

**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

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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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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- κ 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

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