

**14TH IAA HUMANS IN SPACE SYMPOSIUM  
18 - 22 MAY, 2003, BANFF, CANADA**

**LIVING IN SPACE: SCIENTIFIC, MEDICAL AND  
CULTURAL IMPLICATIONS.**

humans in space is an international scientific symposium held every three years and is dedicated to discussion of research in those human and biological sciences related to long-duration space travel.

**Preface**

**Perry Johnson-Green<sup>1</sup>, Marion Neiman<sup>2</sup>, and Nicole Buckley<sup>3</sup>**

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As humans continue to explore and inhabit space, the need for research into the effects of spaceflight on humans increases in urgency. Nowadays, the scope for human-space research includes the traditional physiological elements such as bone loss, muscle atrophy, or orthostatic intolerance, but has also broadened to include psychological aspects of leadership, perception and orientation, and isolation-induced stress. Furthermore, space researchers are increasingly turning their attention to improving both the working and living environment onboard space vehicles, and the ability of humans in space to respond to challenges (e.g., medical emergencies).

The perspective of space life sciences research has also been extended to the molecular and cellular levels, mirroring changes in life sciences research on Earth. For example, many now seek to understand the molecular bases of the effects of microgravity and radiation on humans in the space environment. Thus, space life sciences research currently spans a broad range of activities, ranging from those seeking increased understanding of the response of humans to space, to those aiming to improve strategies for mitigating the negative aspects of spaceflight.

Humans In Space is an international scientific symposium held every three years and is dedicated to discussion of research in those human and biological sciences related to long-duration space travel. The Canadian Space Agency hosted the Humans In Space 2003 symposium under the theme of "Living in Space: Scientific, Medical and Cultural

Implications” at the Banff Centre in Banff, Alberta from May 18 to 22, 2003. Two hundred and seven delegates from the USA, Canada, Japan, Germany, France, Italy, Russia, Austria, Greece, Norway, and Sweden attended the symposium.

The conference began with snow on the ground, but the weather quickly warmed, leading to a beautiful week in the Canadian Rocky Mountains. There were six Plenary Sessions, including a memorial session to the crew of STS-107 (Columbia). There was also a discussion among representatives from CSA, ESA, NASA, and NASDA on the physiological, psychological, and operational issues that might come into play during selection of the crew for the first human mission to Mars. Remaining plenary sessions focused on remote sensing, a discussion of the STS-90 Neurolab Mission, and a panel discussion on the pros and cons of international cooperation in space life sciences research.

The remainder of the symposium consisted of 150 scientific presentations in six theme areas: Education, Missions, Physiology, Psychology, Radiation, and Technology. This proceedings includes thirty-six manuscripts from the scientific sessions, organized for this volume into Education/Outreach, Medical Care (Bedrest), Medical Care (Countermeasures), Medical Care, Missions (Mars), Missions (Neurolab), Missions (Historical Lessons), Physiology, Psychology, Radiation, Technology (Human Factors), and Technology. They represent a broad range of experimental and theoretical approaches to understanding the problems faced when humans venture into space, as well as the strategies that have the potential to alleviate or remove these problems.

For example, included in the proceedings are studies of the effects of prolonged bedrest on the endocrine system, as well as attempts to develop improved diagnostic tools for use both in-flight and post-flight. The microbiological research community, as well as space medicine specialists, will find V.K.Ilyin’s contribution “Microbiological Status of Cosmonauts during Orbital Spaceflights on Salyut and Mir Orbital Stations” particularly interesting, as it includes data not readily available to the scientific community until now. The continuing impact of emerging microbial diseases on ground-based health care illustrates the importance of assessing microbial risks related to space exploration.

A strong representation by the space psychology research community includes experiments using virtual reality to better understand the disorientation that can appear onboard space stations, and studies of communication and leadership in isolated research stations, including the impact of multicultural crews on leadership issues.

The symposium also had a strong set of studies related to the detection and mitigation of radiation in space. Two papers examine novel systems for detection of neutrons and other particles present in the space environment, and two manuscripts from Lawrence Townsend and coworkers use historical and current data to estimate worst-case scenarios arising from solar activity.

The importance of understanding past successes and failures of space exploration is also an important theme of the proceedings, particularly in the context of mission planning

and leadership. For example, John Uri and coauthors have contributed two papers that summarize and analyze the contributions of Mir and the International Space Station to scientific research.

The symposium also had an outreach component, which is illustrated in the proceedings by the articles by Nancy Moreno and coworkers, and Marlene MacLeish and coauthors. These works focus on techniques and strategies that could improve the dissemination of information and enthusiasm for space exploration and research into the issues surrounding human exploration or inhabitation of space. It is particularly important that students be aware of the importance of space research, and of the opportunities for careers in space life sciences research.

In summary, this proceedings is important; not only does it introduce strategies to solve known problems facing humans in space, but it also anticipates new issues. The symposium tackled these issues at an appropriate time, during the early planning stages of increasingly ambitious space voyages.

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Y. Natochin (Russia)	D. Williams (Canada)

### Symposium Coordinators

M. Neiman (Canada)	S. Neiman (Canada)
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## **Physiology 1**

**IAA.03.BF.PH01**

**Monday May 19th 2:45-6:15**

**Co-Chairs: R. Gorczynski, P. Gräf**

**H-C. Gunga**

**IAA.03.BF.PH01.01 White Mountain research Study – 2001. Long-term hypoxic-hypobaric exposure (~3,800 m) as a terrestrial analog for future planetary missions: Haematological adaptations and changes in capillary density in humans**

**B. Crucian**

**IAA.03.BF.PH01.02 Immune system alterations during simulated Mars planetary exploration at the Haughton impact crater (high Canadian arctic): resolution of specific clinical responses vs. mission-associated dysfunction.**

**S. Morrison**

**IAA.03.BF.PH01.03 The Influence of Core and Skin Temperature on Motor Unit Activation in Men**

**V. Nikolaev**

**IAA.03.BF.PH01.04 Prediction of Decompression Sickness Risk Based on Stochastic Models of Bubbling Processes in Body Tissues**

**R. Gorczynski**

**IAA.03.BF.PH01.05 An interaction between sleep-deprivation and microgravity alters expression of cytokines implicated in regulation of osteogenesis**

**S. Mehta**

**IAA.03.BF.PH01.06 Herpesvirus Reactivation Associated with Spaceflight**

**P. Uchakin**

**IAA.03.BF.PH01.07 Effects of Long-Term Confinement on In Vitro Cell-Mediated vs. Humoral Cytokine Balance.**

## **Human Factors 1**

**IAA.03.BF.TE01**

**Monday May 19th 2:45-6:15**

**Co-Chairs: A. Samel, B. Woolford**

**S. Seguin**

**IAA.03.BF.TE01.01 Engaging Space: Extraterrestrial Architecture and the Human Psyche.**

**M. Whitmore**

**IAA.03.BF.TE01.02 Multipurpose Crew Restraints for Long Duration Space Flights.**

**S. Fairburn**

**IAA.03.BF.TE01.03 Stabilizing Space – Design of a ‘Kit of Parts’ Crew Positioning and Furnishing System for the ISS.**

**D. Akin**

**IAA.03.BF.TE01.04 Advanced Controls and Displays for Enhancing EVA Performance and Safety.**

**S. Garrett**

**IAA.03.BF.TE01.05 Knowledge Development in Varying Time Scales and Organizational Levels.**

**B. Caldwell**

**IAA.03.BF.TE01.06 Analysis and Modeling of Information Flow to Support Distributed Mission Control Capabilities.**

**M. Grushcow**

**IAA.03.BF.TE01.07 The SUSOPS Task Battery in Single and Multi-Subject Environments**

**H. Aoki**

**IAA.03.BF.TE01.08 The Effect of the Configuration and the Interior Design of a Virtual Weightless Space Station on Human Spatial Orientation**

**Mars**

**IAA.03.BF.MI01**

**Monday May 19th 2:45-6:15**

**Co-Chairs: G. Ruyters, L. R. Young**

**J. Chowdhury,**

**T. Marzullo**

**IAA.03.BF.MI01.01 Humans to Mars : The Political Initiative and Technical Expertise Needed for Human Exploration of the Red Planet**

**A. Blaber**

**IAA.03.BF.MI01.02 Humans in Deep Space at SFU**

**E. Seedhouse**

**IAA.03.BF.MI01.03 Early Polar Exploration and its implications for crew selection for a mission to Mars.**

**P. Lee**

**IAA.03.BF.MI01.04 NASA Haughton-Mars Project: EVA and Expeditionary Telemedicine Research in the Canadian High Arctic for Future Human Moon-Mars Exploration Planning**

**L. Young**

**IAA.03.BF.MI01.05 The evolution of artificial gravity: Faster, cheaper, better**

**P. Allard**

**IAA.03.BF.MI01.06 Autonomous Rover Navigation**

**A-L. Paul**

**IAA.03.BF.MI01.07 Genomic Responses of Arabidopsis to Abiotic Stresses Relevant to Mars Exploration and Colonization – What do we need to know before we go?**

**Bedrest 1**

**IAA.03.BF.MC01**

**Monday May 19th 2:45-6:15**

**Co-Chairs: O. Angerer, R. Gerzer**

**A. Leblanc**

**IAA.03.BF.MC01.01 Bone and Muscle loss in Men and Women During Bed Rest**  
**J. Rittweger**

**IAA.03.BF.MC01.02 Loss of Bone mineral content and muscle cross sectional area at the distal leg and at the forearm during 90 days -6° head down tilt: Evaluation of fly-wheel exercise and pamidronate as countermeasures**

**P. Tesch**

**IAA.03.BF.MC01.03 Resistance exercise maintains quadriceps, but not triceps surae muscle size during 90 d bed rest**

**D. Paddon-Jones**

**IAA.03.BF.MC01.04 Amino acid supplementation and muscle protein loss during prolonged bedrest**

**A. Ferrando**

**IAA.03.BF.MC01.05 The effects of hypercortisolemia on muscle protein anabolism during bedrest**

**D. Blottner**

**IAA.03.BF.MC01.06 Expression of Nitric Oxide Synthase in Human Skeletal Muscle Following 84-days Of 6° Head-Down Tilt Bedrest With and Without Exercise**

**Countermeasure**

**D. MacIntyre**

**IAA.03.BF.MC01.07 Recovery of Muscle Following 6 Weeks of Non Weight-Bearing**

**Physiology 2**

**IAA.03.BF.PH02**

**Tuesday May 20th 8:30-12:00**

**Co-Chairs: N. Buckley, G. Ruyters**

**S. Nagaoka**

**IAA.03.BF.PH02.01 Autonomic Nerve Responses under Linear Acceleration**

**M. Tagliabue**

**IAA.03.BF.PH02.02 Evaluation of complex movement planning theories in different level of gravity**

**G. Baroni**

**IAA.03.BF.PH02.03 Human body orientation in transient microgravity**

**D. Watt**

**IAA.03.BF.PH02.04 Effects of Prolonged Exposure to Microgravity on H-Reflex**

**Loop Excitability**

**M. Dai**

**IAA.03.BF.PH02.05 Motion sickness: Its relation to the spatio-temporal properties of velocity storage**

**G. Clement**

**IAA.03.BF.PH02.06 Adaptation of Otolith Responses Assessed by Off-Vertical Axis Rotation**

**J. Eckhard**

**IAA.03.BF.PH02.07 Effects of Changes in the Gravitational Force Direction on Geometric Visual Illusions**

**Y. Kumei**

**IAA.03.BF.PH02.08 Molecular and Neuronal Response to Gravity Change in Rat Limbic System**

**Human Factors 2**

**IAA.03.BF.TE02**

**Tuesday May 20th 8:30-12:00**

**Co-Chairs: A. Samel, B. Woolford**

**S. Abel**

**IAA.03.BF.TE02.01 The effects of prolonged noise exposure on hearing and human performance in simulated international space station operations.**

**J. Buckey**

**IAA.03.BF.TE02.02 Using autoacoustic emissions to assess cochlear function in noisy environments**

**J. Maida**

**IAA.03.BF.TE02.03 Predicting and Managing Lighting and Visibility for Human Operations in Space**

**R. Fucci**

**IAA.03.BF.TE02.04 Optimizing Lighting as a Countermeasure to Circadian Disruption in Long Duration Space Flight**

**L. Harris**

**IAA.03.BF.TE02.05 The relative role of visual, gravity and body cues in judging the direction of 'up': Experiments in the York tilted room and in parabolic flight**

**L. Harris**

**IAA.03.BF.TE02.06 Gravity and perceptual stability during translational head movement on earth and in microgravity**

**W. Toscano**

**IAA.03.BF.TE02.07 Individual Differences in Adaptational Capacity During Sustained Hypergravity**

**S. Rajulu**

**IAA.03.BF.TE02.08 Human Factors data from Space- How Quantitative has it been?**

**Education/Outreach**

**IAA.03.BF.ED01**

**Tuesday May 20th 8:30-12:00**

**Co-Chairs: M. MacLeish, Pat Sullivan**

**M, MacLeish, C. Wilson IAA.03.BF.ED01.01 National Space Biomedical Research Institute Education and Public Outreach: Communicating Bioastronautics Research to the Public Students and Families**

**N. Moreno, B. Tharp**

**IAA.03.BF.ED01.02 Increasing Student Learning through Space Life Sciences Education**

**P, Gannon**

**IAA.03.BF.ED01.03 Defying Gravity: Enduring Life in Space. NSBRI's Countermeasures to Deficits of Science and Mathematics Educational Achievement in the US**

**C. Mukai**

**IAA.03.BF.ED01.04 Educational Program on the STS-95 Space Shuttle Mission --- Student Plant Experiments and Teddy Bear Naming ---**

**C. Mukai**

**IAA.03.BF.ED01.05 Outreach Program on the STS -95 Space Shuttle Mission --A Linked Poem as a Bi-directional Communications Between Space and Earth--**

**F. Tanigaki**

**IAA.03.BF.ED01.06 NASDA Education Program on the STS -107 Space Shuttle Mission**

**Bedrest 2**

**IAA.03.BF.MC02**

**Tuesday May 20th 8:30-10:00**

**Co-Chairs: O. Angerer, R. Gerzer**

**P. Platen**

**IAA.03.BF.MC02.01 Energy Balance and Metabolism in Immobilization: Regulatory Effects of the Serotonergic System**

**S.M. Grenon**

**IAA.03.BF.MC02.02 The Effect of a Constant High Salt Diet on the Renal, Cardio-Endocrine and Cardiovascular Responses to Simulated Microgravity**

**S. Saivin**

**IAA.03.BF.MC02.03 Influence of simulated weightlessness on the pharmacokinetics of orally administered acetaminophen used as a gastric emptying probe in man: a plasma and salivary study**

**Neurolab**

**IAA.03.BF.MI02**

**Tuesday May 20th 2:45-6:15**

**Co-Chairs: Mary Anne Frey, D. Williams**

**F. Baisch**

**IAA.03.BF.MI02.01 No Change in Heart Rate and Blood Pressure Response Pattern over 104 Days of Continuous Roller Coaster Riding. A Natural Response?**

**C. Fuller**

**IAA.03.BF.MI02.02 The effects of spaceflight on the Circadian Timing System**

**B. Fowler**

**IAA.03.BF.MI02.03 Does the absence of a gravity signal influence perceptual-motor coordination in space?**

**K. Baldwin**

**IAA.03.BF.MI02.04 Effects of Spaceflight on Neonatal Skeletal Muscle Development and Differentiation**

**J. Raymond**

**IAA.03.BF.MI02.05 Development of the rat vestibular system in microgravity**

**M. Ross**

**IAA.03.BF.MI02.06 Neurolab Experimental Results Indicate Differing Saccular and Utricular Macular Responses to Weightlessness**

**B. Cohen**

**IAA.03.BF.MI02.07 Spatial Orientation of Optokinetic Nystagmus (OKN) and Ocular Pursuit During Space Flight**

**S. Moore**

**IAA.03.BF.MI02.08 Perceptual and Oculomotor Responses to Artificial Gravity: Results from the Neurolab STS-90 Centrifugation Experiments**

**Life Support**

**IAA.03.BF.TE03**

**Tuesday May 20th 2:45-6:15**

**Co-Chairs: A. Mortimer, N. Buckley**

**A.M. Bell**

**IAA.03.BF.TE03.01 Measuring the Resilience of Advanced Life Support Systems**

**C. Chamberlain**

**IAA.03.BF.TE03.02 Physiological responses of plants to reduced atmospheric pressure in a bioregenerative life support system**

**M. Stasiak**

**IAA.03.BF.TE03.03 Inner Canopy Irradiation - Enhancing the Productivity of Advanced Life Support Systems for Long -Term Space Exploration**

**D. Gazda**

**IAA.03.BF.TE03.04 Rapid Determination of Biocide Concentration Using Colorimetric Solid Phase Extraction (C-SPE)**

**J.H. Miller**

**IAA.03.BF.TE03.05 Progress in the Development of an Enhanced Cavity Absorption Sensor for Spacecraft Air Monitoring**

**R. Dyck**

**IAA.03.BF.TE03.06 Artificial Photosynthesis**

**Radiation 1**

**IAA.03.BF.RA01**

**Tuesday May 20th 2:45-6:15**

**Co-Chairs: B. Glickman, S. Nagaoka**

**A.R. Green, B.Lewis**

**IAA.03.BF.RA01.01 Bubble Detector Characterization for Space Radiation**

**I. Thomson**

**IAA.03.BF.RA01.02 Radiation Doses Experienced by Astronauts in EVA**

**L. Townsend**

**IAA.03.BF.RA01.03 Prediction of Solar Particle Event Proton Dose Using Early Dose Rate Measurements**

**L. Townsend**

**IAA.03.BF.RA01.04 Interplanetary Crew Dose Estimates for Worst Case Solar Particle Events Based on the Historical Data for the Carrington Flare of 1859**

**G. Jonkmans**

**IAA.03.BF.RA01.05 A Canadian High-Energy Neutron Spectrometry System (CHENSS) For Measurements In Space.**

**K. Nojima**

**IAA.03.BF.RA01.06 Effects of Low Dose Particle Radiation to Mouse Neonatal Neurons in Culture**

### **Countermeasures**

**IAA.03.BF.MC03**

**Tuesday May 20th 2:45-6:15**

**Co-Chairs: R. Izumi, C.F. Sawin**

**D. Dinges**

**IAA.03.BF.MC03.01 Nap Sleep-Wake Schedules as a Countermeasure for Chronic Sleep Loss in Space**

**N. Rogers**

**IAA.03.BF.MC03.02 Neuroendocrine Changes During Chronic Sleep Restriction**

**E. Caiani**

**IAA.03.BF.MC03.03 Echocardiographic Quantification of the Effects of Low Body Negative Pressure on Left Ventricular Dimensions during Parabolic Flight**

**A. Kyparos**

**IAA.03.BF.MC03.04 Dynamic Foot Pressure Attenuates Myofiber Atrophy Induced by Mechanical Unloading**

**K. Iwasaki**

**IAA.03.BF.MC03.05 Usefulness of artificial gravity by a human centrifuge with exercise as a countermeasure against cardiovascular deconditioning during weightlessness**

**K. Forth**

**IAA.03.BF.MC03.06 Spatial Factors Influence the Generation of Neuromuscular Responses to Foot Stimulation**

**C. Layne**

**IAA.03.BF.MC03.07 Does Varying Muscle Spindle Input Modify Neuromuscular Responses to Foot Stimulation?**

**G. Pearce**

**IAA.03.BF.MC03.08 An Investigation into the effects of different exercise protocols for potential use with multi-national crews in the Micro-Gravity environment of Space**

### **Historical Lessons**

**IAA.03.BF.MI03**

**Wednesday May 21st 8:30-12:00**

**Co-Chairs: D. Watt, R.J. White**

**M. Reschke**

**IAA.03.BF.MI03.01 A Historical Review of Physiological Research in Space Flight**

**J. Uri**

**IAA.03.BF.MI03.02 Lessons Learned from Mir – A Payload Perspective**

**J. Uri**

**IAA.03.BF.MI03.03 Accomplishments in Bioastronautics Research Aboard International Space Station**

**J. Charles**

**IAA.03.BF.MI03.04 STS-107: A Model for Future Multi-Disciplinary Research In Space**

**P. Cowings**

**IAA.03.BF.MI03.05 Psychophysiology of Spaceflight**

**M. Buderer**

**IAA.03.BF.MI03.06 Lessons Learned from Spacelab**

**Psychology 1**

**IAA.03.BF.PS01**

**Wednesday May 21st 8:30-12:00**

**Co-Chairs: N. Kanas, G. Sandal**

**S. Bishop**

**IAA.03.BF.PS01.01 Northern Cross Expedition 2001: Two Teams, Different Outcomes**

**N. Inoue**

**IAA.03.BF.PS01.02 Development of behavioral assessment tools for Astronauts by an isolated and confined experiment**

**R. Kass**

**IAA.03.BF.PS01.03 Conflict Handling During Long -Duration Isolation**

**N. Kraft**

**IAA.03.BF.PS01.04 Resident Crew's Expectations of their Visitors: A Host-Guest Dilemma**

**L. Schmidt**

**IAA.03.BF.PS01.05 Gender Differences in Leader and Follower Perceptions of Social Support in the Antarctic**

**V. Gushin**

**IAA.03.BF.PS01.06 Psychological Problems of Crew Communication in Mars Flight**

**N. Kanas**

**IAA.03.BF.PS01.07 Leadership Issues with Multicultural Crews on the International Space Station**

**D. Manzey**

**IAA.03.BF.PS01.08 Psychological challenges of human missions to Mars: The issue of crew composition**

## **Radiation 2**

**IAA.03.BF.RA02**

**Wednesday May 21st 8:30-10:00**

**Co-Chairs: B. Glickman, S. Nagaoka**

**V. Miller**

**IAA.03.BF.RA02.01 Effect of  $^{56}\text{Fe}^{26+}$ , and Si on Human Hematopoietic Progenitor Cell Function**

**C. Baumstark-Khan**

**IAA.03.BF.RA02.02 Activation of the NF- $\kappa$ B Pathway by Heavy ion Radiation in Recombinant Human Embryonic Kidney Cells**

**F.S. Ambesi-Impiombato**

**IAA.03.BF.RA02.03 Radiation effects are dependent upon the proliferative status of normal, differentiated cells in culture**

**B. Glickman**

**IAA.03.BF.RA02.04 The in vivo Monitoring of Mutations in Cosmonauts with Flight Experience**

## **Technology 1**

**IAA.03.BF.TE04**

**Wednesday May 21st 10:30-12:00**

**Co-Chairs: H. Ing, I. Thomson**

**H. Charles**

**IAA.03.BF.TE04.01 Biomedical Instrument Technology Development for Space: Advances by the NSBRI Technology Team**

**B. Yost**

**IAA.03.BF.TE04.02 Small Free Flyers as Secondary Payloads as Technology Demonstrators**

**J. Buckey**

**IAA.03.BF.TE04.03 Improved Bubble Detection for EVA**

## **Medical Care 1**

**IAA.03.BF.MC04**

**Wednesday May 21st 8:30-12:00**

**Co-Chairs: C. Kourtidou-Papadeli, D. Williams**

**J.A. Jones**

**IAA.03.BF.MC04.01 Development of Diagnostic Imaging Capability for the International Space Station and Implications for Future Spaceflight**

**D. Hamilton**

**IAA.03.BF.MC04.02 The Ultrasound Detection of Thoracic Trauma on the ISS**

**W. Gowin**

**IAA.03.BF.MC04.03 Skeletal Locations for the Examination of Bone Structure Alterations due to Microgravity Exposure**

**S. Prohaska**

**IAA.03.BF.MC04.04 A Virtual Laboratory for Assessment of Bone Biopsies**

**P. Saparin**

**IAA.03.BF.MC04.05 Quantification of Spatial Structure of Human Proximal Tibial Bone Biopsies Using 3D Measures of Complexity**

**A. Kirkpatrick**

**IAA.03.BF.MC04.06 Thoracic Sonography for Pneumothoraces: The Clinical Evaluation of an Operational Space Medicine Spin-off**

**J. Carstensen**

**IAA.03.BF.MC04.07 Carbon Monoxide Poisoning: Diagnosis and Treatment Aboard the International Space Station with Limited Treatment Facilities**

**Physiology 3**

**IAA.03.BF.PH03**

**Wednesday May 21st 2:45-6:15**

**Co-Chairs: J. Heersche, T. Smith**

**K. Bergh**

**IAA.03.BF.PH03.01 Subregional Bone Experiment for the International Space Station**

**R. Pietrzyk**

**IAA.03.BF.PH03.02 Overview of Renal Stones and Space Flight**

**P. Tesch**

**IAA.03.BF.PH03.03 Plantar flexor muscle atrophy in men and women in response to five wk simulated spaceflight**

**N. Basso**

**IAA.03.BF.PH03.04 The Effect of Age on Osteoprogenitor Cell Number and Bone Formation in Response to Mechanical Unloading in the Male Rat**

**D. Zawieja**

**IAA.03.BF.PH03.05 Simulated microgravity inhibits the active lymph pump in rats.**

**B. Chiu**

**IAA.03.BF.PH03.06 Induction of Vascular Endothelial Phenotype and Cellular Proliferation from Human Cord Blood Stem Cells Cultured in Simulated Microgravity**

**S. Nagaoka**

**IAA.03.BF.PH03.07 Gravity and Postnatal Developments of Cardiopulmonary Reflex**

**V. Zolesi**

**IAA.03.BF.PH03.08 Analysis of the Performances of the Human Upper Limb on the International Space Station**

**Psychology 2**

**IAA.03.BF.PS02**

**Wednesday May 21st 2:45-6:15**

**Co-Chairs: N. Kanas, G. Sandal**

**D. Musson**

**IAA.03.BF.PS02.01 Instrumentality, Expressivity and the Big 5 in astronaut applicants and airline pilots; Implications for performance and crew resource management**

**A. Spsychalski**

**IAA.03.BF.PS02.02 ISS Behavioral and Performance Training for NASA Astronauts**

**J. Brady**

**IAA.03.BF.PS02.03 Distributed Communication and Psychosocial Performance in Simulated Space Dwelling Groups**

**J. Carter**

**IAA.03.BF.PS02.04 Best Practices for Managing Conflict and Depression on Long-duration Space Flights: The Astronauts' Perspectives**

**D. Dinges**

**IAA.03.BF.PS02.05 Optical Computer Recognition of Stress Induced by Performance Demands**

**J. Orasanu**

**IAA.03.BF.PS02.06 Assessing Team Interactions for Long-Duration Space Missions**

**B. Johannes**

**IAA.03.BF.PS02.07 About operator's reliability in professional skills under the extreme environmental conditions in space.**

**S. Stepanova**

**IAA.03.BF.PS02.08 On operator's productivity decrement after a single sleep shifting.**

**Technology 2**

**IAA.03.BF.TE05**

**Wednesday May 21st 2:45-6:15**

**Co-Chairs: H. Ing, I. Thomson**

**K. Larson**

**IAA.03.BF.TE05.01 Capabilities and Performance of the Human Research Facility Rack 1 on the International Space Station**

**F. Tittel**

**IAA.03.BF.TE05.02 Photonic Technologies for Early detection of Human Disease**

**J. Kinnison**

**IAA.03.BF.TE05.03 Neutron Spectroscopy for Space Applications**

**T. Hatfield**

**IAA.03.BF.TE05.04 Development of Quantitative Ultrasonic Physiological Measurement Technology for Space Flight Application**

**G. Neri**

**IAA.03.BF.TE05.05 ELITE S2 – a New Instrument for Multifactorial Movement Analysis on the International Space Station**

**M. Grushcow IAA.03.BF.TE05.06 Organizing and Visualizing Multi-channel Data with Aha!**

**Medical Care 2**

**IAA.03.BF.MC05**

**Wednesday May 21st 2:45-6:15**

**Co-Chairs: C. Kourtidou-Papadeli, Pat Sullivan**

**J. Hines**

**IAA.03.BF.MC05.01 Smart Healthcare Management System (SHMS) for inflight Astronaut Monitoring**

**R. Potember**

**IAA.03.BF.MC05.02 Miniature Time Of Flight Mass Spectrometer**

**A. Miyamoto**

**IAA.03.BF.MC05.03 Benefits of High Definition TV image in Crew's Health Care**

**H. Yamada**

**IAA.03.BF.MC05.04 Facial Poses of Emotional Expression in Micro -Gravity Environment**

**J. Sallach**

**IAA.03.BF.MC05.05 Efficacy and Feasibility of Portable Real-Time Ultrasound Cardiac Image Acquisition During Long-term Space Travel: Devon Island Pilot Study**

**K. Bacal**

**IAA.03.BF.MC05.06 What Do You Need to "Stand and Fight" on Orbit? Medical Devices for Contingency Care on the International Space Station"**

**Physiology 4**

**IAA.03.BF.PH04**

**Thursday May 22nd 8:30-12:00**

**Co-Chairs: O. Angerer, C. Blomqvist**

**A. Blaber**

**IAA.03.BF.PH04.01 Autonomic Control of Heart Rate Pre- and Post-Spaceflight as assessed by Heart Rate Variability Analysis: Relationship to Post-flight Orthostatic Intolerance.**

**R. Baevsky**

**IAA.03.BF.PH04.02 Heart rate variability analysis in evaluation of functional condition in humans during long -term space flights.**

**T. Wells**

**IAA.03.BF.PH04.03 Autonomic responses to LBNP in women are not associated with fitness level**

**H. Hinghofer-Szalkay**

**IAA.03.BF.PH04.04 Blood pressure as primarily regulated variable in a combined cardiovascular stimulation paradigm**

**K. Shoemaker**

**IAA.03.BF.PH04.05 Test-Retest Repeatability of Sympathetic and Hemodynamic Orthostatic Responses**

**M. Delp**

**IAA.03.BF.PH04.06 Simulated Microgravity Enhances Vasoconstriction of Cerebral Arteries Through A Nitric Oxide Mechanism**

**O. Larina**

**IAA.03.BF.PH04.07 Plasma Proteins at Extended Space Flights**

**Medical Care 3**

**IAA.03.BF.MC06**

**Thursday May 22nd 8:30-12:00**

**Co-Chairs: C. Kourtidou-Papadeli, M. Buderer**

**D. Hamilton**

**IAA.03.BF.MC06.01 Electrocardiographic Monitoring of Astronauts on the ISS**

**L. Crum**

**IAA.03.BF.MC06.02 Image-Guided High Intensity Focused Ultrasound for Mission Critical Care**

**V. Ilyin**

**IAA.03.BF.MC06.03 Microbiological Status of Cosmonauts While Orbital Spaceflights**

**K. Bacal**

**IAA.03.BF.MC06.04 A Bad Day on Orbit: How to Prepare for Medical Contingencies Aboard the International Space Station**

**E. O'Rangers, L. Plus**

**IAA.03.BF.MC06.05 Civilian Selection for "Space Tourism" Flights: Medical Guideline Evolution Over the Next Century**

**L. Putcha**

**IAA.03.BF.MC06.06 Operational Application of Increment Science**