#0031**

The Hopper is a wearable robotic device designed to address muscle and bone density loss for astronauts spending extended periods of time in micro-gravity.

Metzger C. E. Seidel D. V. Allen M. R. Hogan H. A. Turner N. D. Zwart S. R. Bloomfield S. A.

[*Modulation of Bone Response to Long-Term Disuse by Iron Overload*](#) **#0032**

Our long-term goal is to determine if inducing iron overload by increasing dietary iron intake during long-term hindlimb unloading (HU) exacerbates disuse-induced bone loss by increasing oxidative damage.

Bokhari R. Zwart S. R. Fields E. Heer M. Sibonga J. Smith S. M.

[*Fibroblast Growth Factor-23 In Bed Rest and Spaceflight*](#) **#0033**

A pilot study to investigate changes in fibroblast growth factor-23, secreted by osteocytes in response to elevated serum phosphorus levels, in bed rest subjects and astronauts.

Brezicha J. E. Lenfest S. E. Narayanan A. Kosniewski J. Leach C. Bloomfield S. A. Allen M. R. Hogan H. A.

[*Pre-Treatment with Bisphosphonates Mitigates Bone Loss during Subsequent Hindlimb Unloading*](#) **#0034**

Pre-treating adult rats with bisphosphonates before hindlimb unloading mitigates bone loss and during and following the unloading period.

Bruno A. G. Anderson D. E. Bouxsein M. L.

[*Development and Validation of a Fully Articulated Musculoskeletal Model of the Thoracolumbar Spine for Estimation of In Vivo Muscle Activity and Vertebral Loading*](#) **#0035**

We describe the development and validation of a musculoskeletal model of the fully articulated thoracolumbar spine and rib cage for estimation of in vivo trunk muscle activity and vertebral loading.

Burkhart K. A. Brooks D. J. Bouxsein M. L. Mao X. W.

[*Combined Effect of Hindlimb Unloading and Radiation on Trabecular and Cortical Bone in Adult Mice*](#) **#0036**

Negative effects of extended spaceflight on the musculoskeletal system come from two main sources: mechanical unloading and ionizing radiation. We investigate the effects of unloading, radiation, and the combination of both on changes in trabecular and cortical microarchitecture in mice.

Vignaux G. de la Croix Ndong J. Perrien D. Elefteriou F.

[*Impact of Vestibular Alterations on Bone Remodeling*](#) **#0037**

In this study, we established a model of bilateral vestibular lesions (VBX) in mice to address the hypothesis that bone loss in space or in the elderly may be, in part, caused by alterations in vestibular signals.

Gadomski B. C. McGilvray K. C. Easley J. T. Palmer R. H. Ruehlman D. Roberts M. Puttlitz C. M.
[Shock Wave Therapy Does Not Enhance Acute Fracture Strength but May Accelerate Formation Rates under Simulated Microgravity Conditions](#) [#0038]

The objective of this study was to investigate the efficacy of shock wave therapy as a countermeasure to the inhibited fracture healing experienced during simulated microgravity in a previously-developed large animal model.

Skulan J. L. Gordon G. W. Anbar A. D.

[Bone Mineral Balance in Astronaut Urine before, during, and after Spaceflight as Inferred From Ca Isotope Variations](#) [#0039]

Naturally-occurring calcium isotopes provide a measure of net bone mineral balance, as demonstrated by samples from 30 astronauts before, during and after stays on the International Space Station.

Govey P. M. Donahue H. J.

[Mechanical Loading Attenuates Radiation-Induced Bone Loss in Mice](#) [#0040]

A 3-week compressive loading regimen in irradiated mice significantly reduced both trabecular and cortical bone loss, suggesting a possible countermeasure for bone loss due to space radiation exposure and radiation therapy on Earth.

Hargens A. R. Chiang S. B. Sayson J. V. Riascos R. Parazynski S. E. Chang D. G. Lotz J. C.

[Post-Flight Herniation of Intervertebral Discs](#) [#0041]

Our investigation is aimed to understand the higher incidence of herniated intervertebral discs post-flight.

Taggart R. M. Henderson S. E. Langer M. D. Best T. M. Hernandez L. Lewis G. K. Jr.

[Sustained Acoustic Medicine for Treating Back Pain Related to Herniated Disc on Earth and Preventing SABP and Disc Herniation in Space](#) [#0053]

The proposed study will evaluate the use of a long duration therapeutic ultrasound device to treat back pain on earth and prevent intervertebral disc herniation in space

Krause A. R. Speacht T. Steiner J. L. Lang C. H. Donahue H. J.

[Sclerostin Deficient Mice Have Protective Effects on Bone but Deleterious Effects on Muscle during Simulated Microgravity](#) [#0042]

Sclerostin deficiency has remarkable protective effects on bone, but may also have deleterious effects on muscle and metabolism.

Lau A. G. Ellman R. Comte T. L. Sullivan L. K. Smith C. T. Livingston E. W. Spatz J. Stodiek L. S. Paszty C. Buxsein M. L. Ferguson V. L. Bateman T. A.

[Comparing Effects of Spaceflight to Hind Limb Unloading on Bone Strength and Structural Efficiency Using Finite Element Analysis](#) [#0043]

Finite Element Analysis is used to get a detailed analysis of bone health in a hind limb unloading mouse model and mice flown on space shuttle STS-135 with a sclerostin-antibody countermeasure.

Lenfest S. E. Brezicha J. E. Narayanan A. Reyna W. Bloomfield S. A. Allen M. R. Hogan H. A.

[Comparison of Protective Effects of Alendronate and Zoledronic Acid for Two Successive Unloading Exposures](#) [#0044]

Beneficial effects of bisphosphonates given only for an initial unloading period extend to a second unloading period.

Mantri A. V. Bloomfield S. A.

[Developing a Model for Modulation of Microgravity-Induced Bone Loss by Oral Contraceptive Use](#) [#0045]

Simulated oral contraceptive use can effectively suppress estrous cycling and prevent vBMD losses seen with single housing in rats.

Mellor L. F. Taylor M. A. Baker T. Hiremath M. Oxford J. T. Loba E. G.

[Crosstalk Between Subchondral Bone and Articular Cartilage in Reduced Gravity May Contribute to Catastrophic Joint Damage](#) [#0046]

Interactions between subchondral bone and articular cartilage may contribute to joint degradation in microgravity.

Nordberg R. C. Mellor L. F. Orndorff D. C. Loba E. G.

[LRP Receptors in Canonical Wnt Signaling Are Responsive to Microgravity and Regulate Cartilage Homeostasis](#) [#0047]

LRP4, LRP5, and LRP6 have been found to be mechano-responsive in microgravity and to regulate the expression of cartilage matrix degrading proteases.

Sankaran J. S. Zhang W. Donahue L. R. Judex S.

[FGF2-/- and NOD2-/- Mice Have Distinct Contributions to Bone Health during Unloading and under Habitual Loading Conditions](#) [#0048]

FGF2 and NOD2 genes are critical in maintaining trabecular and cortical bone health in the femoral metaphysis under physiological loading conditions while NOD2 gene can also modulate specific aspects of cortical bone morphology during unloading, providing new diagnostic and therapeutic avenues.

Feiveson A. H. Mendez C. M. Somers J. T.

[Assessing the Effect of Spaceflight on the Propensity for Astronauts to Develop Disk Herniation](#) [#0256]

Electronic medical records from 330 US astronauts were examined to see if reports of herniated disks could be attributed specifically to space missions, or whether they were more simply explainable as a consequence of training and the general lifestyle of astronauts.

Turner R. T. Philbrick K. A. Keune J. A. Wong C. P. Olson D. A. Branscum A. J. Iwaniec U. T.

[Housing Mice at Room Temperature Results in Premature Age-Related Cancellous Bone Loss: Implications for Spaceflight Studies](#) [#0050]

Adaptation to mild cold stress associated with room temperature housing may accelerate bone loss in mice during spaceflight by a mechanism distinct from skeletal unloading caused by microgravity.

Willey J. S. Payne V. Kwok A. Lindburg C. Hutchinson I. Walb M. Okoukoni C. Munley M. T. Olson J.

[Degradation and Recovery of Knee Articular Cartilage Resulting from Combined Unloading and Spaceflight Radiation](#) [#0051]

Exposing rats to a solar flare-relevant whole-body dose of radiation during hind limb unloading impairs the recovery of articular cartilage when returned to full weight-bearing conditions.

Shao L. Li H. Feng W. Chang J. Lou Y. Pathak R. Hauer-Jensen M. Meng A. Zhou D.

[Mitigation of Total Body Irradiation-Induced Long-Term Bone Marrow Injury and Genomic Instability via Induction of Selective Depletion of Senescent Hematopoietic Stem Cells and Expansion of Normal Hematopoietic Stem Cells](#) [#0052]

We describe mitigation of radiation-induced late bone marrow injury.

Tuesday, January 13, 2015
POSTER SESSION A: MUSCLE
4:30 p.m. Exhibit Hall B

Broxterman R. M. Ade C. J. Wagner W. J. Wilcox S. L. Craig J. C. Warren S. Schinstock D. Barstow T. J.
[Development of an Offload Hoist System for the Simulation of Microgravity during Activity](#) **[#0054]**
We have successfully developed an offload hoist system to simulate the gravitational environments of future mission destinations.

Bruinsma D. F. M. Bernal C.
[Advanced Exercise Concepts Hardware Evaluation of the Next-Generation Resistive Exercise Device](#) **[#0055]**
The NGRED (a servomotor-based advanced exercise concept for use in microgravity) was qualitatively and quantitatively evaluated by 11 subjects and crew members with favorable results.

Ploutz-Snyder L. L. Buxton R. E. De Witt J. K. Williams M. E. Hanson A. M. Peters B. T. Scott Pandorf M. M. Sibonga J. D.
[Retrospective Analysis of In-Flight Exercise Loading and Physiologic Outcomes](#) **[#0056]**
Retrospective analysis of exercise data as it relates to bone muscle changes during space flight.

Deymier-Black A. C. Schwartz A. G. Cai Z. Genin G. M. Thomopoulos S.
[Effect of Unloading on the Structure and Organization of Mineral Crystals at the Tendon-to-Bone Attachment](#) **[#0057]**
Mineral orientation, strain, and crystal size measured in the supraspinatus tendon-to-bone attachment site, via nano X-ray diffraction, were found to vary across the attachment as well as between normal and Botulinum Toxin unloaded animals.

Diaz A. Young L. R.
[Artificial Gravity and Exercise on the MIT Compact-Radius Centrifuge](#) **[#0058]**
A new Compact Radius Centrifuge (CRC) platform was designed and built at MIT to study AG combined with ergometer exercise. Results of the first human experiment will be presented and discussed.

English K. L. Buxton R. E. Crowell J. B. Goetchius E. Guined J. R. Hoellen D. Nieschwitz B. Ryder J. W. Seponski C. A. Ploutz-Snyder R. J. Ploutz-Snyder L. L.
[Correlations Between Clinical and Functional Muscle Outcomes: Implications for Spaceflight](#) **[#0059]**
Correlations between clinical and functional muscle outcomes are modest, suggesting the need for new measures that are predictive of functional task performance.

Hanson A. M. Peters B. T. Newby N. Ploutz-Snyder L.
[Evaluation of the XSENS Force Shoe on ISS](#) **[#0060]**
We describe analysis of early data from XSENS Force Shoe on ISS.

Kendrick D. Newman D.
[The Gravity Loading Countermeasure Skinsuit](#) **[#0061]**
The Gravity Loading Countermeasure Skinsuit is a passive, wearable countermeasure garment that can be employed to combat physiological deconditioning.

Newby N. Caldwell E. Sibonga J. Ploutz-Snyder L.

[*ISS Squat and Deadlift Kinematics on the Advanced Resistive Exercise Device* \[#0062\]](#)

To help trainers and other exercise personnel better assess squat and deadlift form, a tool was developed that removes the vibration isolation system motion and creates a stick-figure video of the exerciser.

Weaver A. S. Funk J. H. Funk N. W. Sheehan C. C. Humphreys B. T. Perusek G. P.

[*Parabolic Flight Investigation for Advanced Exercise Concept Hardware, Hybrid Ultimate Lifting Kit \(HULK\)* \[#0063\]](#)

We summarize results of a parabolic flight campaign with humans in the loop on this Advanced Exercise Concept.

Scott J. M. Hackney K. J. Downs M. E. Martin D. Caine T. Matz T. Babcock L. Goetchius E. Buxton R. Ryder J. Ploutz-Snyder L.

[*Panoramic Ultrasound Imaging for Quantification of Disuse-Induced Muscle Atrophy* \[#0065\]](#)

Panoramic US imaging is a valid alternative to MRI that could be used to characterize changes in upper and lower leg muscle CSA.

Shimkus K. L. Lee Y. Savio E. M. Wiggs M. P. Macias B. R. Deaver J. W. Hord J. M. Lima F. Shirazi-Fard Y. Greene E. S. Braby L. A. Hogan H. A. Lawler J. M. Bloomfield S. A. Fluckey J. D.

[*Radiation Exacerbates Alterations to Skeletal Muscle Morphology Subjected to Simulated Lunar Environment* \[#0064\]](#)

We describe combined effects of simulated Lunar gravity and GCR alter skeletal muscle morphology.

Tuesday, January 13, 2015
POSTER SESSION A: EXTRAVEHICULAR ACTIVITY
4:30 p.m. Exhibit Hall B

Conkin J. Feiveson A. H. Gernhardt M. L. Norcross J. R. Wessel J. H. III

[*Designing an Exploration Atmosphere Prebreathe Protocol* \[#0067\]](#)

We present a plan to validate a new prebreathe protocol.

Duda K. R. Vasquez R. A. Middleton A. J. Hansberry M. L. Newman D. J. Jacobs S. E. West J. J.

[*Variable Vector Countermeasure Suit \(V2Suit\) for Space Exploration* \[#0071\]](#)

We describe a wearable sensing and actuation system for providing resistance to movement during 0-G living and working.

Dungan L. K. Shy C. Valle P.

[*Generating a Reduced Gravity Environment on Earth* \[#0303\]](#)

The Active Response Gravity Offload System (ARGOS) is the newest and most realistic gravity offload simulator.

Foster P. P. Pollock N. W. Conkin J. Dervay J. P. Caillot N. Chhikara R. S. Vann R. D. Butler B. D. Gernhardt M. L.

[*Skeletal Muscle Microcirculation and Extra-Vehicular Activity Preparation* \[#0309\]](#)

In addition to nitrogen tissue washout, another unknown exercise-induced effect is further enhancing the DCS protection, possibly mediated via the anti-inflammatory effect of exercise, gas micronuclei reduction, NO pathways, or other molecular mechanisms.

Hilbert A. Bertrand P. Reyes S. Anderson A. Newman D. J.

[*Human-Spacesuit Interaction: Experimental Results and Future Testing* \[#0320\]](#)

We discuss results and future test plans of a human subjects experiment involving a suite of sensors placed in the pressurized suit environment to evaluate human-spacesuit interaction and assess the potential for injury.

Holschuh B. Newman D.

[*Mechanical Counter-Pressure Space Suit Design Using Active Materials* \[#0322\]](#)

We present the modeling and development of novel MCP suit components using active materials that achieve physiological requirements for extravehicular activity.

Holschuh B. Gatto G. Levriano L. Bretl K. Newman D.

[*Active Material Technology Development for Mechanical Counter-Pressure Space Suits Using 3D-Printed Components* \[#0072\]](#)

We present a summary of several ongoing research efforts to develop actively controlled, 3D-printed MCP space suit systems for use in future planetary exploration missions.

Norcross J. R. McFarland S. M.

[*Moving Towards Metabolic Assessment of Suited Mobility Using Functional Tasks* \[#0353\]](#)

Methods for assessing spacesuit mobility using metabolic cost of functional tasks will be described.

Vadhavkar N. A. Newman D. J.

[*Modular Portable Life Support System \(PLSS\) for Advanced Suit Concepts* \[#0399\]](#)

Mechanical counter pressure (MCP) suits allow for a simpler, lighter portable life support system (PLSS).

Vanegas M. Stirling L.

[*Characterization of Sensor Placement Variability on the Human Body upon Repeated Donnings and Doffings*](#) [#0401]

Relating anthropometry, mounting configurations, mounting locations, and don and doff times to IMU placement variability on the human body for the development of quick don and doff sensor suites that can be reliably used by a non-expert for real-time decision making.

Wessel J. H. III Norcross J. R. Bekdash O.

[*Historical Evidence from the Shuttle Era towards the Exploration Atmosphere*](#) [#0409]

10.2 Staged Shuttle missions are examined for comparison purposes to the Exploration Atmosphere since they have similar mild hypoxia conditions.

Tuesday, January 13, 2015
POSTER SESSION A: OCCUPANT PROTECTION
4:30 p.m. Exhibit Hall B

Newby N. Somers J. T. Wells J.

[*Soyuz Landing Risk Characterization*](#) **#0074**

An accurate estimation of the occurrences of injury during Soyuz landings will be determined using data contained in NASA flight medicine databases and supplemented with data collected from crewmembers, flight surgeons, Russian and international partner sources.

Wells J. Somers J. T. Newby N.

[*THOR Injury Metric Development*](#) **#0407**

We describe methods of injury metric development for the Test Device for Human Occupant Restraint (THOR) Anthropomorphic Test Device (ATD).

Tuesday, January 13, 2015
POSTER SESSION A: COMPUTATIONAL MODELING
4:30 p.m. Exhibit Hall B

Gallo C. A. Thompson W. K. Lewandowski B. E. Humphreys, B. T. Funk J. H. Funk N. H. Weaver A. S.
Perusek G. P. Sheehan C. C. Mulugeta L.

[Computational Modeling Using Opensim to Simulate a Squat Exercise Motion \[#0311\]](#)

Computational modeling of a test subject performing a squat exercise using an exercise device prototype for space flight.

Lewandowski B. E. Pennline J. A. Thompson W. K. Humphreys B. T. Ryder J. W. Ploutz-Snyder L. L.
Mulugeta L.

[Development of the NASA Digital Astronaut Project Muscle Model \[#0338\]](#)

The work completed to date on the development of the Digital Astronaut Project muscle model will be described and discussed.

Nelson E. S. Myers J. G. Mulugeta L. Vera J. Raykin J. Feola A. Gleason R. Samuels B. Ethier C. R.

[Numerical Modeling of Ophthalmic Response to Space \[#0350\]](#)

In this work, we describe a method for computing IOP, based on changes to ocular blood flow and retrolaminar pressure, and the integration of this model with its sister models of the cardiovascular and central nervous systems.

Werner C. R. Mulugeta L. Myers J. G. Pennline J. A.

[Integration of a Finite Element Model with the DAP Bone Remodeling Model to Characterize Bone Response to Skeletal Loading \[#0408\]](#)

A Finite Element Model was developed and implemented into a bone remodeling model.

Price R. Gady S. Heinemann K. Nelson E. S. Mulugeta L. Ethier C. R. Samuels B. C. Feola A. Vera J.
Myers J. G.

[An Integrated Model Of The Cardiovascular And Central Nervous Systems For Analysis Of Microgravity Induced Fluid Redistribution \[#0455\]](#)

This presentation will focus on the development and testing of this integrated computational model that simulates the behavior of pressures, volumes, and flows within the CVS and CNS.

Tuesday, January 13, 2015
POSTER SESSION A: SPACE RADIATION DEGENERATIVE
4:30 p.m. Exhibit Hall B

Sasi S. P. Muralidharan S. Park D. Wage J. Rahimi L. Yan X. Goukassian D. A.

[*Ionizing Particle Radiation Induce Cyclical Increase in Bone Marrow-Derived Endothelial Progenitor Cell Apoptosis*](#) **[#0075]**

Our data indicates that early, within hours, increase in BM-EPC apoptosis may be the effect of direct IR exposure, whereas late increase in apoptosis and decrease in proliferation could be a result of non-targeted effects in the cells that were not traversed by IR directly.

Sasi S. P. Lee J. Mehrzad R. Morgan J. P. Gee H. Song J. Rahimi L. Enderling H. Yan X. Goukassian D. A.

[*Different Sequence of Fractionated Proton and Single Low Dose Iron Radiation Induce Divergent Biological Responses in the Heart*](#) **[#0085]**

Our findings in mixed ion fractionated/sequential IR groups strongly suggest dramatically different biological responses due to diverse sequence and fractionation of 1H vs. a single 56Fe-IR.

Sasi S. P. Muralidharan S. Park D. Zuriaga M. A. Hirschi K. Walsh K. Yan X. Goukassian D. A.

[*Particle Radiation Induced Long-Lasting Cyclical Decreases in the Number of Bone Marrow Progenitor Cells is Associated with Upregulation of Several Pluripotent Stem Cell Markers Over Ten Months Post-IR*](#) **[#0087]**

The long-lasting and cyclical effects of IR on the BM E- and L-MPPs after a single 1H or 56Fe IR dose suggests the presence of prolonged and non-targeted effects in BM milieu, that occur in cells that were not traversed by IR, rather induced by signals from IR cells.

Coleman M. Sasi S. P. Onufrak J. Natarajan M. Manickam K. Peterson L. E. Yan X. Goukassian D. A.

[*Delayed Cardiomyocyte Response to Total Body Heavy Ion Particle Radiation Exposure – Identification Of Regulatory Gene Networks*](#) **[#0451]**

Understanding of complex processes that take place in CMs after insults caused by IR, such as proton and HZE particles, is paramount to our understanding of CV system function during and after exploration-type space missions.

Yan X. Sasi S. P. Gee H. Lee J. Yang Y. Mehrzad R. Onufrak J. Song J. Enderling H. Agarwal A. Rahimi L. Morgan J. Wilson P. F. Carrozza J. Walsh K. Kishore R. Goukassian D. A.

[*Low Dose Particle Radiation-Associated Degenerative Cardiovascular Risks during Aging*](#) **[#0452]**

With increased use of proton and carbon ion radiotherapy and concerns about space radiation exposures to astronauts on future long-duration exploration-type missions, the long-term effects and risks of low-dose charged particle irradiation (IR) on the CV system must be better evaluated.

Yan X. Sasi S. P. Gee H. Lee J. Yang Y. Mehrzad R. Onufrak J. Song J. Enderling H. Agarwal A. Rahimi L. Morgan J. Wilson P. F. Carrozza J. Walsh K. Kishore R. Goukassian D. A.

[*Radiation-Associated Long-Term Cardiovascular Risks for Recovery after Acute Ischemia*](#) **[#0453]**

Our data in radiation in aging mice with an adverse CV event (i.e., ischemia) suggest that low dose exposures of HZE particles (56Fe) may have significant impact on the CV system during an ischemic myocardial event and it is conceivable that low-dose 1H-IR may have some type of preconditioning effect that is reminiscent of ischemic preconditioning in the heart.

Galicia E. Palma E. Bonner W. M. Martin O. A. Griko Y. V.

[*Beneficial Effects of Metabolic Suppression for Adaptation and Survival in Space Environment* \[#0086\]](#)

Metabolic suppression in animals and humans will profoundly reduce their sensitivity to the damaging effects of radiation and microgravity

Nzabarushimana E. Miousse I. R. Shao L. Chang J. Allen A. R. Latendresse J. R. Turner J. Stewart B. Raber J. Nelson G. Koturbash I.

[*Epigenetic Effects of Exposure to Low Doses of High-LET Radiation in the Mouse Lung* \[#0076\]](#)

Exposure to high-LET radiation can result in significant epigenetic alterations detected in the mouse lung short (4 weeks) and long (22 weeks) term after exposure.

Chanda D. Gupta K. Kabarowski J. H. Kucik D. F.

[*56Fe Irradiation of Wild Type C57BL/6 Mice Results in Increased Adhesiveness of Aortic Endothelium* \[#0077\]](#)

Whole body 56Fe irradiation of wild type mice at space-relevant doses results in increased adhesiveness of aortic endothelium, an early event in atherosclerosis.

Mao X. W. Song S. K. Nelson G. A.

[*High LET \(56\) Fe Ion Irradiation Induces Microvessel and Structural Damage in Rat Retina* \[#0078\]](#)

Iron ion radiation produces significant cell loss and histological changes in the rat retinal microvasculature.

Miousse I. R. Shao L. Chang J. Feng W. Wang Y. Allen A. R. Turner J. Stewart B. Raber J. Zhou D. Koturbash I.

[*Exposure to Low Dose 56Fe Irradiation Induces Long-Term Epigenetic Alterations in Mouse Bone Marrow Hematopoietic Progenitor and Stem Cells* \[#0079\]](#)

Low doses of 56Fe resulted in significant changes in DNA methylation, methylation machinery, and reactivation of repetitive elements in murine hematopoietic stem and progenitor cells.

Narayanan A. Shirazi-Fard Y. Schreurs A. S. Globus R. K. Delp M. D. Cromer W. Zawieja D. C.

[*Hindlimb Unloading and Space-Relevant Radiation Exposure in Mice Induces Gut Inflammatory Modulation* \[#0080\]](#)

We describe preliminary data on how radiation and hindlimb unloading effects the lymphatics and immune function.

Over S. E. Myers J. G.

[*Assessing Acute Radiation Risk Outside Earth Orbit for the Integrated Medical Model* \[#0081\]](#)

Due to the general lack of data outside low Earth orbit, the radiation module in the Integrated Medical Model is especially important for assessing radiation risk, and this study addresses acute radiation risk, simulating Mars transits proposed for short- and long-stay missions.

Pathak R. Ghosh S. P. Hauer-Jensen M.

[*Vitamin-E Analog Gamma Tocotrienol \(GT3\) Suppresses Radiation-Induced Cytogenetic Damage in Mice* \[#0082\]](#)

Vitamin E analog gamma tocotrienol pre-treatment suppressed radiation-induced cytogenetic damage in human endothelial cells and mouse bone marrow cells

Chang J. Feng W. Wang Y. Allen A. R. Turner J. Stewart B. Hauer-Jensen M. Raber J. Zhou D. Shao L.

[*The Early Effect of Whole Body 28Si Irradiation on Hematopoietic Stem Cells in Mice* \[#0083\]](#)

Exposure to low doses of 28Si irradiation can lead to HSC damage in mice.

Tuesday, January 13, 2015
POSTER SESSION A: SPACE RADIATION CANCER I
4:30 p.m. Exhibit Hall B

Aravindan N. Natarajan M.

[*Tissue Dependent Molecular Basis for Neoplastic Transformation by 56Fe Ion Particle Radiation Exposure*](#) [#0088]

In this study we demonstrated that high-LET radiation instigate tissue-dependent deregulation of oncotargets and further imply that radiogenic cell transformation within a tissue may involve a complex network of events that are orchestrated in unison by multiple oncotargets.

Bozeman R. G. Luitel K. Kasani A. Delgado O. Barron S. Shay J. W.

[*Biological Effects on Lung Cancer Susceptible K-rasLA1 Mice Irradiated with an Acute Dose of Protons Compared to Protracted Protons Provided as a Solar Particle Event Simulation*](#) [#0090]

Acute, SPE, and X-ray irradiation may lead to increased tumor formation by activating various mitogenic signaling pathways.

Suman S. Fornace A. J. Jr. Datta K.

[*Persistent Alterations of Autophagy in Mouse Intestine after Exposure to 56Fe Radiation*](#) [#0092]

We describe space radiation and autophagy.

Ding L. -H. Yu Y. Ullrich R. L. Weil M. M. Ray A. Story M. D.

[*Gene Expression and miRNA Signature of Radiation-Induced Murine Hepatocellular Carcinoma in Tissue and in Plasma*](#) [#0093]

We discuss gene expression and miRNA signatures identified in HCC tissues and plasma.

El-Ashmawy M. A. Wright W. E. Shay J. W.

[*Organotypic Culture in Three-Dimensions Protects Against Radiation-Induced Cancer Progression*](#) [#0094]

Cell culture conditions are crucial for responses to radiation and can affect cancer progression.

Farin A. Manzo N. Stripp B.

[*Trp53 Dependent Clonal Expansion of Airway Epithelial Progenitor Cells Following High-LET Radiation Exposure*](#) [#0095]

Exposure to both low- and high-LET radiation leads to progenitor cell depletion and lung tissue remodeling in a p53-dependent manner.

Gao B. Peters-Hall J. R. LaRanger R. Coquelin M. Wei Q. Wright W. E. Minna J. D. Shay J. W.

[*Establishing Accurate Three-Dimensional Human Airway Cellular Models to Study Space Radiation Damage in the Lung*](#) [#0096]

We describe 3D cell models for the study of space radiation damage in lung.

Gonzalez-Junca A. Zapata-Rodriguez E. Pellicciotta I. Barcellos-Hoff M. H.

[*HZE Radiation Effects on Malignant Progression in Human Epithelial Cells*](#) [#0097]

Radiation-induced TGF-beta elicits an EMT process that is a critical step for early carcinogenesis.

Hada M.

[Targeted and Non-Targeted Effects on Chromosome Aberrations in Human Fibroblasts Exposed to Very Low Doses of High-LET Radiation](#) [#0098]

Non-targeted effect contribute to chromosome aberrations induced by high-LET radiation.

Jangiam W. Tungjai M. Gordon C. Honikel L. Rithidech K. N.

[Induction of Chronic Inflammation and Aberrant Patterns of Global DNA Methylation in Somatic and Germinal Tissues of CBA/CAJ Mice Exposed Whole Body to 48Ti Ions](#) [#0099]

We evaluated the biological effects of 1 GeV/n 48Ti ions (LET=107 keV/μm), delivered at 1 cGy/min, on the lung (the somatic tissue) and the testis (the germinal tissue) of exposed CBA/CaJ mice.

Jella K. K. Li Z. Dynan W. S.

[Exosomes as Mediators of Radiation Induced Non-Targeted Effects](#) [#0100]

We discuss non-targeted effects.

Kim S. B. Bozeman R. Kaisani A. Barron S. Zhang L. Richardson J. A. Wright W. E. Shay J. W.

[Characterizing the Biological Effects of Solar Particle Event and HZE Particle Exposures in a Colorectal Cancer Susceptible Mouse Model](#) [#0101]

We discuss the colon cancer risk of space radiation.

Castle K. D. Lee C. L. Sachdeva M. Moding E. J. Luo L. Kirsch D. G.

[Defining the Role of miR-182 in Tumorigenesis after Exposure to Space Radiation](#) [#0102]

Utilizing a mouse model of radiation-induced lung cancer, we are investigating whether miR-182 functions following radiation to regulate lung tumor development by altering Fbxw7 levels.

Castle K. D. Moding E. J. Lee C. L. Reinsvold M. Williams N. Luo L. Ma Y. Kirsch D. G.

[Radiation Enhances Lung Tumor Development in a Mouse Model of HZE-Induced Lung Cancer](#) [#0119]

Exposure to a single dose or fractionated doses of X-rays or 56Fe ions increases the incidence and alters the spectrum of lung tumors in a mouse model of small cell lung cancer.

Loucas B. D. Cornforth M. N.

[The Production of Chromosome Exchanges By Low-Energy 7Li Ions: A Base Line for Track Interaction of HZE Particles in the Chromosome Exchange Breakpoint Dose Response](#) [#0103]

Low energy Li ions are likely to produce a linear dose response for chromosome exchange breakpoints providing a base for comparison with higher energy HZE ions whose dose response is likely to be curved.

Mishra B. Ortiz L. Luderer U.

[Charged Iron Particle Exposure Increases Apoptosis and Depletes Ovarian Follicles in Mice](#) [#0104]

To best protect the health of women astronauts, it is important to understand whether space radiation has similar effects on the ovary as the types of radiation exposure that are common on earth.

Ouyang H. Illa-Bochaca I. Mao J. -H. Barcellos-Hoff M. H.

[HZE Non-Targeted Effects on Trp53 Nullizygous Mammary Carcinogenesis in Aged Mice](#) [#0108]

HZE promotes Trp53 null mammary carcinogenesis, potentially via inflammation, in aged mice.

Park S. Ding L. H. Yeshitla S. A. Zhang Y. Wu H. Minna J. D. Story M. D.

[The Molecular Characterization of Long Term Cultured Soft Agar Clones Post Irradiation](#) [#0109]

Long term cultured soft agar clones post irradiation were characterized.

Sridharan D. M. Enerio S. Chen J. Chapell L. Pluth J. M.

[*Influence of Age on Cancer Risk Markers Post High LET Exposure* \[#0120\]](#)

We describe using mammary epithelial strains of various ages to define cancer risk of HZE exposures.

Rampersad R. Onaitis M.

[*Fractionated High LET Iron Irradiation Effects on K-RasG12D-Induced Tumor Progression* \[#0110\]](#)

Fractionated high LET iron irradiation increases tumor progression in a K-ras G12D induced lung tumor model.

Tuesday, January 13, 2015
POSTER SESSION A: EXPLORATION MEDICAL CAPABILITY
4:30 p.m. Exhibit Hall B

Bircher W. Hawks J. Farritor S. Oleynikov D.

[*Design of Robust Robot for Minimally Invasive Surgery in Space* \[#0122\]](#)

We designed a robust miniature surgical robots for repeated use in remote locations, such as space.

Chan E. Y. Eames D. Bauer B. Kalashnikov M. Bae C. Bell A. Perusek G. Nelson E. S.

[*Continuous Wireless Vitals with the rHEALTH X Technology* \[#0123\]](#)

We developed a prototype wireless vitals patch.

Henderson S. E. Taggart R. M. Jarit P. Lewis G. K. Jr.

[*Sustained Acoustic Medicine for Improved Recovery from Tendinitis: A Pilot Study* \[#0124\]](#)

Results from this pilot study suggest that sustained acoustic medicine reduces pain from tendinitis and increases tendon strength.

Ivkovic V. DiPasquale D. Hu G. Zhang Q. Spielmann G. Strangman G.

[*Monitoring of Cerebral and Systemic Physiology in Parabolic Flight* \[#0125\]](#)

The parabolic flight study demonstrated the suitability of NINscan 4a for multimodal physiologic monitoring in spaceflight analog operational setting, where it reliably measured changes in scalp and cerebral hemodynamics, heart rate, and changes in gravitational vectors, and was advanced to TRL 6.

Langer M. D. Taggart R. Ortiz R. Lewis G. K. Jr.

[*Sustained Acoustic Medicine for the Treatment of Osteoarthritis of the Knee: A Randomized, Placebo Controlled Clinical Study* \[#0126\]](#)

A portable, wearable therapeutic ultrasound device is investigated for treatment of osteoarthritis of the knee.

Legband N. D. Buesing K. L. Borden M. A. Terry B. S.

[*Surgical Options in Space: Development of a Closed-Loop Peritoneal Membrane Oxygenator for Acute Respiratory Distress Syndrome* \[#0127\]](#)

A closed loop peritoneal oxygenator has been designed with the goal of safe and effective oxygen delivery in space missions.

Olson S. L. Hussey S. W.

[*Multipurpose Oxygen Concentrator for Future Exploration Missions* \[#0128\]](#)

A modular, portable oxygen concentrator can not only provide high flow rate oxygen therapy to an ill crewmember, but can also be used in a distributed mode, each at lower flow rates, and used for multiple crewmember's EVA pre-breathing or for airway protection in the event of a fire or toxic spill.

Pantalos G. Crigger M. Kennedy T. Joseph E. Snider J. Montidoro T. Burgess J. Antaki J.

[*Parabolic Flight Evaluation of a Hermetic Surgical System for Reduced Gravity* \[#0129\]](#)

We are developing an Aqueous Immersion Surgical System (AISS) which is a clear enclosure to permit minimally invasive and open surgical procedures within a localized aqueous environment.

Simon J. C. Dybing S. N. Cunitz B. W. Sapozhnikov O. A. Bailey M. R.

[Twinkling in Space: Kidney Stone Detection with Ultrasound \[#0130\]](#)

Enhancing the color Doppler ultrasound twinkling artifact, which selectively highlights hard objects with rapidly changing color, could improve kidney stone detection in space.

Siu K. Best B. J. Kim J. W. Oleynikov D. Ritter F. E.

[Surgical Skill Learning in Space Using an Adaptive Virtual Reality Trainer \[#0131\]](#)

Surgical skills can be learned and maintained optimally, and modeled properly using our theory-based adaptable virtual reality trainer

Zhang Q. Ivkovic V. Hu G. Strangman G. E.

[Improving Differential Pathlength Factor \(DPF\) Estimation for Better Quantitative Accuracy in NIRS Data Analysis \[#0132\]](#)

For near infrared spectroscopy-based wearable functional neuroimaging, good estimation of differential path length (DPF) factor is essential for quantitative accuracy; we have developed novel methods to improve DPF estimation for NIRS analysis.

Zuniga J. M. Katsavelis D. Carson A. Petrykowski M. Ploutz-Snyder L.

[Cyborg Beast: A Low-Cost 3D-Printed Prosthetic Hand for Children with Upper-Limb Reduction Deficiency \[#0133\]](#)

The purpose of the present investigation was to examine improvement in perceived changes in quality of life, daily usage, and activities performed with our low-cost prosthetic hand named Cyborg Beast.

Tuesday, January 13, 2015
POSTER SESSION A: BEHAVIORAL HEALTH AND PERFORMANCE I
4:30 p.m. Exhibit Hall B

Goel N. Abel T. Basner M. Bhatnagar S. Dinges D. Kirkpatrick J. Weljie A.

[*Biomarkers as Predictors of Resiliency and Susceptibility to Stress in Space Flight*](#) **[#0026]**

The aim of this project is to validate biomarkers as predictors of susceptibility or resiliency to the neurobehavioral effects of stress and sleep loss for use in space flight in short-duration and long-duration analogs.

St. Hilaire M. A. Rahman S. A. Sullivan J. P. Kristal B. S. Quackenbush J. Duffy J. F. Barger L. K. Czeisler C. A. Lockley S. W.

[*Development and Testing of Biomarkers to Determine Individual Astronauts' Vulnerabilities to Behavioral Health Disruptions*](#) **[#0027]**

This project will identify candidate biomarkers to predict neurocognitive and psychological responses to sleep deprivation and circadian misalignment.

Wednesday, January 14, 2015
CARDIOVASCULAR
8:00 a.m. Grand Ballroom A & B

Chairs: **Michael Stenger**
 Benjamin Levine

- 8:00 a.m. Shea S. A. Barr D. A. Butler M. P. Rueger M. Scheer F. A. J. L. Ollmann A. Mehta S. K.
 Pierson D. L. Quiriarte H. Crucian B. E.
 [Cardiovascular Vulnerabilities Caused by Circadian and Sleep Stressors Commonly Encountered during Space Missions](#) **[#0265]**
 We will present data regarding the hemodynamic, autonomic, cardiovascular, and endocrine outcomes affected by circadian misalignment, with and without sleep loss.
- 8:18 a.m. Ade C. J. Charvat J. M. Gadbury G. L. Barstow T. J.
 [Determining the Effect of Space Flight on the Incidence of Cardiovascular Risk Factors and Disease](#) **[#0266]**
 The primary aim was to use data from the LSAH (Longitudinal Surveillance of Astronaut Health) to determine if the rate of incidence for a "cardiovascular disease event" is greater in astronauts compared to matched controls.
- 8:36 a.m. Natarajan M. Krishnan M. Sureshkumar M. A. Zheng H. Mohan S.
 [Inflammatory Response of Vascular Endothelium Exposed to Space Radiation](#) **[#0263]**
 In this study we examined, in vivo, the space radiation-mediated alterations of vasomotor function, accelerated atherosclerotic lesions and impaired endothelial progenitor cell (EPCs)-dependent repair processes.
- 8:54 a.m. Radford N. B. DeFina L. F. Barlow C. E. Lakoski S. G. Leonard D. Paixao A. R. M. Khera A. Levine B. D.
 [Progression of Coronary Artery Calcification Score and Risk of Incident Cardiovascular Disease](#) **[#0262]**
 The study objectives are to determine the relative contributions of baseline coronary artery calcification (CAC), follow-up CAC, CAC progression rates and overall risk factor status on risk of incident cardiovascular disease events.
- 9:12 a.m. Popovic Z. B. Negishi K. Borowski A. Martin D. S. Bungo M. F. Levine B. D. Thomas J. D.
 [Impact of Spaceflight on Left Ventricular Systolic and Diastolic Function: Analysis from the Integrated Cardiovascular Study](#) **[#0264]**
 In order to better define the impact of long-term spaceflight on cardiovascular function, NASA has supported the Integrated Cardiovascular Study, with detailed echocardiographic examinations conducted before, during, and after flight.
- 9:30 p.m. BREAK

Wednesday, January 14, 2015
BEHAVIORAL HEALTH AND PERFORMANCE COUNTERMEASURES
8:00 a.m. Grand Ballroom C

Chairs: **Jason Schneiderman**
 Diana Arias

- 8:00 a.m. Tannenbaum S. I. Mathieu J. E. Alliger G. M. Donsbach J. S. Cerasoli C. P.
 [*Team-Led Debriefs during Missions: A Countermeasure for Sustaining Team Resilience and Effectiveness* \[#0239\]](#)
 Studying the usability and effectiveness of a team-led debriefing tool in the HERA and NEEMO analogs.
- 8:15 a.m. Fischer U. Mosier K.
 [*Communication Protocols to Support Space-Ground Collaboration during Long-Duration Exploration Missions* \[#0238\]](#)
 We summarize research investigating the effectiveness of communication protocols in supporting time delayed communication.
- 8:30 a.m. Davis C.M. Guida P. M. Hienz R. D.
 [*Using the Rodent Psychomotor Vigilance Test as a Tool for Understanding Radiation-Induced Impairments in Behavioral Performance & CNS Function* \[#0241\]](#)
 Data is presented that supports the use of the rodent psychomotor vigilance test as an animal model for characterizing neurobehavioral deficits following exposure to space radiation.
- 8:45 a.m. Wu P. Morie J. Chance E. Haynes K. Wall P. Hamell J. Ladwig J. Ott T.
 [*Virtual Worlds as a Countermeasure for Social and Sensory Monotony* \[#0240\]](#)
 We describe use of persistent virtual worlds to combat negative effects of social and sensory monotony.
- 9:00 a.m. Feltz D. L. Ede A. Winn B. Pivarnik J. M. Kerr N. L. Jeffery W. Deere S. Samendinger S.
 Max E. J. Hill C. R. Ploutz-Synder L.
 [*Cyber Partners in Exergames: Boosting Motivation to Exercise Harder* \[#0236\]](#)
 The purpose of the current project is to use group dynamics principles to improve the motivation of astronauts to exercise at higher intensities through the use of an exercise video game (exergame).
- 9:15 a.m. Q&A
- 9:30 p.m. BREAK

Wednesday, January 14, 2015
EXTRAVEHICULAR ACTIVITY
8:00 a.m. Yacht

Chair: Jason Norcross

- 8:00 a.m. Conkin J. Abercromby A. F. Dervay J. P. Feiveson A. H. Gernhardt M. L. Norcross J. R.
Ploutz-Snyder R. Wessel J. H. III
[*Hypobaric Decompression Sickness Treatment Model: Final Report* \[#0070\]](#)
Describing the NASA hypobaric DCS treatment model.
- 8:20 a.m. Pollock N. W. Natoli M. J. Conkin J. Wessel J. H. III Gernhardt M. L.
[*Ambulation Increases Decompression Sickness in Spacewalk Simulations* \[#0068\]](#)
We evaluated ambulation exercise associated with simulated spacewalk, finding decompression sickness to be higher when ambulation was conducted at both preflight and spacesuit pressures but, tentatively, not when at preflight pressure alone (4/20 & 1/11 vs. 0/45, p=0.004 and p=0.098; Fisher Exact).
- 8:40 a.m. Reid C. R. Benson E. England S. Charvat J. Norcross J. R. McFarland S. M. Rajulu S.
[*High Performance EVA Glove Collaboration: Glove Injury Data Mining Effort* \[#0069\]](#)
EVA glove-hand injury-causation data mining investigation
- 9:00 a.m. Newman D. J. Anderson A. Bertrand P. Diaz A. Hilbert A. Hoffman J. Kracik M. Reyes S. Trotti G.
[*Conclusions and Paths Forward in Space Suit Injury Countermeasures* \[#0066\]](#)
We present our findings to analyze astronaut injury incurred while working in the space suit through a many tiered approach: Statistical analysis, Musculoskeletal modeling, Experimental evaluation, and Protective device development.
- 9:20 a.m. DISCUSSION
- 9:30 a.m. BREAK

Wednesday, January 14, 2015
ADVANCED ENVIRONMENTAL HEALTH/ADVANCED FOOD TECHNOLOGY
8:00 a.m. Galleon I

Chairs: C. Mark Ott
Grace Douglas

- 8:00 a.m. Castro S. L. Ott C. M. Douglas G. L.
[*Probiotics in the Space Food System: Delivery, Microgravity Effects, and the Potential Benefit to Crew Health* \[#0229\]](#)
This work assesses delivery methods and the effect of microgravity on a probiotic strain to indicate the potential to utilize probiotics as a noninvasive countermeasure to crew immune dysregulation in spaceflight.
- 8:15 a.m. Voorhies A. Ott C. M. Mehta S. K. Torralba M. Pierson D. L. Lorenzi H. A.
[*Study of the Impact of Long-Term Space Travel on the Astronauts' Microbiome* \[#0230\]](#)
We will collect samples from skin, nares, mouth, feces, saliva and blood from nine astronauts before, during and after a mission to the International Space Station to investigate the impact of space travel on the astronauts' microbiome and its association with stress levels and immune response.
- 8:30 a.m. Smith S. M. Heer M. A. Zwart S. R.
[*Nutritional Status Assessment \(SMO 016E\)* \[#0231\]](#)
Results from the Nutrition SMO project.
- 9:30 a.m. BREAK

Wednesday, January 14, 2015
PHYSICS AND SPACE RADIATION TECHNOLOGIES
8:00 a.m. Galleon II & III

Chairs: **John Norbury**
 Lawrence Heilbronn

- 8:00 a.m. Zeitlin C. Hassler D. M. Wimmer-Schweingruber R. F. Ehresmann B. Koehler J. Guo J.
 Rafkin S. C. R. Reitz G. Posner A. Boettcher S.
 [Results from the MSL-RAD Investigation on Curiosity](#) **#0415**
 We report recent measurements from the RAD instrument aboard the Curiosity rover on Mars.
- 8:20 a.m. Wilson J. W. Slaba T. C. Badavi F. F. Reddell B. D. Bahadori A. A.
 [Space Radiation Transport Code Development: 3DHzETRN](#) **#0436**
 3D transport procedures developed for NASA radiation transport code, HZETRN, are discussed.
- 8:30 a.m. La Tessa C. Sivertz M. Rusek A.
 [Fragmentation of Light Ions in Elemental and Composite Targets](#) **#0334**
 Experimental characterization of fragmentation of light projectiles in various target
- 8:40 a.m. Heilbronn L. H. Tsai P. Cloudsley M. Norbury J. W. Blattnig S. R. Slaba T. C. Sheu R. -J.
 [Measurements of Light Ion Data Relevant to Shielding in Space](#) **#0318**
 Data will be presented from accelerator-based measurements of light ion data relevant to shielding in space.
- 8:50 a.m. Badavi F. F. Santos Koos L. M.
 [Validation of the New Trapped Proton Model AP9 at Low Earth Orbit](#) **#0278**
 There exist a number of models to define the intensities of the trapped particles during the solar quiet and active times.
- 9:00 a.m. Sandridge C. A.
 [OLTARIS – Overview and Recent Updates](#) **#0376**
 This poster/presentation will summarize capabilities and updates to the OLTARIS website.
- 9:10 a.m. Lee K. T. Barzilla J.E. Wilson P. Davis A. Zachman J.
 [Creation of Workflow to Use Existing ISS CAD Models for Radiation Shielding Analysis](#) **#0283**
 The Direct Accelerated Geometry - United (DAGU) project integrates ISS CAD models into the FLUKA radiation transport program to provide a powerful method for NASA to assess vehicle shielding.
- 9:20 a.m. Plante I. Ponomarev A. L.
 [RITRACKS: A Software for Simulation of Stochastic Radiation Track Structure, Micro- and Nano-Dosimetry, Radiation Chemistry and DNA Damage by Heavy Ions](#) **#0360**
 The software RITRACKS (Relativistic Ion Tracks)

- 9:25 a.m. Ponomarev A. Plante I. Hada M. George K.
[Simulation of DNA Damage in Human Cells from Space Radiation Using a Physical Model of Stochastic Particle Tracks and Chromosomes \[#0364\]](#)
modeling biological damage from space radiation to assess radiation risk to astronauts during long missions
- 9:30 a.m. BREAK

Wednesday, January 14, 2015
TRANSLATIONAL RESEARCH: OXIDATIVE STRESS AND DAMAGE, AND IMMUNOLOGY I
10:00 a.m. Grand Ballroom A & B

Chairs: **Thomas Goodwin**
 Brian Crucian
 Joshua Alwood

10:00 a.m. Chairs
 Introduction **[#0394]**

10:15 a.m. Globus R. K. Shirazi-Fard Y. Schreurs A. -S. Alwood J. Tahimic C. Limoli C. L. Goukassian D. Delp M.
 [*Oxidative Stress Responses to Simulated Spaceflight in Mineralized and Marrow Compartments of Bone and Associated Vasculature*](#) **[#0313]**
 This study aims to assess the role of oxidative stress in progressive bone loss and vascular dysfunction caused by spaceflight.

10:30 a.m. Lawler J. M. Hord J. M. Guzzoni V. Lee Y. Garcia-Villatoro E. E. Ginnings Z. Kuczmarski J. M.
 [*Spaceflight Sarcopenia: Redox Regulation of nNOS \$\mu\$ Translocation*](#) **[#0335]**
 Our laboratory has recently reported that nNOS μ translocation in skeletal muscle experiencing unloading is dependent upon reactive oxygen species (ROS).

10:45 a.m. Zwart S. R. Smith S. M.
 [*Risk of Oxidative Damage to Bone from Increased Iron Stores during Space Flight*](#) **[#0417]**
 The results suggest that increased iron stores do constitute a risk factor for oxidative damage and bone resorption, during space flight and on Earth

11:00 a.m. Spielmann G. Bigley A. B. Kunz H. Agha N. LaVoy E. Crucian B. E. Mehta S. K. O'Connor D. P. Pierson D. L. Simpson R. J.
 [*Impact of Long Duration Spaceflight on Cellular and Mucosal Immune Function: The Salivary Markers Study*](#) **[#0390]**
 The "Salivary Markers" study is a Flight Definition investigation designed to determine the effects of long duration spaceflight (6 month ISS mission) on cellular and mucosal immune function.

11:15 a.m. Crucian B. Chouker A. Pierson D. Simpson R. Goodwin T.
 [*The 'Exploration Atmosphere' Flight Study on ISS: Assessment of Immunity, Oxidative Stress, Vision and Cognition*](#) **[#0297]**
 Evaluation of the physiological impact of the proposed exploration atmosphere during spaceflight.

11:30 a.m. LUNCH

Wednesday, January 14, 2015
BEHAVIORAL HEALTH AND PERFORMANCE MONITORING TOOLS
10:00 a.m. Grand Ballroom C

Chairs: **Sandra Whitmire**
 Kristine Ohnesorge

- 10:00 a.m. Dinges D. F. Metaxas D. N. Jones C. W. Zhong L. Yu X. Dennis L. Trentalange M. Ecker A. Basner M.
[Optical Computer Recognition \(OCR\) of Stress, Negative Affect and Fatigue in Space Flight: Proof-of-Principle](#) **[#0242]**
This project is developing and validating an objective, unobtrusive, computational model-based tracker using optical computer recognition (OCR; a form of machine vision) to identify facial indications of stress, fatigue and positive and negation expressions in spaceflight.
- 10:15 a.m. Salas E. Driskell J. E. Driskell T. Burke S. Neuberger L.
[Using Real-Time Lexical Indicators to Detect Performance Decrements in Spaceflight Teams: A Preliminary Test](#) **[#0243]**
This research presents preliminary data from HERA1 - HERA3 to test the use of lexical measures to assess stress.
- 10:30 a.m. Lee Y. J. Velo L. A.
[Multimodal Neurodiagnostic Tool for Stress Monitoring](#) **[#0244]**
Wearable devices on the head and wrist are used to monitor stress.
- 10:45 a.m. Miller C. A. Wu P. Ott T. Schmer-Galunder S. Rye J. M.
[Non-Intrusive Psycho-Social State Detection: Technique Validation and Multiple Applications](#) **[#0245]**
Non-Intrusive, automated textual analysis techniques have been applied to journals and written and spoken interactions in this work and we are now able to report several validation findings.
- 11:00 a.m. Lee M. L. Strangman G. E. Hull J. T. Kamath T. V. Wang W. Ivkovic V. Zhang Q. Czeisler C. A. Klerman E. B.
[Prefrontal Brain Response to Neurobehavioral Testing is Correlated with Cognitive Performance](#) **[#0450]**
We used Near-Infrared Spectroscopy (NIRS) to examine prefrontal cortex (PFC) activity in 6 healthy volunteers who participated in a 32-day inpatient study that assessed the effects of chronic sleep restriction (CSR; multiple consecutive days of insufficient sleep).
- 11:15 a.m. Mollicone D. J. Stubna M. D. Kan K. G. W. Mott C. G. Basner M. Dinges D. F. Pickard S.
[Behavioral Health and Performance Dashboard Software \(BHP-DS\)](#) **[#0028]**
We provide an update about BHP-DS to track and mitigate behavioral health risks.
- 11:30 a.m. LUNCH

Wednesday, January 14, 2015
HUMAN EXPLORATION RESEARCH ANALOG (HERA)
10:00 a.m. Yacht

Chairs: **Ronita Cromwell**
 Joseph Neigut

10:00 a.m. Nolan D.
 Standing Up the HERA for HRP Analog Missions

10:15 a.m. Self A.
 Operations and Mission Fidelity

10:30 a.m. Cromwell R. Neigut J.
 [Human Exploration Research Analog \(HERA\): Development and Study Implementation](#)

10:45 a.m. Keenan A. Hurst V.
 [Human Exploration Research Analog: Crewmember Experience](#)

11:00 a.m. DISCUSSION

11:30 a.m. LUNCH

Wednesday, January 14, 2015
AUTOMATION AND ROBOTICS
10:00 a.m. Galleon I

Chair: Brent Beutter

- 10:00 a.m. Billman D. Feary M.
[*Needs Assessment and Work Allocation Tools for Mission Operations and Procedures* \[#0233\]](#)
We describe assessment of Human - Automation interaction in design of safety-critical systems.
- 10:15 a.m. Schreckenghost D. Billman D. Milam T.
[*Automation in Procedures: Guidelines for Allocating Tasks for Performance* \[#0235\]](#)
We report results of human performance with procedure automation.
- 10:30 a.m. Ellis S. R. Adelstein B. D.
[*Teleoperation with Rotated Viewing Geometries: New Theoretical and Analytic Findings* \[#0232\]](#)
This research present a new generalization of Fitts' Law and identification of a strategy change in operation correction for display-control misalignment.
- 10:45 a.m. Sándor A. Cross E. V. II Chang M. L.
[*Human-Robot Interaction* \[#0234\]](#)
We present research on camera views for teleoperation.
- 11:00 a.m. DISCUSSION
- 11:30 a.m. LUNCH

Wednesday, January 14, 2015
NASA SPACE RADIATION LABORATORY USER'S GROUP MEETING
10:00 a.m. Galleon II & III

Chair: Peter Guida

- 10:00 a.m. Rusek A. Guida P.
[*NASA Space Radiation Laboratory \(NSRL\) User's Group* \[#0315\]](#)
This is for the annual NASA Space Radiation Lab's user group forum/discussion.
- 10:30 a.m. Rusek A. and Guida P.
NASA Space Radiation Laboratory User's Group Meeting [#0373]
- 11:00 a.m. Wu H. Huff J. L. Simonsen L. C.
[*Space Radiation Program Element Tissue Sharing Initiative* \[#0411\]](#)
We present the Radiation Element's tissue sharing initiative.
- 11:15 a.m. Kim M-H. Y. Hu S. Plante I. Ponomarev A. L. Sandridge C.
[*NASA Space Radiation Program Integrative Risk Model Toolkit* \[#0329\]](#)
We present a software demo.
- 11:30 a.m. LUNCH

Wednesday, January 14, 2015
TRANSLATIONAL RESEARCH: OXIDATIVE STRESS AND DAMAGE, AND IMMUNOLOGY II
12:30 p.m. Grand Ballroom A & B

Chairs: **Thomas Goodwin**
 Brian Crucian
 Joshua Alwood

- 12:30 p.m. Craver B. M. Chmielewski N. Tran K. K. Giedzinski E. Baulch J. Limoli C. L.
[Persistent Oxidative Stress in Human Neural Stem Cells Exposed to Low Fluences of Heavy Ion Irradiation](#) **[#0339]**
Here we show that human neural stem cells exposed to different heavy ions at space relevant fluences exhibit significant and persistent oxidative stress.
- 12:45 p.m. Pecaut M. J. Jonscher K. R. Ferguson V. L. Bateman T. A. Gridley D. S.
[Oxidative Stress during Spaceflight](#) **[#0358]**
We describe the impact of spaceflight on oxidative stress pathways.
- 1:00 p.m. Asaithamby A. Sadek H. A.
[Effect of Space Radiation on Cardiomyocyte Turnover](#) **[#0433]**
Our results indicate that DNA damage induces cell cycle arrest in the vast majority of cardiomyocytes postnatally, while a small number of hypoxic myocytes escape DNA damage and maintain proliferative competency.
- 1:15 p.m. Schmidt M. A. Goodwin T. J.
[Protecting Neural Structures and Cognitive Function during Prolonged Space Flight by Targeting the Brain Derived Neurotrophic Factor Molecular Network](#) **[#0377]**
This section explores the brain derived neurotrophic factor molecular network in the context of 1) protecting the brain and nervous system in the space environment, 2) optimizing neurobehavioral performance in space, and 3) reducing the residual effects of space flight on the nervous system on return to Earth.
- 1:30 p.m. Lanceta L. Nunn B. Akalkotkar A. Chauhan R. O'Toole M. Eaton J. Keynton R. Ehringer W. Soucy P.
[Nanoparticle Drug Delivery for Mitigation of Radiation Induced Damage to Lymphocytes](#) **[#0389]**
The goal of this work is to design drug delivery systems to enhance the effectiveness of antioxidants to mitigate radiation induced lymphocyte DNA damage and induce repair mechanisms.
- 1:45 p.m. Hadi M.
[Variation In DNA Repair Capacity](#) **[#0317]**
In an effort to identify susceptibility variants in the human population we sought to identify and characterize amino acid substitutions in Ape1 that impart reduced repair function.
- 2:00 p.m. BREAK

Wednesday, January 14, 2015
BEHAVIORAL HEALTH AND PERFORMANCE RISK ASSESSMENT
12:30 p.m. Grand Ballroom C

Chairs: **Brandon Vessey**
 Lauren Landon

- 12:30 p.m. Binsted K. Bedwell W. Caldwell B. Hunter J. Kozlowski S. Miller C. Roma P.
[*Preliminary Results on Team Function and Performance from Hawaii Space Exploration Analog and Simulation \(HI-SEAS\) \[#0246\]*](#)
Over three years (2014-2016), we will measure and track the factors expected to have significant impacts on team function and performance, and assess that impact, over three high-autonomy missions of differing durations (four, eight, and twelve months).
- 12:45 p.m. Flynn-Evans E. E. Barger L. K. Sullivan J. Kubey A. Czeisler C. A.
[*Sleep and Circadian Rhythms Among 21 Astronauts during Long-Duration Missions on the International Space Station \[#0247\]*](#)
I will present data on sleep and medication use relative to modeled circadian phase during spaceflight.
- 1:00 p.m. Palinkas L. A. Vessey W. B. Chou C. P. Leveton L. B.
[*Communication Delay and Its Impact on Performance, Well-Being and Autonomy on the ISS \[#0248\]*](#)
This study examined task performance and interactions between the ISS crew and mission control with and without delays in communications between the team elements.
- 1:15 p.m. Roma P. G. Hursh S. R. Hienz R. D.
[*Composition Factors and Individual Differences in Group Cohesion, Team Performance, and Biopsychosocial Adaptation \[#0249\]*](#)
We will present an overview of our multidisciplinary research and technology development program aimed at informing and enhancing group cohesion, team performance, and biopsychosocial adaptation.
- 1:30 p.m. Seidler R. D. Mulavara A. P. Koppelmans V. Kofman I. S. De Dios Y. E. Szecsy D. L.
Riascos-Castaneda R. F. Wood S. J. Bloomberg J. J.
[*The Effects of Spaceflight on Neurocognitive Performance: Extent, Longevity, and Neural Bases \[#0250\]*](#)
We are measuring changes in behavior, brain structure and function with spaceflight.
- 2:00 p.m. Presentation of the JSC Director's Innovation Team Award: Establishing the flexible
Space Station Lighting Assembly for the ISS
Presentation of the Group Achievement Award: The Impact of Sex and Gender on
Adaptation to Space

Wednesday, January 14, 2015

BONE

12:30 p.m.

Yacht

Chair: Jean Sibonga

- 12:30 p.m. Lewandowski B. E. Myers J. G. Licata A.
[*Probabilistic Risk Assessment for Astronaut Post Flight Bone Fracture* \[#0258\]](#)
The overview includes an assessment of contributing factors utilized in the BFRM and illustrates how new information, such as biomechanics of space suit design or better understanding of post flight activities may influence astronaut fracture risk.
- 12:45 p.m. Sibonga J. D. Feiveson A. H.
[*Astronaut Bone Medical Standards Derived from Finite Element \[FE\] Models of QCT Scans from Population Studies* \[#0448\]](#)
This abstract will present the FE-based standards accepted by the FE Strength Task Group for its recommendation to HHC in January 2015.
- 1:00 p.m. Amin S.
Risk Factors as Predictor of BMD Loss during Spaceflight
- 1:15 p.m. Smith S. M. Heer M. A. Shackelford L. C. Zwart S. R.
[*Bone Metabolism on ISS Missions* \[#0259\]](#)
Bone Metabolism on ISS Missions
- 1:30 p.m. Zwart S. R. Heer M. Shackelford L. Smith S. M.
[*An Updated Look at the Pro K Experiment: Urinary Acid Excretion Can Predict Changes in Bone Metabolism during Space Flight* \[#0261\]](#)
The results from this study, which represent healthy individuals in a unique environment, will be important to better understand diet and bone interrelationships during space flight as well as on Earth.
- 1:45 p.m. LeBlanc A. Matsumoto T. Jones J. Shapiro J. Lang T. Shackelford L. Smith S. M. Evans H. Spector E. Snyder R. P. Sibonga J. Keyak J. Nakamura T. Kohri K. Ohshima H. Moralez G.
[*Update of Bisphosphonate Flight Experiment* \[#0257\]](#)
The purpose of this report is twofold: 1) to report the results of inflight, post flight and one year post flight bone measures compared with available controls with and without the use of ARED; and 2) to discuss preliminary data on concurrent controls.
- 2:00 p.m. BREAK

Wednesday, January 14, 2015
EXPLORATION MEDICAL CAPABILITY: EVIDENCE BASE
12:30 p.m. Galleon I

Chair: Jerry Myers

- 12:30 p.m. Myers J. Boley L. Butler D. Foy M. Goodenow D. Griffin D. Keenan A. Kerstman E. Melton S. McGuire S. Saile L. Shah R. Garcia Y. Sirmons B. Walton M.
[Integrated Medical Model Project – Overview and Summary of Historical Application \[#0454\]](#)
This presentation provides an overview of the IMM conceptual architecture and range of application through examples of actual space flight community questions posed to the Integrated Medical Model project.
- 12:45 p.m. Foy M. Keenan A. B. Saile L. L. A. Walton M. E. Shah R. V. Kerstman E. L. Myers J. G.
[Integrated Medical Model \(IMM\) 4.0 – Enhanced Functionalities \[#0310\]](#)
The addition of the Timeline, Partial Treatment, and Alternate Drug functionalities to the Integrated Medical Model make for more accurate medical risk prediction.
- 1:00 p.m. Walton M. E. Boley L. A. Keenan A. B. Kerstman E. L. Shah R. Foy M. H. Saile L. Garcia Y. Myers J. G.
[Integrated Medical Model Project Verification, Validation, and Credibility \[#0403\]](#)
The VV&C approach established by the IMM Project of incorporating project-specific recommended practices and guidelines for implementing the 7009 requirements is comprehensive and includes end-user involvement at every stage in IMM evolution.
- 1:15 p.m. Kassemi M. Griffin E. Thompson D.
[Effect of Gravitational Field and Countermeasures on Renal Calculi Development & Size Distributions in the Nephron \[#0326\]](#)
We describe predicting the effect of microgravity and subsequent reentry to a gravitational field on the risk of critical renal stone development in space.
- 1:30 p.m. Discussion regarding the Integrated Medical Model
- 1:45 p.m. Simon M. Shah R. Urbina M. Canga M. Reyna B. Wong D.
[ExMC Work Prioritization Process \[#0381\]](#)
This presentation describes a process currently in development which utilizes the Integrated Medical Model (IMM) and decision analysis techniques to prioritize work within the ExMC element to minimize the medical risk on future missions within a constrained budget.
- 2:00 p.m. BREAK

Wednesday, January 14, 2015
GALACTIC COSMIC RAY SIMULATOR I
12:30 p.m. Galleon II & III

Chairs: **John Norbury**
 Tony Slaba

- 12:30 p.m. Simonsen L.
 Comments On GCR Simulation [#0382]
- 12:40 p.m. Reitz G. Matthiä D.
 [Calculation of Radiation Exposure Levels in Space Missions](#) [#0369]
 We describe dose calculations using GEANT for low Earth orbit and interplanetary missions and comparison with experimental data.
- 1:00 p.m. Norbury J. W. Slaba T. C.
 [The Role of Secondary Neutrons and Light Ions for Space Radiation Accelerator Experiments](#) [#0352]
 The importance of secondary neutrons and light ions is considered when astronauts spend considerable time in thickly shielded regions of a spacecraft.
- 1:05 p.m. Slaba T. C. Blattnig S. R. Walker S. A. Norbury J. W.
 [A Reference Field for GCR Simulation and an LET-Based Implementation at NSRL](#) [#0385]
 Strategies for developing a GCR simulator at NSRL are presented.
- 1:25 p.m. Slaba T.
 LaRC GCR Simulator Workshop Summary [#0444]
- 1:30 p.m. Rusek A.
 Comments on GCR simulation [#0432]
- 1:45 p.m. Nelson G.
 Comments on GCR simulation [#0429]
- 2:00 p.m. BREAK

Wednesday, January 14, 2015
TRANSLATIONAL RESEARCH: OXIDATIVE STRESS AND DAMAGE, AND IMMUNOLOGY III
2:30 p.m. Grand Ballroom A & B

Chairs: **Thomas Goodwin**
 Brian Crucian
 Joshua Alwood

2:30 p.m. Goodwin T.
 Guidance and Goals for Panel Discussion

2:35 p.m. Crucian B. Alwood J.
 Outline of Subtopics to be discussed

2:40 p.m. Integrated Panel Discussion with previous session speakers

Wednesday, January 14, 2015

BEHAVIORAL HEALTH AND PERFORMANCE STANDARDS

2:30 p.m.

Grand Ballroom C

Chairs: Lauren Leveton

2:30 p.m. Barger L. K. Flynn-Evans E. E. Kubey A. Walsh L. Ronda J. M. Wang W. Wright K. P. Jr.

[Sleep Deficiency on Short and Long Duration Spaceflight Missions](#) [#0251]

Sleep deficiency is prevalent during short and long duration spaceflight.

2:45 p.m. Basner M. Dinges D. F. McGuire S. Nasrini J. Mollicone D. J. Mott C. G. McCann T. Port A.

[Cognitive Performance in Space Flight: Update on the Development and Validation of the Cognition Test Battery](#) [#0252]

An update on critically needed, state-of-the-art, brief, comprehensive, and sensitive computerized neurocognitive test battery for space flight (Cognition) is provided.

3:00 p.m. Kozlowski S. W. J. Chang C. -H. Biswas S.

A Multi-Method Approach for Capturing Teamwork Dynamics [#0254]

The research employs multiple methods to capture teamwork dynamics across an array of analog environments.

3:15 p.m. Dinges D. F. Basner M. Mollicone D. J. Ecker A. E. Jones C. W. Hyder E. C. Di Antonio A.

Reaction Self-Test (RST) Results from Astronauts on ISS Compared to RST Assessments from the Crew of the 520-Day Simulated Mission to Mars **[#0255]**

Because exploration spaceflight will require missions even longer than current 180-day missions or planned 360-day missions on ISS, there is a need to compare ISS astronauts' perceptions of their mental and physical fatigue, workloads, stress and sleep, and their neurobehavioral vigilance, to the most extensive Earth-based simulation of an exploration mission conducted to date, which was the 520-day simulated mission to Mars.

3:30 p.m. DISCUSSION

Wednesday, January 14, 2015
OCCUPANT PROTECTION
2:30 p.m. Yacht

Chairs: **Jeff Somers**
 Chuck Lawrence

- 2:30 p.m. Somers J. T. Gernhardt M. Newby N.
 [*Assessing the Risk of Crew Injury Due to Dynamic Loads during Spaceflight* \[#0388\]](#)
 We provide an overview of the Occupant Protection discipline.
- 2:50 p.m. Wells J. Somers J. T. Newby N.
 [*Data Mining of Historic Human Data to Assess the Risk of Injury Due to Dynamic Loads* \[#0073\]](#)
 We describe methods and results of the Occupant Protection data mining study to generate confidence intervals for the Test Device for Human Occupant Restraint (THOR) injury assessment risk value (IARV) metrics.
- 3:10 p.m. Newby N. Somers J. T. Wells J.
 [*Comparison of THOR and THOR Finite Element Model Impact Testing to Humans* \[#0430\]](#)
 Reported here is the final step in the finite element (FE) validation process by comparing the simulated results with each individual human response using the same correlation and analysis (CORA) technique.
- 3:30 p.m. Putnam J. B. Somers J. Newby N. Wells J. A. Untaroiu C. D.
 [*Calibration and Validation of the THOR Finite Element Model under Frontal and Spinal Loading Conditions* \[#0437\]](#)
 We discuss validation of the THOR Finite Element Model.
- 3:50 p.m. DISCUSSION

Wednesday, January 14, 2015
EXPLORATION MEDICAL CAPABILITY: INTEGRATED MEDICAL SYSTEM
2:30 p.m. Galleon I

Chair: David Rubin

- 2:30 p.m. Rubin D. A. Shah R.
[Exploration Medical System Demonstration: An Integrated Medical Data System for Spaceflight](#) **[#0372]**
The integration of medical devices and informatics tools for managing evidence and enhancing decision making to benefit crew medical care.
- 2:45 p.m. Hurst V. Smith B. Garner L. Rubin D.
[Exploration Medical System Demonstration: Assisted Medical Procedures](#) **[#0325]**
We will show how the AMP was developed for the EMSD, how its user interface works, how it plays a role in managing medical information, and how it will control medical devices to assist an astronaut crew medical officer's mitigation of a crewmember's medical issue during an exploration-class mission.
- 3:00 p.m. Smith B. Hurst V. Grobe G. L. Rubin D.
[Exploration Medical System Demonstration \(EMSD\): How Do All of the Components Talk with One Another?](#) **[#0387]**
The focus of this presentation is to show how the EMSD components communicate with one another and how they will work together to assist an astronaut CMO manage a medical issue during an exploration class mission.
- 3:15 p.m. Zoldak J. T. Stroh J. R. Calaway K. M. Fedak A. J. Novick C. R. Czerwien S.
[Medication and Medical Consumables Tracking for Exploration](#) **[#0416]**
We describe medication and medical consumable tracking for exploration.
- 3:30 p.m. Strangman G. E. Jamieson I. M. D. Montgomery R. R.
[SpaceMED 2.2: Prototype Platform for Spaceflight Biomedical Support](#) **[#0393]**
SpaceMED v2.2 is a prototype platform developed to reduce the time and training required for collecting, consolidating, synchronizing, managing and displaying biomedical and environmental data, and that will also enable integration with future guidance, decision-support and countermeasure systems.
- 3:45 p.m. DISCUSSION

Wednesday, January 14, 2015
GALACTIC COSMIC RAY SIMULATOR II AND PANEL DISCUSSION
2:30 p.m. Galleon II & III

Chairs: **John Norbury**
 Tony Slaba

2:30 p.m. Kronenberg A.
 [*Comments on GCR simulation*](#) [#0426]

2:40 p.m. Weil M.
 Comments on GCR simulation [#0445]

2:50 p.m. Blakely E.
 Comments on GCR simulation [#0420]

3:00 p.m. PANEL DISCUSSION

Wednesday, January 14, 2015
INFORMAL STATISTICS HELP DESK
4:00 p.m. Exhibit Hall B

Chairs: **Rob Ploutz-Snyder**
 Al Feiveson

4:00 p.m. Ploutz-Snyder R. J. Fiedler J. Feiveson A. H.

[*Informal Statistics Help Desk* \[#0156\]](#)

The JSC Biostatistics Lab is offering an opportunity for informal conversation about challenges you may have encountered with issues of experimental design, analysis, data visualization or related topics.

Wednesday, January 14, 2015
POSTER SESSION B: PHARMACOLOGY
4:00 p.m. Exhibit Hall B

Farquharson S. Smith W. Brouillette C. Shende C.

[Drug Stability Analyzer \[#0134\]](#)

The ability of Raman spectroscopy to monitor and quantify drug degradation will be presented.

Griko Y. V.

[Challenges Facing Application of Biopharmaceuticals to Prevent and Treat Medical Conditions in Astronauts \[#0135\]](#)

We discuss space biopharmaceuticals.

Wotring V. E. Pour S.

[New Pharmacology Studies on the ISS \[#0136\]](#)

Multiple studies are in progress to address open questions pharmacology in spaceflight before exploration missions commence.

Wu L. Chow D. S. L. Tam V. Putcha L.

[Pharmacokinetic Modeling of Intranasal Scopolamine in Plasma Saliva and Urine \[#0137\]](#)

The aim of this project was to develop a PK model that can predict the relationship between plasma, saliva and urinary scopolamine concentrations using data collected from the IND clinical trial with intranasal scopolamine.

Wednesday, January 14, 2015
POSTER SESSION B: IMMUNOLOGY
4:00 p.m. Exhibit Hall B

Narayanan A. Boudreaux R. D. Lenfest S. E. Hogan H. A. Bloomfield S. A. Zawieja D. C. Cromer W.
[*Simulated Microgravity Effects on Lymphatic Associated Innate Immune Cells and the Development of Gastrointestinal Inflammation*](#) **[#0138]**

We present preliminary data on how radiation and hindlimb unloading effects the lymphatics and immune function.

Seidel D. V. Martínez I. Hicks K. K. Taddeo S. S. Joseph M. L. Carroll R. J. Haub M. D. Walter J. Jayaraman A. Turner N. D.
[*A Polyphenol-Rich Sumac Sorghum Cereal Alters Colon Microbiota and Plasma Metabolites in Human Subjects*](#) **[#0139]**

We present data demonstrating the ability of a polyphenol-rich dietary intervention to modify human gut microbe composition and metabolism with implications for host health and we relate these observations to our previous work employing rodent spaceflight analogues and short duration spaceflight.

Olamigoke L. Mann V. Mansoor E. Ellis I. Okoro E. Wakame K. Kulkarni A. Doursout M. -F. Sundaresan A.
[*AHCC Activates Human Lymphocytes Via Phenotypic, Genotypic and Differentiation Changes to an Adherent Cell Type. A Possible Novel Mechanism of T Cell Activation.*](#) **[#0140]**

We describe a possible novel mechanism of T cell activation.

Sundaresan A. Bhuiyan S. Mao J. Marriott K. S. Wilkins R. Guersey R. Gaza R. Denkins P. Williams W. Moore M. Ellis I. Okoro E. Madison O. Carasquillo C. Diles A. Osborne A. Agee J. Bowman S. Meis D. Reudas J.
[*Immune Modulation in Normal Human Lymphocytes on ISS*](#) **[#0141]**

We discuss immune modulation in normal human lymphocytes on ISS.

Wednesday, January 14, 2015
POSTER SESSION B: OXIDATIVE STRESS AND DAMAGE
4:00 p.m. Exhibit Hall B

Bailey S. M. Sishc B. J. Nelson C. McKenna M. Taylor L. George K.

[Assessing Telomere Length and Telomerase Activity in Astronauts \[#0142\]](#)

We speculate that for the astronauts, telomere maintenance represents a particularly relevant biomarker, since it reflects the combined exposures and experiences encountered during space travel.

Kuczmarski J. M. Lee Y. Hord J. M. Guzzoni V. Lawler J. M.

[Developing Novel, Targeted Countermeasures to Reduce Oxidative Stress and Skeletal Muscle Atrophy during Microgravity \[#0143\]](#)

The purpose of this investigation is to develop novel, targeted countermeasures to abolish the effects of oxidative stress and prevent skeletal muscle atrophy during microgravity.

Stolc V. Zvejnieks N.

[Induction of Oxidation in Living Cells by Extremely Weak Time-Varying Electromagnetic Fields \[#0145\]](#)

We describe induction of oxidation in living cells by extremely weak time-varying electromagnetic fields.

Wednesday, January 14, 2015
POSTER SESSION B: ADVANCED FOOD TECHNOLOGY
4:00 p.m. Exhibit Hall B

Cooper M. R. Bermudez-Aguirre L. D. Douglas G.

[Functional Foods Baseline and Requirements Analysis](#) **[#0147]**

The Functional Foods Study hypothesis is that foods will sustain functional ingredients for an extended shelf life if compatible formulation, processing, and storage conditions are achieved.

Sirmons T. O. Cooper M. R. Douglas G. L.

[Food Fortification Stability Study](#) **[#0148]**

The purpose of this research is to assess the stability of vitamin supplementation in traditionally processed spaceflight foods, with the hopes of mitigating inadequate nutrition during long-duration missions.

Ahlstrom B. Wagner H. S. Redden J. P. Vickers Z. Mann T.

[The Potential for Food to Reduce Stress and Increase Consumption On-Ground and In-Flight on Long-Duration Missions](#) **[#0146]**

Many individuals believe "comfort foods" reduce stress and increase consumption, and we therefore investigated whether comfort foods could simultaneously produce these outcomes.

Xiao H. Peleg M. Decker E. McClements D. J.

[Vitamins B1 and K Degradation in Spaceflight Foods: Establishment of Prediction Models and Prevention Strategies](#) **[#0149]**

This project aims to measure vitamins B1 and K degradation kinetics and use this information to establish robust computational models that are user friendly to predict vitamin stability in spaceflight foods during processing and five-years of storage.

Wednesday, January 14, 2015
POSTER SESSION B: MIXED TOPICS
4:00 p.m. Exhibit Hall B

Babiak-Vazquez A. Cornett A.N. Wear M. L. Sams C.

[*The Importance of Data Visualization: Incorporating Storytelling into the Scientific Presentation*](#) **[#0150]**

We will describe the importance of storytelling through an integrated model and of subsequent data visualizations in today's scientific presentations and discuss the collaborative methods used.

Foy M.

[*Permutation Testing and Bootstrapping: Non-Parametric Approaches to Statistical Testing and Estimation*](#) **[#0161]**

This poster describes empirical methods of data analysis and estimation that do not rely on underlying distributional assumptions.

Schaefer C. M. Foy M.

[*Got Graphs? An Assessment of Data Visualization Tools*](#) **[#0164]**

This poster describes an evaluation of six different data visualization tools on range of capabilities, ease of use, customer service responsiveness, and cost.

Kline A. Terlizese Z. Schrader K. Pabba R. Kaushik L. Sangwan A. Hansen J. H. L. Oard D.

[*Apollo Archive Explorer: An Online Tool to Explore and Study Space Missions*](#) **[#0151]**

This is an online tool that provides easy and friendly access to complex space mission data for people concerned with education and outreach, and informative for researchers interested in Behavior Health & Performance (BHP).

Lee L. R. Mason S. S. Babiak-Vazquez A. Ray S. L. Van Baalen M.

[*Email-Based Informed Consent: Innovative Method for Reaching Large Numbers of Subjects for Data Mining Research*](#) **[#0152]**

The development of the Remote Consent process, the laws allowing transmission of consent via electronic means, total metrics to date, and remaining challenges (e.g., response issues, use of International Partner data, biospecimens/genetic data) for the research use of LSAH/LSDA data will be described.

McNeel R. L. Hackler A. S. Thomson W. A.

[*Career Development Programs in Space Life Sciences with a National Exposure*](#) **[#0153]**

This poster will highlight accomplishments and significant outcomes of the NSBRI Summer Apprenticeship and Summer Bioastronautics Institute.

Murray J. D. Laughlin M. S. Eudy D. L. Wear M. L. Van Baalen M. G.

[*Injury Surveillance Among NASA Astronauts Using the Barell Injury Diagnosis Matrix*](#) **[#0154]**

The purpose of this study is to assess the usefulness and complexity of the Barell Injury Diagnosis Matrix to classify and track musculoskeletal injuries among NASA astronauts.

Ottenbacher M. E. Pfannenstiel T. D. Wiseman L. A. Powell D. W.

[*UTMB Bed Rest Unit: Evolution from the NASA-Supported Flight Analog Research Unit*](#) **[#0155]**

We will provide an overview of the evolution from a NASA-supported flight analog research unit to a UTMB bed rest unit.

Ploutz-Snyder R. J. Fiedler J. Feiveson A. H.

[Informal Statistics Help Desk \[#0156\]](#)

The JSC Biostatistics Lab is offering an opportunity for informal conversation about challenges you may have encountered with issues of experimental design, analysis, data visualization or related topics.

Ronca A.E. Baker E. S. Bavendam T. G. Beck K. D. Miller V. M. Tash J. S. Jenkins M.

[Effects of Sex and Gender on Adaptation to Space: Reproductive Considerations \[#0157\]](#)

Protecting and maintaining the health and safety of male and female astronaut crew depends upon our understanding of the influences that sex and gender exert on physiological and behavioral changes in the space environment.

Ronca A. E. Mains R. C. Alwood J. S. French A. J. Smith J. D.

[The TCAR Report: Translational Cell and Animal Research in Space \(1965-2011\) Sponsored by NASA Ames Research Center \[#0162\]](#)

Space biology flight studies inform astronaut health.

Smith J. D. French A. J. Ronca A. E.

[Fifty Years of Biospecimen Sharing at Ames: Maximizing Scientific Return from Rare, Complex and Costly NASA Spaceflight and Ground Studies \[#0158\]](#)

The NASA Ames Research Center Biospecimen Sharing Program (BSP) was developed to ensure that valuable tissue samples from rare, complex and costly spaceflight experiments, and not part of primary investigations, would be made available to the scientific community for analysis.

Turner N. D. Taddeo S. S. Lupton J. R.

[The Mentored Research Program at Texas A&M University: Overall Graduate Student Development \[#0163\]](#)

The Mentored Research Program at Texas A&M University prepares students to become successful young professionals by preparing them for the various challenges of their chosen career.

French A. J. Wood A. E. Ngaotheppitak R. Leung D. M. Freed M. Thomas D. M. Finkle T. Delaney M. Van Baalen M. Jenks K. Maese C. Johnson-Troop K. A. Stewart H.

[The Life Sciences Repositories as Foundation for Integrated Pathways to Mars \[#0159\]](#)

We describe the cycle of knowledge building, and the roles played by ARC and JSC in building the Evidence Base.

Globus R.K. Choi S. Wigley C. Pletcher D. Beegle J.

[Maiden Voyage of the Rodent Habitat on ISS: Opportunities For Investigating Molecular Mechanisms and Biomedical Consequences Of Long Duration Spaceflight \[#0456\]](#)

This new Rodent Research system enables achievement of both basic science and translational research objectives to advance human exploration of space.

Wednesday, January 14, 2015
POSTER SESSION B: SENSORIMOTOR
4:00 p.m. Exhibit Hall B

Beaton K. H. Roberts D. C. Schubert M. C.

[*Compensation of Otolith Asymmetries in Military Fighter Pilots vs. Non-Pilots*](#) **[#0165]**

In this study we evaluate a novel approach for quantifying otolith asymmetries and explore the differences in compensating for these asymmetries by active duty military fighter pilots and non-pilot controls.

Beaton K. H. Bloomberg J. J.

[*Forecasting Sensorimotor Adaptability from Baseline Inter-Trial Correlations*](#) **[#0173]**

We propose a novel hypothesis that considers baseline inter-trial correlations, the trial-to-trial fluctuations in motor performance, as a predictor of individual sensorimotor adaptive capabilities.

Beltran E. J. Wood S. J. Moore S. T.

[*Assessment of Proficiency during Simulated Rover Operations Following Long-Duration Spaceflight*](#) **[#0285]**

We will present preliminary results of a study to quantify postflight decrements in operational proficiency in a motion-based rover simulation after International Space Station (ISS) expeditions.

Clark T. K. Newman M. C. Oman C. M. Merfeld D. M. Young L. R.

[*Modeling Human Orientation Perception in Altered Gravity*](#) **[#0166]**

We extended a mathematical model of canal-otolith integration, previously validated only in 1 Earth G, to altered gravity environments.

Clark T. K. Galvan R. C. Bermudez Rey M. C. Yi Y. Merfeld D. M.

[*Perceptual Noise and Sensorimotor Adaptation*](#) **[#0174]**

Sensory noise, as assayed with vestibular perceptual thresholds, was found to be remarkably consistent within an individual, which may prove to be a predictor of individual differences in sensorimotor adaptation.

Cowings P. S. Toscano W. B. Reschke M.

[*Pre-Flight Training of Autonomic Responses for Mitigating the Effects of Spatial Disorientation during Simulated Spacecraft Re-Entry*](#) **[#0167]**

We describe a countermeasure for spatial disorientation produced by Orion re-entry.

Galvan-Garza R. C. Clark T. K. Merfeld D. M. Bloomberg J. J. Mulavara A. P. Oman C. M.

[*Improving Sensorimotor Function Using Stochastic Vestibular Stimulation*](#) **[#0168]**

Two studies are presented that aim to quantify the effects of SVS on various sensorimotor tasks and investigate the practical implications of its use in the context of human space flight.

Goel R. Kofman I. De Dios Y. E. Jeevarajan J. Stepanyan V. Nair M. Congdon S. Fregia M. Cohen H. Bloomberg J. J. Mulavara A. P.

[*Optimal Stimulus Amplitude for Vestibular Stochastic Stimulation to Improve Sensorimotor Function*](#) **[#0169]**

This study advances our knowledge of the use of vestibular stochastic resonance as a potential countermeasure tool to reduce sensorimotor deconditioning following spaceflight.

Madansingh S. Bloomberg J. J.

[*Virtual Reality as a Medium for Sensorimotor Adaptation Training and Spaceflight Countermeasures* \[#0170\]](#)

We discuss investigating the ability for virtual reality to serve as a tool for sensorimotor adaptation training.

Mulavara A. P. Seidler R. D. Feiveson A. Oddsson L. Zanello S. Oman C. M. Ploutz-Snyder L. Peters B. Cohen H. S. Reschke M. Wood S. Bloomberg J. J.

[*Physiological Observations and Omics to Develop Personalized Sensorimotor Adaptability Countermeasures Using Bed Rest and Spaceflight Data* \[#0169\]](#)

The ability to predict the manner and degree to which individual astronauts would be affected would improve the effectiveness of countermeasure training programs designed to enhance sensorimotor adaptability.

Peters B. T. Caldwell E. E. Batson C. D. Guined J. R. De Dios Y. E. Stepanyan V. Gadd N. E. Szecsy D. L. Mulavara A. P. Seidler R. D. Bloomberg J. J.

[*Using Tests Designed to Measure Performance of Individual Sensorimotor Subsystems to Predict Locomotor Adaptability* \[#0171\]](#)

Results from eight sensorimotor tests are being compared to performance in a gait adaptation protocol to determine if the ability to adapt can be predicted.

Clément G. Reschke M. F. Wood S. J.

[*Subjective Straight Ahead Orientation in Microgravity* \[#0172\]](#)

This joint ESA NASA study will address adaptive changes in spatial orientation related to the subjective straight ahead and the use of a vibrotactile sensory aid to reduce perceptual errors.

Wednesday, January 14, 2015
POSTER SESSION B: SPACE HUMAN FACTORS ENGINEERING
4:00 p.m. Exhibit Hall B

Duda K. R. Robinson S. K. Prasov Z. York S. P. Handley P. Karasinski J. Tinch J. D. West J. J.

[*Metrics and Methods for Real-Time Task Performance Assessment* \[#0176\]](#)

We describe development of real-time, unobtrusive, and continuous measures of workload, SA and flight performance metrics.

Fanchiang C. Klaus D. M. Marquez J. J.

[*A Framework for Quantifying Human Performance to Support Conceptual Spacecraft Design Evaluation* \[#0177\]](#)

This work explores various approaches for quantifying crew performance during the conceptual spacecraft design process.

Hillenius S. R. Marquez J. Korth D. Rosenbaum M.

[*Evaluation of Crew-Centric Onboard Mission Operations Planning and Execution Tool* \[#0178\]](#)

This work will inform the design of planning systems for more autonomous crew operations and provide a platform for research on crew autonomy for future deep space missions.

Thaxton S. Archer R. Whitmire A. Schuh S. Vasser K. Holden K. Thompson S. Sándor A. Barshi I. Byrne V. Vessey B. Hurst V. Dempsey D.

[*Space Human Factors Engineering ISS One-Year Mission Investigations* \[#0179\]](#)

Three ISS one-year human factors studies are described, covering the areas of Habitability, Fine Motor Skills, and Training Retention.

Marquez J. J.

[*What Do the NASA Design Reference Missions Require with Respect to Human and Automation/Robotic Integration?* \[#0180\]](#)

We provide an update of the new HARI Task Scoping project.

Oglesby J. M. Stowers K. Leyva K. Sonesh S. C. Hughes A. M. Iwig C. Shimono M. Salas E.

[*A Review and Summary of Methods for Assessing Human-Automation System Safety and Performance* \[#0181\]](#)

This presentation will share results of a systematic literature review conducted to identify metrics for assessing human-automation system performance and safety.

Robinson S. K. Liu A. M. Oman C. M. Mindock J. Byrne V. Warren L. E. Burbank D. C. Reagan M.

[*Customized Refresher and Just-in-Time Training for Long-Duration Spaceflight Crews* \[#0182\]](#)

Does customized training for long-duration astronauts reduce risk and improve training efficiency?

Sebok A. Wickens C. D. Sargent R. Clegg B. A. Jones T.

[*Predicting Astronaut Performance in Unexpected Workload Transitions* \[#0183\]](#)

This paper describes an effort to develop and validate empirically-based models of astronaut performance in unexpected workload transitions.

Thaxton S. Chen M. Hsiang S. Myers J.

[Computational Model for Spacecraft/Habitat Design \[#0184\]](#)

This new study seeks to develop a constraint-driven optimization model to assist in determining net habitable volume needs.

Vos G. Fink P. Ngo P. Simon C. Williams R. Perez L.

[A Tool for the Automated Collection of Space Utilization Data: Three Dimensional Space Utilization Monitor \(3D-SUM\) \[#0185\]](#)

We discuss development of a 3D space utilization monitor to quantify and assess space utilization by crew.

Wenzel E. M. Godfroy-Cooper M. Miller J. D.

[Multimodal Augmented Displays for Surface Telerobotic Missions \[#0186\]](#)

Progress is reported for two studies designed to investigate the impact of two different forms of workload, multi-tasking and latency, on performance with different types of unimodal or bimodal displays in the context of simulated telerobotic exploration tasks.

Wednesday, January 14, 2015
POSTER SESSION B: SPACE RADIATION CENTAL NERVOUS SYSTEM
4:00 p.m. Exhibit Hall B

Acharya M. M. Baulch J. E. Allen B. D. Chmielewski N. N. Baddour A. A. D. Parihar V. K. Boison D. Limoli C. L.

[High LET Radiation-Induced Disruption in Brain Adenosine Kinase: Introducing a Novel Mechanism of Radiation-Induced Cognitive Dysfunction](#) [#0188]

We describe the Adenosine Kinase Hypothesis for High LET radiation-induced cognitive dysfunction.

Acharya M. M. Baddour A. A. D. Parihar V. K. Ru N. Baulch J. E.

[Effect of High and Low LET Radiation Exposures on 5-Methylcytosine and 5-Hydroxymethylcytosine Levels in the Brain of the Irradiated Mouse](#) [#0189]

Changes in 5-methylcytosine and 5-hydroxymethylcytosine levels that correlated with altered neuronal structure and impaired cognition are observed in the brain of the irradiated mouse.

Shaler T. A. Lin H. Chang P. Y.

[Particle Radiation-Induced Dysregulation of Protein Homeostasis in the Brain](#) [#0190]

Long-term changes in protein turnover pathways related to the ubiquitin proteasome system can occur in specific brain regions as a result of exposure to particle radiation.

Lucero M. J. Redfield R. L. Ito N. Reynolds R. P. Richardson D. R. Palchik G. Mukherjee S. Shih H.S. Rivera P. D. Birnbaum S. G. Chen B. P. C. Eisch A. J.

[Neural Mechanisms Contributing to HZE Radiation-Induced Improvement in Pattern Separation in Adult Mice](#) [#0191]

We explore the neural mechanisms underlying HZE radiation induced improvement in hippocampal function.

Grabham P. Sharma P.

[Inhibition of Angiogenesis by Ion Particles: Two Distinct Mechanisms Dependent on Linear Energy Transfer](#) [#0192]

Low LET ion particles (LET lower or equal to 0.89) inhibit the early stages of angiogenesis when tip cells have motile protrusive structures and are creating pioneer tunnels through the matrix, and higher LET ion particles (LET equal to or higher than 8.0) do not affect the early stages of angiogene.

Hadley M. Jewell J. Macadat E. Miller V. Britten R. A.

[Executive Function is Significantly Impaired Following Exposure to Low \(<20 cGy\) Doses of 1GeV/n 48Ti Particles](#) [#0193]

We have determined the impact that exposure of male Proven Breeder Wistar rats to (10-20 cGy) of 1GeV/n 48Ti particles has on their ability to perform attentional-set shifting.

Jewell J. Macadat E. Miller V. Hadley M. Dutta S. Britten R. A.

[Changes in the Hippocampal Proteome Associated with the Induction of Spatial Memory Impairment by Mission-Relevant HZE Doses](#) [#0194]

To elucidate what processes are differentially altered in rats that exhibit impaired or apparently normal spatial memory following exposure to 20 cGy 1 GeV/u 56Fe or 1 GeV/u 56Fe particles we have characterized the composition of the hippocampal proteome using an unbiased proteomic profiling approach.

Lemere C. A. O'Banion M. K. Williams J. P.

[*Impact of Space Radiation on Cognition, Synapses and Biomarkers in Aging and Alzheimer's Disease* \[#0195\]](#)

Our recently funded project will examine the effects of space radiation on CNS risks to astronauts.

Macadat E. Miller V. Jewell J. Hadley M. Britten R. A.

[*Executive Function is Significantly Impaired Following Exposure to Mission-Relevant \(10 cGy\) Doses of 600 MeV/ \$\mu\$ 56Fe Particles* \[#0196\]](#)

Doses of 600 MEV/ μ 56Fe particles significantly impair executive function.

Miller V. Jewell J. Hadley M. Macadat E. Britten R. A.

[*Executive Function is Significantly Impaired Following Exposure to Low \(15 cGy\) Doses of 600 MeV/ \$\mu\$ 28Si Particles* \[#0197\]](#)

We have determined the impact that exposure of male Proven Breeder Wistar rats to 10 or 15 cGy 600 MeV/ μ 28Si particles has on their ability to perform attentional-set shifting.

Parihar V.K.

[*Low Dose Heavy-Ion Radiation Impairs Cognitive Function and Reduces Dendritic Complexity In Medial Prefrontal Cortex* \[#0198\]](#)

We describe heavy ion irradiation and altered brain function.

Sawtell N. M. Thompson R. L.

[*Acute and Long Term Outcomes of Simulated Deep Space Radiation Exposure on Latent Viral CNS Infection and CNS Pathology* \[#0199\]](#)

We describe design and outcomes of pilot study to test safety of exposure of mice latently infected with herpes simplex virus to simulated deep space radiation.

Wyrobek A. J. Rabin B. Bhatnagar S. Albertolle M. Straume T. Witkowska E.

[*Proteomic Profiling of Cerebral Spinal Fluid and Hippocampus Identifies Neurosignaling Abnormalities Associated with Persistent CNS Damage and Susceptibility for Neurocognitive Deficits after Exposure to HZE Radiation* \[#0200\]](#)

Whole-body HZE exposures induced anxiety behaviors and CSF proteomic changes at 2 months, and hippocampal proteomic changes at 9 months after exposure. We identified protein functions associated with persistent CNS damage response and inter-individual variations in neurocognitive performance.

Rosi S. Jopson T. Riparip L. Feng X. Leu D. Jones T. Nelson G. Huang T. -T.

[*The Role of Oxidative Stress and Inflammation on Synaptic Functions after Exposure to Space Radiation* \[#0144\]](#)

We describe the role of oxidative stress and inflammation in the development of cognitive deficits after exposure to low doses of space irradiation.

Wednesday, January 14, 2015
POSTER SESSION B: PHYSICS AND SPACE RADIATION TECHNOLOGIES
4:00 p.m. Exhibit Hall B

Ruedas J. Gaza R. Wilkins R. Gersey B. Sundaresan A. Marriott K. Mao J. Bhuiyan S. Williams W. Denkins P.

[*Radiation Measurements for ISS/SpaceX-3 Flight Radiation Experiment in Support of the UR-1 Project*](#) **#0201**

We describe radiation dosimetry measurements using TLD-100,300,600, and 700.

Santos Koos L. M. Walker S. A. Badavi F. F.

[*Effective Dose Exposure Estimates for a Cislunar Mission*](#) **#0202**

Mission planners continue to experience challenges associated with human space flight and must evaluate the amount of exposure a crew will be subjected to during a transit trajectory from low Earth orbit to geosynchronous orbit and beyond.

Kim M-H. Y. Hu S. Plante I. Ponomarev A. L. Sandridge C.

[*NASA Space Radiation Program Integrative Risk Model Toolkit*](#) **#0329**

We present a software demo.

Wednesday, January 14, 2015
POSTER SESSION B: BEHAVIORAL HEALTH AND PERFORMANCE II
4:00 p.m. Exhibit Hall B

Baard S. K. Pearce M. Golden S. Harvey R. P. Karner J. Ayton J. Chang C. -H. Kozlowski S. W. J.

[*The Dynamics of Teamwork on the Ice: A Multi-Year, Multi-National Effort* \[#0203\]](#)

Two research streams will be presented that utilize teams operating in isolated environments to gather rich insights into the dynamics of cohesion and other teamwork-related processes.

Bell S. T. Brown S. G. Outland N. B. Abben D. R.

[*Critical Team Composition Issues for Long-Distance and Long-Duration Space Exploration: A Literature Review, an Operational Assessment, and Recommendations for Practice and Research* \[#0204\]](#)

We reviewed the LDSE-analogue research, conducted operational assessment interviews, and provided recommendations related to: (a) key composition factors most likely to have a strong influence on crew performance and well-being, and (b) methods for composing crews.

Brainard G. Barger L. Clark T. Coyle W. Czeisler C. Hanifin J. Johnston S. Maida J. Moomaw R. Pineda C. Warfield B. Lockley S.

[*Testing Solid State Lighting Countermeasures to Improve Circadian Adaptation, Sleep, and Performance during High Fidelity Analog and Flight Studies for the International Space Station* \[#0205\]](#)

The broad aim of the following work is to test light emitted by SSLAs for their efficacy in supporting astronaut operational tasks as well as circadian, neuroendocrine, neurobehavioral and sleep physiology.

Buckey J. C. Loeb L. Fellows A. Tregubov T. Harquail N. Fleischer J. Weiss J. Hegel M.

[*Autonomous Behavioral Health Countermeasures for Spaceflight* \[#0206\]](#)

We describe evaluating and developing autonomous behavioral health countermeasures.

Burke C. S. Feitosa J.

[*Culture's Effect on Team Functioning in Spaceflight: A Review and Identification of Gaps* \[#0207\]](#)

We will report on the findings of an integrative review and operational assessment to catalog what the challenges are with regard to cultural diversity and team interaction in spaceflight, what has been done to mitigate those challenges, and how this work might be leveraged in LDDEM.

Dixit A.

[*Causal Sleep Modulation Using a Discordance Model* \[#0208\]](#)

This abstract proposes a framework for coupling a hidden markov model of sleep stages with external stimuli to discover temporally causal variation.

Santoro J. M. Dixon A. J. Chang C. -H. Kozlowski S. W. J.

[*A Multi-Site Investigation into Team Dynamics in Isolated, Confined, Extreme Environments* \[#0253\]](#)

Our team reviews research conducted in order to capture team dynamics in extreme cases.

Driskell T. Salas E. Driskell J. E. Burke S. Neuberger L.

[*Development of the STRESSnet Lexical Analysis Tool to Detect Stress and Related Deficits in Long Duration Spaceflight*](#) **[#0221]**

This research describes the development and conceptual structure of the STRESSnet lexical analysis tool to designed to provide a comprehensive assessment of stress effects.

Hughes A. M. Oglesby J. M. Marlow S. L. Leyva K. Bisbey T. Marshall A. Salas E.

[*Real-Time Measurement of Cognitive Performance: A Meta-Analysis*](#) **[#0209]**

This meta-analysis seeks to validate and aid in the interpretation of psychophysiological measures by quantifying the relationship between physiological and traditional measures of cognitive factors.

Liu A. M. Galvan R. C. Rueger M. Flynn-Evans E. E. Natapoff A. Lockley S. W. Oman C. M.

[*Validation of Assessment Tests and Countermeasures for Detecting and Mitigating Changes in Cognitive Function due to Fatigue during Telerobotic Operations*](#) **[#0210]**

We characterize the impairment of simulated space telerobotic task performance due to fatigue, circadian and time-on task effects and determine the efficacy of blue-light and caffeine countermeasures.

Rahman S. A. St. Hilaire M. A. Flynn-Evans E. E. Barger L. K. Brainard G. C. Czeisler C. A. Lockley S. W.

[*The ISS Dynamic Lighting Schedule: An In-Flight Lighting Countermeasure to Facilitate Circadian Adaptation, Improve Sleep and Enhance Alertness and Performance on the International Space Station*](#) **[#0222]**

The results of this project will form the basis of operational lighting recommendations for the use of the Solid State Lighting Assemblies (SSLA) aboard ISS when deployed in 2015-2016.

McGuire S. Ecker A. J. Nasrini J. Dinges D. F. Basner M.

[*An Objective Measure of Crew Cohesion in Space Flight Using Proximity Sensors*](#) **[#0211]**

Interactions between crew members and the location of their interactions were measured during 4 missions in NASA's Human Exploration Research Analog (HERA) using proximity sensors in order to evaluate crew cohesion.

DeChurch L. A. Mesmer-Magnus J. R.

[*Maintaining Shared Mental Models over Long Duration Space Exploration*](#) **[#0212]**

We describe the literature review and operational assessment related to maintaining shared mental models over long duration space exploration.

Mumford M. D. Yammarino F. Day E. A. Connelly S. Gibson C. Mulhearn T. McIntosh T.

[*Leadership and Followership for Long-Duration Exploration Missions*](#) **[#0213]**

An integrated leadership model was developed outlining key capacities needed for Mission Control and Astronaut Crew leadership.

Basner M. Nasrini J. McGuire S. Dinges D. F. Goel N. Ecker A. J. Johannes B. Rittweger J. Gerlach D. Stahn A. Gunga H. C. Mollicone D. J. Mott C. G. Satterthwaite T. Elliott M. Bilker W. Gur R. C.

[*Neurostructural, Cognitive, and Physiologic Changes during a 1-Year Antarctic Winter-Over Mission: Study Design and Research Methodology*](#) **[#0214]**

To address the knowledge gap in behavioral health during prolonged periods in space analog environments, neurostructural, cognitive, behavioral, physiologic, and psychosocial changes are being examined in several winter-over missions at the Concordia and Neumayer-III Antarctic research stations.

Sangwan A. Yu C. Kaushik L. Ziaei A. Hansen J. H. L.

[Speech Processing Technology for Human Behavior and Performance Monitoring: Recent Algorithmic Advancements, Solutions and Challenges](#) [#0215]

We are presenting recent algorithmic advancements in speech processing that allow the use of speech technology for analyzing aspects of crew behavior and communication.

Smith-Jentsch K. A.

[Team Task Switching](#) [#0216]

This presentation describes performance risks that occur when crews shift from autonomous to highly interdependent work.

Stankovic A. S. Alexander D. J. Schneiderman J. S.

[The Effects of Increased CO₂ Exposure on Cognition and Behavior: A Review](#) [#0217]

This paper presents a comprehensive literature review of the cognitive and behavioral effects of exposure to increased levels of CO₂, with particular consideration to operational and spaceflight-like environments.

Vanhove A. J. Herian M. N. Harms P. D. Luthans F.

[Resilience and Growth in Long-Duration Isolated, Confined, and Extreme \(ICE\) Missions: A Literature Review and Operational Assessment](#) [#0218]

Findings from this qualitative study suggest that crewmember resilience and growth are crucial to mission success and individual health in ICE settings, and that the ICE context is associated with some unique characteristics that should be considered in efforts to develop resilience.

Vanhove A. J. Herian M. N. Harms P. D. Luthans F.

[The "Right 'Good' Stuff"? A Systematic Review of the Relationship between Well-Being and Performance and Health in Isolated, Confined and Extreme \(ICE\) Settings](#) [#0223]

This study presents a two-dimensional (hedonic and eudaimonic) framework for organizing constructs that contribute to well-being, reviews existing evidence through the lens of this framework, and establishes a series of propositions for moving this literature forward.

Vanhove A. J. Herian M. N. DeSimone J. A. Harms P. D. Luthans F.

[A Meta-Analysis of Temporal Effects on Positive and Negative Indicators of Psychosocial Health over the Duration of Isolated, Confined, and Extreme \(ICE\) Missions](#) [#0224]

This study provides meta-analytic evidence of the temporal trends in psychosocial health variables over the course of ICE missions.

Vessel E. A. Russo S. C.

[A General Framework for Evaluating Sensory Stimulation Augmentation Tools](#) [#0219]

We present a general framework for evaluating the effectiveness of sensory stimulation augmentation countermeasures that identifies the needs met by sensory stimulation, and their relationship to stress.

Fiore S. M. Wiltshire T. J. Sanz E. J.

[A Research and Operations Agenda for Understanding Team Cognitive Processes during Long-Duration Exploration Missions](#) [#0220]

Our research took a multidisciplinary literature review and operational assessment approach to form the foundation for understanding the issues surrounding team cognition for future long-duration space exploration missions.

Fuller P. M.

[*Diet and Dietary Factors as Countermeasures for Treating Cognitive Disruption Under Conditions of Circadian Misalignment*](#) [#0029]

This is a description of literature review and operational assessment for treating circadian disruption and attendant cognitive compromise through dietary manipulations.

Burke C. S. Salas E. Shuffler M.

[*Moving Beyond Traditional Leadership to Build Highly Functioning Autonomous Teams*](#) [#0457]

Within the poster we will provide an initial illustration of the behaviors identified and the form which leadership takes (i.e., hierarchical, degree of distribution within the team) within isolated, confined environments with characteristics similar to those of long duration/distance exploration missions.

Salas E. Burke C. S. Fiore S. M. Driskell J.

[*Dynamic Team Role Allocation in Long Duration, Exploration Missions: Identification of Roles, Triggers, and Measurement Tools*](#) [#0458]

Within the poster we will provide an illustration of an initial draft of an integrated team role taxonomy (social, task) and highlight those roles that we expect to be especially important within the context of long duration/distance exploration missions.

Wednesday, January 14, 2015
POSTER SESSION B: SPACE RADIATION CANCER II
4:00 p.m. Exhibit Hall B

Blattnig S. R. Chappell L. J. George K. A. Hada M. Hu S. Kidane Y. H. Kim M-H. Y. Kovyrshina T. Norman R. B. Nounu H. N. Peterson L. E. Plante I. Pluth J. M. Ponomarev A. L. Scott Carnell L. A. Slaba T. C. Sridharan D. Xu X.

[NASA Space Radiation Risk Project: Overview and Recent Results \[#0089\]](#)

Overview and results from NASA space radiation risk project will be presented.

Cheema A. K. Suy S. Wang Y. Chidambaram S. Zhong X. Dritschilo A. Collins S.

[Plasma Metabolomics Reveals Biomarkers of Radiation Response in Prostate Cancer \[#0091\]](#)

We discuss understanding metabolic changes in response to radiation therapy.

Luitel K. Bozeman R. Delgado O. Kasani A. Barron S. Shay J. W.

[Dissecting Underlying Molecular Mechanisms of Space Radiation-Induced Invasive Carcinoma in Mouse Models of Lung Cancer \[#0105\]](#)

The aims of the current studies are to investigate the molecular mechanisms of carcinogenic effects of Iron (56Fe) and Silicon (28Si) with high linear energy transfer as compared to gamma or X-ray (terrestrial radiation) with low energy transfer.

Mansoor E. Mann V. Olamigoke L. Ellis I. Okoro E. Curry K. Pho J. Moore M. Gonzalez S. Zumbado F. Sundaresan A.

[Effects of Psoralen Therapy on Breast Cancer Cells in Microgravity \[#0106\]](#)

We describe effects of psoralen therapy on breast cancer cells in microgravity.

Sridharan D. M. Chen J. Enerio S. Chapell L. Pluth J. M.

[Age Impacts Cancer Risk Markers Post High LET Exposure \[#0111\]](#)

We describe the impact of age on surrogate markers of high LET risk.

Todorova P. K. Hardebeck M. C. Alcazar C. G. Ilcheva M. Camacho C. V. Tomimatsu N. Mukherjee B. Story M. D. Bachoo R. Burma S.

[Assessment of Brain Tumor Risk from Space Radiation using Genetically-Defined Mouse Models \[#0112\]](#)

Using genetically-defined mouse glioblastoma models, we have established that HZE particles are highly tumorigenic compared to X-rays, with a linear relationship between LET and glioblastoma development, the underlying mechanism of which involves oncogenic pathways implicated in the human disease.

Turker M. Grygoryev D. Hryciw G. Ohlrich A. Johnson S. Lasarev M. Gauny S. Kronenberg A.

[Radiation Signature Mutations Are Induced In Vivo by Charged Particles at Low Doses \[#0113\]](#)

We show that mutations relevant for cancer formation are induced in vivo in two distinct cell types by charged particles at unexpectedly low doses.

Kennedy E. Powell D. R. Feng H. McCrary M. R. Li Z. Dynan W. Dwivedi B. Kowalski J. Conneely K. N. Vertino P. M.

[*HZE Radiation Exposure Induces Persistent DNA Methylation Alterations Relevant to Human Lung Cancer* \[#0114\]](#)

Here we have evaluated the impact of high and low LET radiation exposure on genome-wide DNA methylation patterns and identify a DNA methylation 'signature' associated with Fe ion exposure that is relevant to human lung cancer.

Wang J. Farris A. B. III Wang P. Zhang X. Sun S. -Y. Wang Y.

[*Gprc5a as a Tumor Suppressor Prevents High Incidents of Silicon Ion-Induced Thyroid Tumors* \[#0121\]](#)

We were interested in determining if Gprc5a plays any role in preventing thyroid tumorigenesis after exposure to low or high-linear energy transfer radiation.

Werner E. Tang K. X. Wang H. Doetsch P. W.

[*The Contribution of Pro-Inflammatory Responses to Radiation-Induced Genomic Instability* \[#0115\]](#)

Radiation induced genomic instability is cell autonomous.

Snijders A. M. Maranon D. G. Idate R. Kronenberg A. Wiese C.

[*Radiation Risk Estimates Based on a Surface Transplantation Assay of 3D Reconstructed Human Skin Epithelia onto Immunodeficient Mice* \[#0116\]](#)

High LET radiation exposure promotes a reinforced irreversible growth arrest in basal keratinocytes of a human skin graft on mice.

Yeshitla S. Zhang Y. Park S. Story M. D. Wilson B. Wu H.

[*Karyotyping of Chromosomes in Human Bronchial Epithelial Cells Transformed by High Energy Fe Ions* \[#0117\]](#)

Genomic Instability in transformed Human Epithelial cells that are caused by low- and high-LET radiation.

Zhang Y. Yeshitla S. Hada M. Kadhim M. Wilson B. Wu H.

[*RBE of Energetic Iron Ions for the Induction of Early and Late Chromosome Aberrations in Different Cell Types* \[#0118\]](#)

This study is to evaluate the RBE of energetic iron ions for the induction of early and late chromosome aberration in different cell types.

Thursday, January 15, 2015
BEHAVIORAL HEALTH AND PERFORMANCE WORKING GROUP
8:00 a.m. Grand Ballroom C

- 8:00 a.m. Check-in and Complimentary Coffee
- 8:25 a.m. Welcome and Opening Remarks
- 8:35 a.m. Bollweg L.
Near Future Research Directions Panel
Including Q&A Discussion with Panelists
- 10:05 a.m. BREAK
- 10:15 a.m. Vessey B.
Analog Panel
Including Q&A Discussion with Panelists
- 11:45 a.m. LUNCH
- 1:00 p.m. Leveton L.
Astronaut Panel
Including Q&A Discussion with Panelists
- 2:30 p.m. BREAK
- 2:40 p.m. Break-Out Working Sessions
- 4:30 p.m. Wrap-Up

Thursday, January 15, 2015
COUNTERMEASURES AND FUNCTIONAL TESTING IN 70-DAYS OF BED REST:
NEXT GENERATION ISS EXERCISE PROTOCOL I
8:00 a.m. Grand Ballroom A & B

Chairs: Lori Ploutz-Snyder

- 8:00 a.m. Cromwell R.
[*Integration and Overview of the Countermeasures and Functional Testing 70-Day Bed Rest Complement* \[#0422\]](#)
This presentation provides an overview of the CFT-70 bed rest campaign. Discussion of the bed rest platform and study complement is presented as an overview for the remaining talks in the 2 sessions devoted to this topic.
- 8:10 a.m. Ploutz-Snyder L. Scott J. Ryder J. Downs M. Ploutz-Snyder R. Dillon L.
Sheffield-Moore M. Urban R.
[*Overview of Exercise Protocol and Fitness Results* \[#0361\]](#)
Fitness was assessed before, during and after 70 days of head down tilt bed rest in subjects randomized to one of three groups.
- 8:35 a.m. Trappe S. Trappe T.
[*70-Day Bed Rest Simulation of the Next Generation ISS Exercise Protocol \(SPRINT\): Initial Skeletal Muscle Biopsy Results* \[#0396\]](#)
This lecture will present our initial muscle biopsy findings on single muscle fiber performance and key enzymes of skeletal muscle carbohydrate and lipid metabolism.
- 9:00 a.m. Dillon E. L. Danesi C. P. Randolph K. M. Glikson C. R. Quisenberry J. M. Ploutz-Snyder L.
Durham W. J. Sheffield-Moore M. Urban R. J.
[*Low Dose Testosterone is a Safe and Effective Countermeasure Against Muscle Loss from Simulated Space Flight/Bed Rest* \[#0300\]](#)
We investigate whether administration of intermittent low-dose testosterone treatment in conjunction with integrated resistance and aerobic exercise training (iRAT) would further protect against HDBR- induced muscle loss in men representative of the astronaut population.
- 9:30 a.m. BREAK

Thursday, January 15, 2015
COMPUTATIONAL MODELING AND SIMULATION I
8:00 a.m. Yacht

Chairs: **Lealem Mulugeta**
 Jerry Myers

- 8:00 a.m. Peng G. C. Y.
 [*Modeling and Simulation in Health and Disease – Are We Making an Impact? \[#0270\]*](#)
 I will introduce the audience to government initiatives on modeling and simulation through IMAG and the NIH.
- 8:30 a.m. Mulugeta L. Walton M. Nelson E. Peng G. Morrison T. Erdemir A. Myers J.
 [*HRP'S Healthcare Spin-Offs through Computational Modeling and Simulation Practice Methodologies \[#0269\]*](#)
 This presentation summarizes HRP's activities in credibility of modeling and simulation, in particular through its outreach to the community of modeling and simulation practitioners.
- 8:45 a.m. Feola A. J. Raykin J. Mulugeta L. Gleason R. Myers J. G. Nelson E. S. Samuels B.
 Ethier C. R.
 [*Finite Element Modeling Techniques for Analysis of VIIP \[#0268\]*](#)
 We discuss establishing a finite element analysis framework for studying the effect of microgravity on the eye.
- 9:00 a.m. Phillips S. D. Chepko A. Kattamis N. T. Knaus D. A. Swan J. G. Zegans M. Buckey J. C.
 [*Modeling Gravity Dependence in the Cranial Venous Circulatory System \[#0271\]*](#)
 We are developing a venous drainage model to capture microgravity induced fluid shift and changes in tissue loading and resulting impact on astronaut vision.
- 9:15 a.m. Vera J. Mulugeta L. Nelson E. S. Raykin J. Feola A. Gleason R. Samuels B. Myers J. G.
 [*Lumped Parameter Models of the Central Nervous System For VIIP Research \[#0272\]*](#)
 We are developing lumped-parameter models of fluid transport in the central nervous system as a means to simulate the influence of microgravity on intracranial pressure.
- 9:30 a.m. BREAK

Thursday, January 15, 2015
EXPLORATION MEDICAL CAPABILITY: NON-INVASIVE IMAGING I
8:00 a.m. Galleon I

Chair: Kathleen Garcia

- 8:00 a.m. Thompson W. K. Zoldak J. D. Eustace J. E. Wall K. Hussey S. W.
[Flexible Ultrasound System for Exploration and Human Research](#) [#0395]
This presentation covers the development status of the Flexible Ultrasound System ground demonstration, which has reached its critical design review milestone, and has delivered its first version of the application programming interface to affiliated investigators.
- 8:15 a.m. Muir J. Jiao J. Li S. Sahul R. Nesvijski E. Qin Y. - X.
[Frequency Sensitivity and Composition in Diagnostic and Therapeutic Ultrasound as Critical Effects of Wave Propagation in Musculoskeletal Tissue](#) [#0366]
We describe broadband ultrasound in tissue characteristics.
- 8:30 a.m. Sahul R. Nesvijski E.
[Optimization of Transducer Design for Wideband Single Crystal Bone Characterization](#) [#0375]
This work presents the application of Model Based Design (MBD) towards optimization of transducer performance using of different types of piezoelectric materials, including some new and promising piezoelectric single crystals such as Mn-doped PIN-PMN-PT and PIN-PMN-PT.
- 8:45 a.m. Ebert D. Sargsyan A. E. Garcia K. M. Dulchavsky S. A.
[Spinal Changes in Response to Spaceflight](#) [#0305]
Over the course of a spaceflight mission, dynamic changes in spinal morphology and pathology occurred may be linked to postflight injury outcomes.
- 9:00 a.m. Dunmire B. L. Cunitz B. W. Wang Y. -N. Simon J. C. Maxwell A. D. Kreider W. Harper J. D. Sorensen M. D. Wessells H. Lingeman J. E. Coburn M. Crum L. A. Khokhlova V. A. Sapozhnikov O. A. Bailey M. R.
[Prevention of Renal Stone Complications in Space Exploration](#) [#0418]
We report on progress to develop and validate 3 new technologies to provide options to manage stones in space.
- 9:15 a.m. DISCUSSION
- 9:30 a.m. BREAK

Thursday, January 15, 2015
SPACE RADIATION SYSTEMS BIOLOGY MODELING
8:00 a.m. Galleon II & III

Chairs: **Janice Pluth**
 Sylvain Costes

- 8:00 a.m. Sridharan D. M. Asaithamby A. Bailey S. M. Costes S. V. Doetsch P. W. Dynan W. S.
Kronenberg A. Rithidech K. N. Saha J. Snijders A. M. Werner E. Naidu M. Plante I.
Ponamarev A. Kidane Y. Peterson L. Wiese C. Blattnig S. Pluth J. M.
[*Virtual Systems Biology Team DNA Damage and Oxidative Stress* \[#0363\]](#)
This is a summary of the team's efforts investigating DNA Damage and Oxidative Stress.
- 8:10 a.m. Heuskin A. C. Osseiran A. Tang J. Costes S. V.
[*In Silico Tumor Incidence Simulation Using Automata* \[#0295\]](#)
Automata are used here to predict tumor incidence of human cohorts exposed to hypothetical doses and linear energy transfer of ionizing radiation.
- 8:30 a.m. Tang H. Zhou Y. Ding L. Girard L. Yao B. Minna J. Story M. Xie Y.
[*A Systems Biology Approach to Identify Hub Genes of HZE Irradiation-Related Lung Cancer Tumorigenesis* \[#0412\]](#)
We will present a systems biology approach to identify hub genes related to HAZ irradiation in lung cancer.
- 8:50 a.m. Beheshti A. Peluso M. Lamont C. Wage J. Naidu M. Hahnfeldt P. Hlatky L.
[*Proton Irradiation Suppresses Carcinogenesis Progression in an Age-Dependent Manner: A Systems Biology Study* \[#0321\]](#)
Our findings suggest that older individuals exhibit a reduced carcinogenesis progression risk, which can be further suppressed by proton irradiation.
- 9:10 a.m. Kidane Y. H. Wu H.
[*A Database Framework for Gene Expression Profiles Pertaining to Ionizing Radiation-Towards Incorporating Transcriptomics Studies in Radiation Risk Prediction Models* \[#0328\]](#)
We present a database framework for gene expression profiles pertaining to ionizing radiation.
- 9:30 a.m. BREAK

Thursday, January 15, 2015
COUNTERMEASURES AND FUNCTIONAL TESTING IN 70-DAYS OF BED REST:
NEXT GENERATION ISS EXERCISE PROTOCOL II
10:00 a.m. Grand Ballroom A & B

Chair: Jessica Scott

- 10:00 a.m. Bloomberg J. J. Batson C. D. Buxton R. E. Feiveson A. H. Kofman I. S. Laurie S. S. Lee S. M. C. Miller C. A. Mulavara A. P. Peters B. T. Phillips T. Platts S. H. Ploutz-Snyder L. L. Reschke M. F. Ryder J. W. Stenger M. B. Taylor L. C. Wood S. J.
[*In-Flight Treadmill Exercise Can Serve as a Multidisciplinary Countermeasure System*](#) **[#0421]**
This presentation will explore the concept that in-flight treadmill exercise, in addition to providing aerobic exercise and mechanical stimuli to the bone, also has a number of sensorimotor benefits.
- 10:20 a.m. Koppelmans V. Ploutz-Snyder L. De Dios Y. E. Stepanyan V. Szecy D. Gadd N. Wood S. J. Reuter-Lorenz P. A. Kofman I. Bloomberg J. J. Mulavara A. P. Seidler R. D.
[*Exercise Effects on Mobility and the Course of Gray Matter Changes over 70 Days of Bed Rest*](#) **[#0330]**
Effects of 70-days 6-degree head down tilt bed rest on functional mobility and brain structure is mediated by exercise.
- 10:40 a.m. Downs M. Goetchius E. Buxton R. Guined J. English K. Scott J. Ploutz-Snyder L.
[*Energy Balance: Caloric Requirements of Exercise Training during 70 Days of Bed Rest*](#) **[#0302]**
We describe caloric requirements of daily resistance and aerobic training during 70 days of bedrest.
- 11:00 a.m. Scott J. M. Martin D. Caine T. Matz T. Ploutz-Snyder L. L.
[*Time Course of Atrophic Remodeling: Effects of Exercise on Cardiac Morphology and Function*](#) **[#0443]**
Alterations in cardiac morphology and function begin early during unloading, while high-intensity exercise attenuates atrophic morphological and functional remodeling.
- 11:20 a.m. DISCUSSION

Thursday, January 15, 2015
COMPUTATIONAL MODELING AND SIMULATION II
10:00 a.m. Yacht

Chairs: **Lealem Mulugeta**
 Jerry Myers

- 10:00 a.m. Shelhamer M. Mindock J. Lumpkins S.
 [Modeling for Integrated Science Management and Resilient Systems Development \[#0428\]](#)
 We will share ideas being explored from fields such as network science, complexity theory, and system-of-systems modeling to aid the Human Research Program in developing collaborative modeling approaches for the purposes of managing its science portfolio in an integrated manner.
- 10:15 a.m. Myers J. G. Foy M. Goodenow D. A. Keenan A. B. Walton M. E. Boley L. A.
 [Can Simulation Credibility Be Improved Using Sensitivity Analysis to Understand Input Data Effects on Model Outcome? \[#0349\]](#)
 Utilizing the NASA Integrated Medical Model (IMM), we illustrate the outcome of sensitivity analysis techniques used to estimate the influence of IMM input parameters on important output metrics.
- 10:30 a.m. Pennline J. A. Werner C. R. Lewandowski B. E. Thompson W. K. Sibonga J. D. Mulugeta L.
 [Development of Bone Remodeling Model for Spaceflight Bone Physiology Analysis \[#0359\]](#)
 The abstract outlines updates to the initial models application on the absence of skeletal loading to include progress on skeletal loading from exercise.
- 10:45 a.m. Thompson W. K. Gallo C. A. Humphreys B. T. Lewandowski B. E. Funk J. H. Funk N. H.
 Weaver A. Perusek G. P. Sheehan C. C. Ploutz-Snyder L. Mulugeta L.
 [Biomechanics Modeling to Inform Exercise Countermeasures for Future Exploration Missions \[#0438\]](#)
 This presentation discusses using biomechanics modeling in OpenSim to estimate differences in human subject loading between a dual-tethered bar and a single-tethered harness while exercising on the Hybrid Ultimate Lifting Kit device for the squat, single-leg squat and heel-raise exercises.
- 11:00 a.m. Lawrence C. Somers J. T. Baldwin M. A. Wells J. A. Newby N. Currie N. J.
 [Validation of the 5th Percentile Hybrid III ATD Finite Element Model \[#0337\]](#)
 Test data obtained from sled testing is used to validate the 5th percentile Hybrid III anthropomorphic test device finite element model for use by the Orion program to insure occupant protection during impact loadings.
- 11:15 a.m. Humphreys B. T. Thompson W. K. Gallo C. A. Weaver A. S. Perusek G. P. Sheehan C. C.
 Mulugeta L.
 [Novel Application of Computational Modeling of Biomechanics in the Development of Exercise Hardware \[#0324\]](#)
 This presentation details work performed on modeling and simulation of integrated exercise device and bio-mechanics.

Thursday, January 15, 2015
EXPLORATION MEDICAL CAPABILITY: NON-INVASIVE IMAGING II/MIXED TOPICS
10:00 a.m. Galleon I

Chairs: Doug Ebert

- 10:00 a.m. Harper J. D. Sorensen M. D. Dunmire B. L. Lingeman J. E. Coburn M. Cunitz B. W. Crum L. A. Bailey M. R. Wessells H.
[*Kidney Stones – First in Man Clinical Trial to Move Kidney Stones*](#) **[#0279]**
We are funded to develop a non-invasive, non-ionizing ultrasound-based technology to reposition stones within the kidney or ureter to facilitate natural clearing.
- 10:15 a.m. Hu G. Zhang Q. Strangman G. E.
[*Development of NINscan-M v2.0: Multi-Use Near-Infrared Imaging for Spaceflight Health Monitoring*](#) **[#0323]**
The NINscan-M v2.0 is being developed as a multi-use near-infrared imaging system with palm-size dimension and improved functionality more suitable for in-flight health monitoring
- 10:30 a.m. Dentinger A. M. Obi A. Patwardhan K. Melton S. Ebert D. Garcia K. M. Sargsyan A. E.
[*Initial In Vivo Volumetric Ultrasound Imaging of Ocular Structures during Head Down Tilt Study*](#) **[#0299]**
Initial in vivo 3-D ultrasound scans of the eye were acquired with prototype volumetric hardware on the Ultrasound 2 platform and preliminary results quantifying the 3-D changes in ocular structures during a head down tilt study will be presented.
- 10:45 a.m. McQuillen J. B. Thompson J. Gilkey K. M. Hussey S. W.
[*Discussion of Medical Suction for Exploration Medical Capability*](#) **[#0345]**
The requirements, approach and performance in microgravity of medical suction approaches will be discussed.
- 11:00 a.m. Gilkey K. M. Olson S. L. Hussey S. W.
[*Evaluation of Oxygen Concentrator Prototypes for Providing Supplemental Oxygen during Spaceflight*](#) **[#0312]**
Two mid-technology readiness level oxygen concentrator prototypes were evaluated for suitability for spaceflight missions.
- 11:15 a.m. DISCUSSION

Thursday, January 15, 2015
NEW INVESTIGATIONS – SPACE RADIATION
10:00 a.m. Galleon II & III

Chair: Janice Huff

- 10:00 a.m. Boerma M. Mao X. W. Nelson G. A. Hauer-Jensen M.
[Center for Space Radiation Research \[#0289\]](#)
This abstract describes the research plans of the new NSBRI Center for Space Radiation Research.
- 10:20 a.m. Baker J. E. Moulder J. E. Little M. Hopewell J. W. Kronenberg A.
[Determination of Risk for and Occurrence of Heart Disease from Space Radiation \[#0280\]](#)
We are determining the increased risk for developing degenerative cardiac disease as a result of exposure to representative components of space radiation.
- 10:30 a.m. Asaithamby A. Sadek H. A.
[Effect of Space Radiation on Cardiomyocyte Turnover \[#0374\]](#)
Our results indicate that DNA damage induces cell cycle arrest in the vast majority of cardiomyocytes postnatally, while a small number of hypoxic myocytes escape DNA damage and maintain proliferative competency.
- 10:40 a.m. Patel Z. S. Grande-Allen K. J.
[Development of a Flow-Perfused and Immunocompetent 3-D Vascular Model for Radiation Risk Assessment of Cardiovascular Disease and Countermeasure Screening \[#0357\]](#)
We will utilize an innovative approach to address the HRP Space Radiation Degen-1 knowledge gap with the development of cocultures of human endothelial cells, smooth muscle cells, and macrophages, providing an immunocompetent 3-D vascular model grown under shear flow conditions for ground-based rese
- 10:50 a.m. Turner N. D. Ford J. R. Carroll R. J. Chapkin R. S.
[Radiation-Induced Apoptosis Avoidance and Colon Tumorigenesis: Epigenetic Regulation in Adult Stem Cells \[#0397\]](#)
The abstract describes a recently funded project to explore the role of epigenetics in regulating apoptosis avoidance induced by low dose radiation.
- 11:00 a.m. Emmett M. R. Ikwuagwu N. Shavkunov A. S. Wildburger N. C. McCarthy M. Yu Y. Corbitt A. D. Nilsson C. L. Ullrich R. L.
[Induction of Hepatocellular Carcinoma By Space Radiation: A Systems Biology Study of Causative Mechanisms \[#0306\]](#)
We describe HZE induced HCC.
- 11:10 a.m. Davis C. M. DeCicco-Skinner K. Guida P. M. Hienz R. D.
[Neurobehavioral and CNS-Related Physiological Changes following Space Radiation \[#0423\]](#)
Of critical importance is the need for an assessment of the vulnerabilities of the central nervous system (CNS) leading to functional neurobehavioral changes during long-term space missions, and the development of effective countermeasures to such risks.
- 11:20 a.m. DISCUSSION

Thursday, January 15, 2015
HUMAN HEALTH COUNTERMEASURES SCIENCE FOR THE FUTURE
1:00 p.m. Grand Ballroom A & B

Chairs: **Peter Norsk**
 Ronita Cromwell

This session is specific to the Human Health Countermeasures Element. Presentations during this session outline current and future directions for HHC science. All HHC supported scientists are asked to attend.

Opening comments: David Baumann, HHC Element Manager

- | | |
|-----------|---|
| 1:00 p.m. | Norsk P.
<i>Why Are We Doing HHC Science?</i> |
| 1:15 p.m. | Smith L.
<i>Publication Tracking in HHC</i> |
| 1:25 p.m. | Cromwell R.
<i>Access to Analogs for Future Research</i> |
| 1:35 p.m. | Norsk P. Clement G.
<i>Artificial Gravity</i> |
| 1:50 p.m. | Panel Discussion
<i>Integrated Countermeasures</i> |
| 2:30 p.m. | BREAK |

Thursday, January 15, 2015
EDUCATION AND OUTREACH I
1:00 p.m. Yacht

Chairs: **Chuck Lloyd**
 Laurie Abadie

- 1:00 p.m. Abadie L. Lloyd C. Reeves K.
 [*Don't Use Your Science Voice! \[#0273\]*](#)
 HRP's Engagement and Communication (HREC) team will help impart various ways to communicate your research to the general public, and how to utilize media avenues to disseminate your story, using the 1-year mission and Kelly twins investigations as case studies.
- 1:05 p.m. Keeney D.
 How to communicate science to the public
- 2:05 p.m. Abadie L.
 Overview of options available to researchers to “get the word out”
- 2:15 p.m. DISCUSSION
- 2:20 p.m. Lloyd C.
 Closing Remarks
- 2:30 p.m. BREAK

Thursday, January 15, 2015
EXPLORATION MEDICAL CAPABILITY: MIXED TOPICS
1:00 p.m. Galleon I

Chair: DeVon Griffin

- 1:00 p.m. Hurst V. Chin D.
[*Use of the Human Exploration Research Analog for Evaluating Medical Capabilities for Exploration Missions* \[#0425\]](#)
We will show how the ExMC team will take the results and lessons learned from their EMSD evaluation and fold them into their future evaluations of other exploration mission-related medical capabilities within the HERA and other exploration flight analogs.
- 1:15 p.m. George R. L. Ahmed R. McCarroll M. L. Gothard M. D. Sheehan C. C. Griffin D. W.
Myers J. G.
[*Quantifying Change in Mission Risk Associated with a Clinician Crew Medical Officer: A Pilot Study of a Medical Judgement Pathway Metric* \[#0314\]](#)
We will present our technical plans to develop a metric allowing NASA to quantify the change in risk posture associated with a physician trained Crew Medical Officer.
- 1:30 p.m. Ebert D. Byrne V. E. McGuire K. M. Hurst V. Kerstman E. L. Cole R. W. Sargsyan A. E.
Garcia K. M. Foy M. Dulchavsky S. A. Gibson C. R.
[*Clinical Outcome Metrics for Optimization of Robust Training* \[#0424\]](#)
This project aims to contribute to the closure of gap ExMC 2.02: We do not know how the inclusion of a physician crew medical officer quantitatively impacts clinical outcomes during exploration missions.
- 1:45 p.m. Krihak M. Luzod L. Shaw T.
[*Exploration Laboratory Analysis – ARC* \[#0332\]](#)
A review of the initial steps that were taken in 2014 towards meeting the objectives for ground and flight demonstrations of Exploration Laboratory Analysis project are provided in this presentation.
- 2:00 p.m. Beshay M. Hatch M. Kawashima R. Lin H. Mudanyali O. Karlovac N.
[*Cell Phone-Based Lateral Flow Assay for Blood Biomarker Detection* \[#0284\]](#)
We are continuing its effort to develop lateral flow assays designed for integration into a customized Holomic LLC cell phone reader to enable the quantitative measurement of early cardiac and liver function biomarkers in serum.
- 2:15 p.m. DISCUSSION
- 2:30 p.m. BREAK

Thursday, January 15, 2015
SPACE RADIATION CARCINOGENESIS NSCOR I
1:00 p.m. Galleon II & III

Chairs: Eleanor Blakely
Albert Fornace

- 1:00 p.m. Barcellos-Hoff M. H.
[*Cancer Biology Working Group*](#) [#0282]
- 1:10 p.m. Chang P. Y. Bjornstad K. A. Bakke J. Rosen C. J. Du N. Fairchild D. Blakely E. A.
[*Update of Harderian Gland Tumorigenesis: Low-Dose- and LET-Response*](#) [#0287]
This study has filled in gaps of knowledge in the low-dose and LET-dependence of particle-induced tumorigenesis.
- 1:30 p.m. Raber J. Belknap J. Iancu O. Kleiman N. Hall E. Ray A. Fallgren C. Kamstock D. Schmidt C. King A. Edmondson E. Weil M.
[*Characterization of the Tumor Spectrum Arising in HZE Ion Irradiated Outbred Mice*](#) [#0405]
The effects of HZE ion irradiation on carcinogenesis, cognitive deficits and cataractogenesis in a genetically heterogeneous murine population are described.
- 1:55 p.m. Wang X. Farris A. B. III Wang P. Zhang X. Wang H. Wang Y.
[*High Linear Energy Transfer Radiation Induced High Incidents of Lung Tumors*](#) [#0404]
Lung cancer is the most commonly diagnosed cancer as well as the leading cause of cancer death in humans; therefore, studying radiation-induced lung tumorigenesis is critical for estimating the risk of space radiation to astronauts.
- 2:20 p.m. BREAK

Thursday, January 15, 2015
HOW WE DO BUSINESS
3:00 p.m. Grand Ballroom A & B

Chair: Susan Steinberg

- 3:00 p.m. Steinberg S. L. Shelhamer M.
[*Identification and Evaluation of Integration and Cross Cutting Issues Across HRP Risks* \[#0392\]](#)
Matrix diagraming was used to systematically identify, analyze and rate cross cutting issues across HRP risks.
- 3:15 p.m. Mindock J. Lumpkins S. Shelhamer M.
[*Concepts to Support HRP Integration Using Publications and Modeling* \[#0340\]](#)
The goal of this project is to enhance the Human Research Program's identification and support of potential cross-disciplinary scientific collaborations.
- 3:30 p.m. Anton W. Havenhill M.
[*Managing Research in a Risk World* \[#0276\]](#)
The presentation provides background on how HRP interfaces with the Human System Risk Board risk management process.
- 3:45 p.m. Callini C. J. Davis J. R. Richard E. R. Keeton K. E.
[*Collaboration Strategies Within NASA: How to Engage External Partners* \[#0293\]](#)
In this presentation, the HH&P engagement and partnership opportunity management system will be reviewed, depicting the ability to engage external partners in a methodical and strategic way.
- 4:00 p.m. Scott G. B. I. Shelhamer M. Kundrot C. E.
[*Twin Sons – A Pilot Demonstration ISS Study, as a Pathfinder for Precision Space Medicine* \[#0379\]](#)
The progress being made by the Twins Study Investigator Team, along with any initial data analysis obtained from biofluids sampled from the Kelly Twins prior to the launch of the One Year Mission - will be outlined during this presentation.
- 4:15 p.m. McCollum S. G. Schwanbeck N. L. Sarmiento L. A. Snyder T. S. Tarkington W. L. Valverde J. R.
[*Success Strategies for Implementing Flight Research on ISS* \[#0400\]](#)
This session will describe and discuss the success strategies that will enable HRP researchers to implement their research on the ISS.

Thursday, January 15, 2015
EDUCATION AND OUTREACH II
3:00 p.m. Yacht

**Chairs: Amanda Hackler
Ron McNeel**

3:00 p.m.	Hackler A.S. McNeel R.	Deymier-Black A.	Clark T.	Lawley J.	Simon J.	Bokhari R.	LaPelusa M.
-----------	---------------------------	------------------	----------	-----------	----------	------------	-------------

Innovation by a New NSBRI Generation [#0316]

NSBRI's Career Development and Outreach Program trains the next generation of space life scientists, engineers, and healthcare providers. This workshop is intended to highlight the research efforts and unique experiences of NSBRI's students and postdoctoral fellows.

3:15 p.m. DISCUSSION











Thursday, January 15, 2015
SPACE RADIATION CARCINOGENESIS NSCOR II
2:50 p.m. Galleon II & III

Chairs: Eleanor Blakely
Albert Fornace

- 2:50 p.m. Minna J. D. Story M. D. Girard L. Batten K. Asaithamby A. Chen D. Park S. Ding L. -H. Das A. Gao B. Peters-Hall J. Liu S. Hight S. Richardson J. Gazdar A. F. Xie Y. Xie X. -J. Shay J. W.
[*Development of a Risk Assessment Model for Lung Cancer Pathogenesis after Exposure of Human and Mouse Lung Epithelial Cells to HZE Particle Radiation*](#) **[#0346]**
We describe the effect of space radiation on transformation to lung cancer.
- 3:15 p.m. Barcellos-Hoff M. H. Balmain A. Costes S. V. Demaria S. Mao J. H. Adams C. Illa-Bochaca I. Ouyang H. Tang J.
[*The Contribution of Non-Targeted Effects in HZE Cancer Risk*](#) **[#0281]**
We hypothesize that the greater carcinogenic risk from high linear energy transfer (LET) radiation is due to qualitatively more effective non-targeted effects (NTE) that promote initiated cells generated from targeted radiation effects on the genome.
- 3:40 p.m. Suman S. Kumar S. Moon B. -H. Fan Z. Strawn S. Takoor H. Fornace A. J. Jr. Datta K.
[*Heavy Ion Radiation-Induced Intestinal Tumorigenesis is Dependent on Ion Energy and Linear Energy Transfer*](#) **[#0308]**
We describe space radiation and the gastrointestinal cancer risk.
- 4:05 p.m. Kirsch D. G. Onaitis M. W. Stripp B. R.
[*Duke NASA Specialized Center for Research: Lung Cancer Risk from HZE Ions*](#) **[#0442]**
To investigate the effect of HZE particles on lung tumor initiation and progression, the Duke NSCOR has utilized genetically engineered mouse models to alter expression of the genes most commonly mutated in human lung cancer.

Galveston Island Convention Center Floor Plan



	Posters		ExMC		Registration and Check-In
	Concessions		SR		Speaker Ready Room
	HHC 2		SHFH		Ancillary Breakouts
	NSBRI luncheon (Thursday only)				

* Please note the GICC provides complimentary Wi-Fi service for all conference attendees.
To access, log on using this password: gicc5600

Galveston Island Convention Center Floor Plan

LEVEL TWO



Plenary and HHC



BHP



AM Coffee Breaks

** Please note the GICC provides complimentary Wi-Fi service for all conference attendees.
To access, log on using this password: gicc5600*