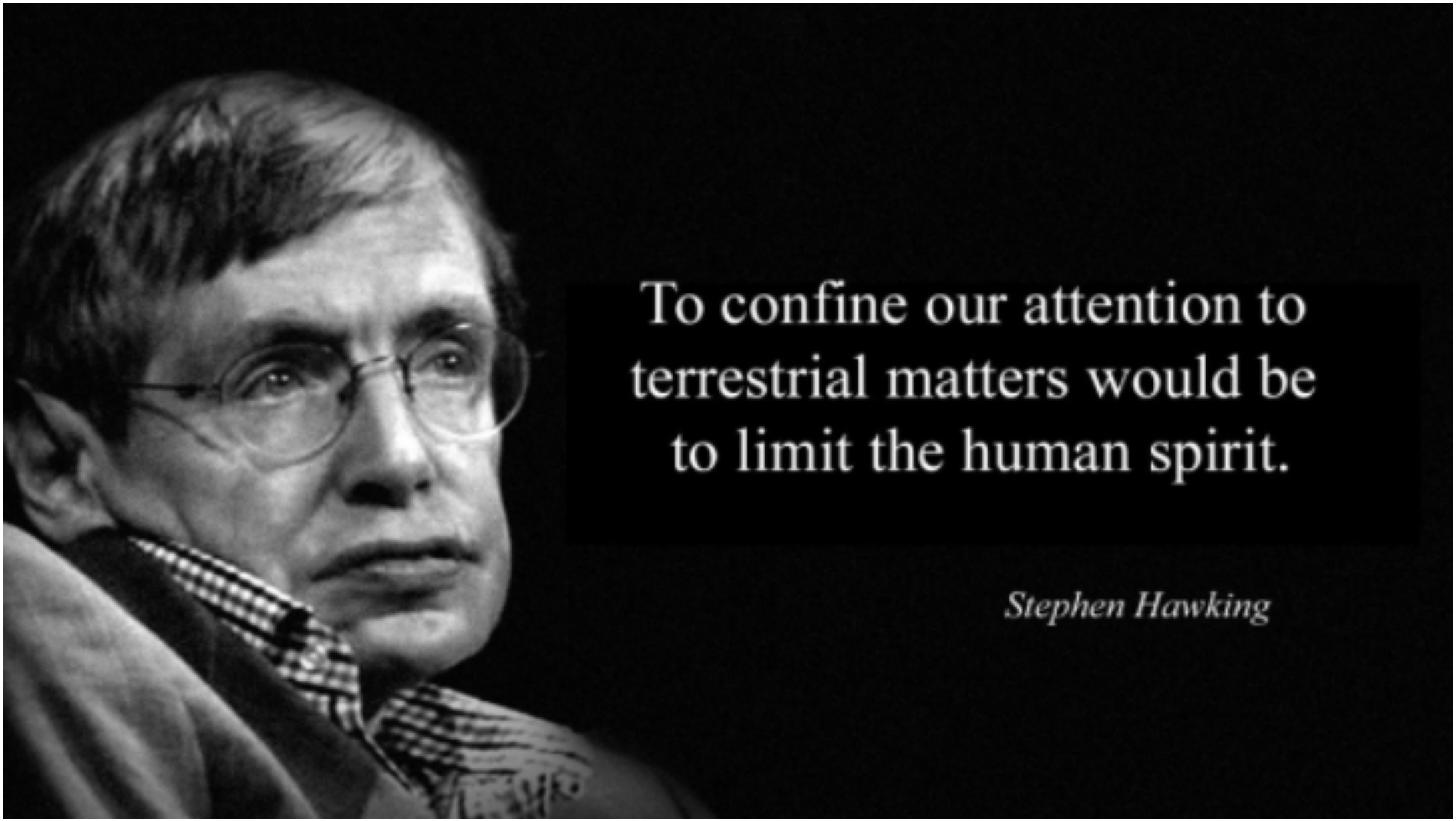
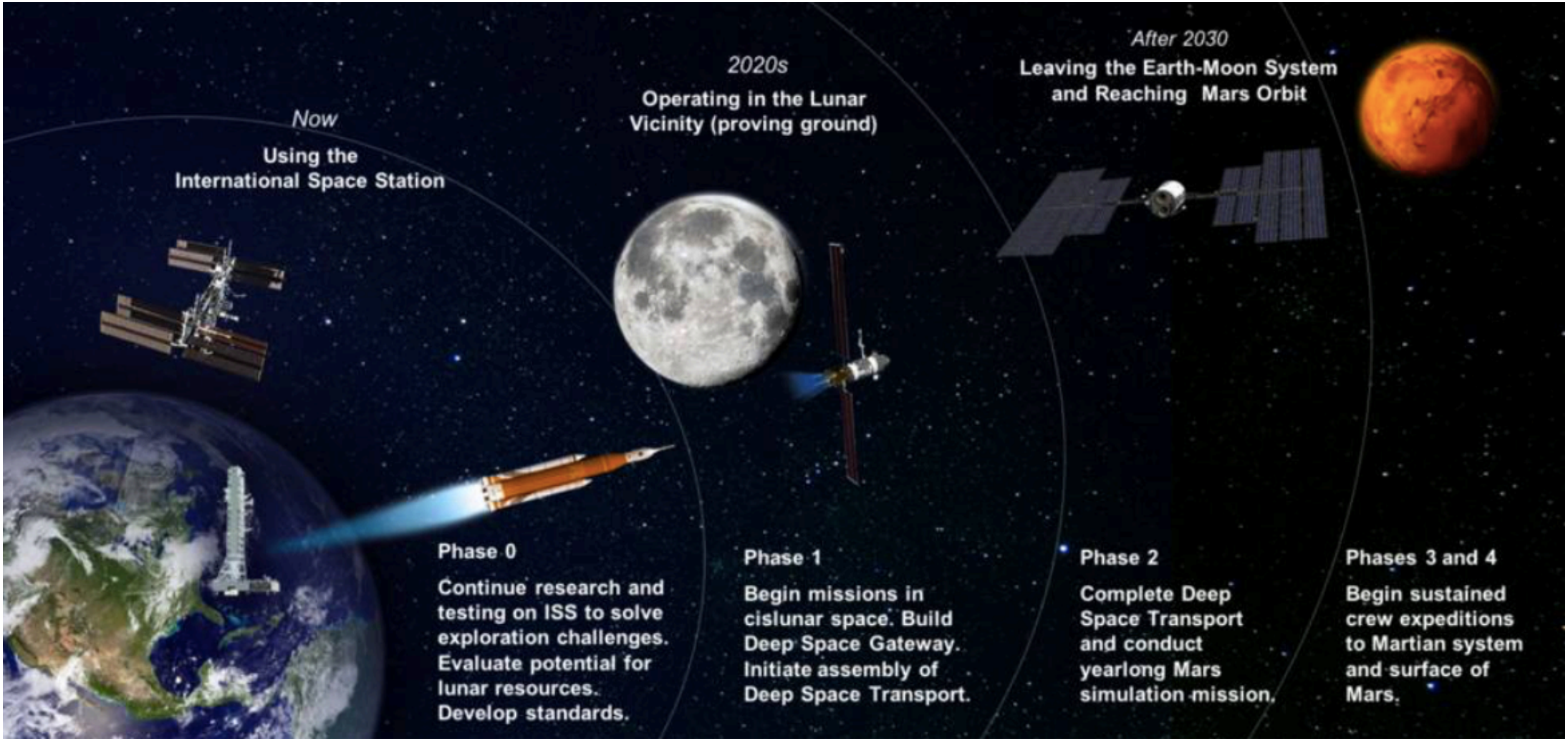
ESA's Human Research Office activities

Dr. med., Dr. rer. nat. Thu Jennifer Ngo-Anh
Human Research Office
Directorate of Human and Robotic Exploration Programmes

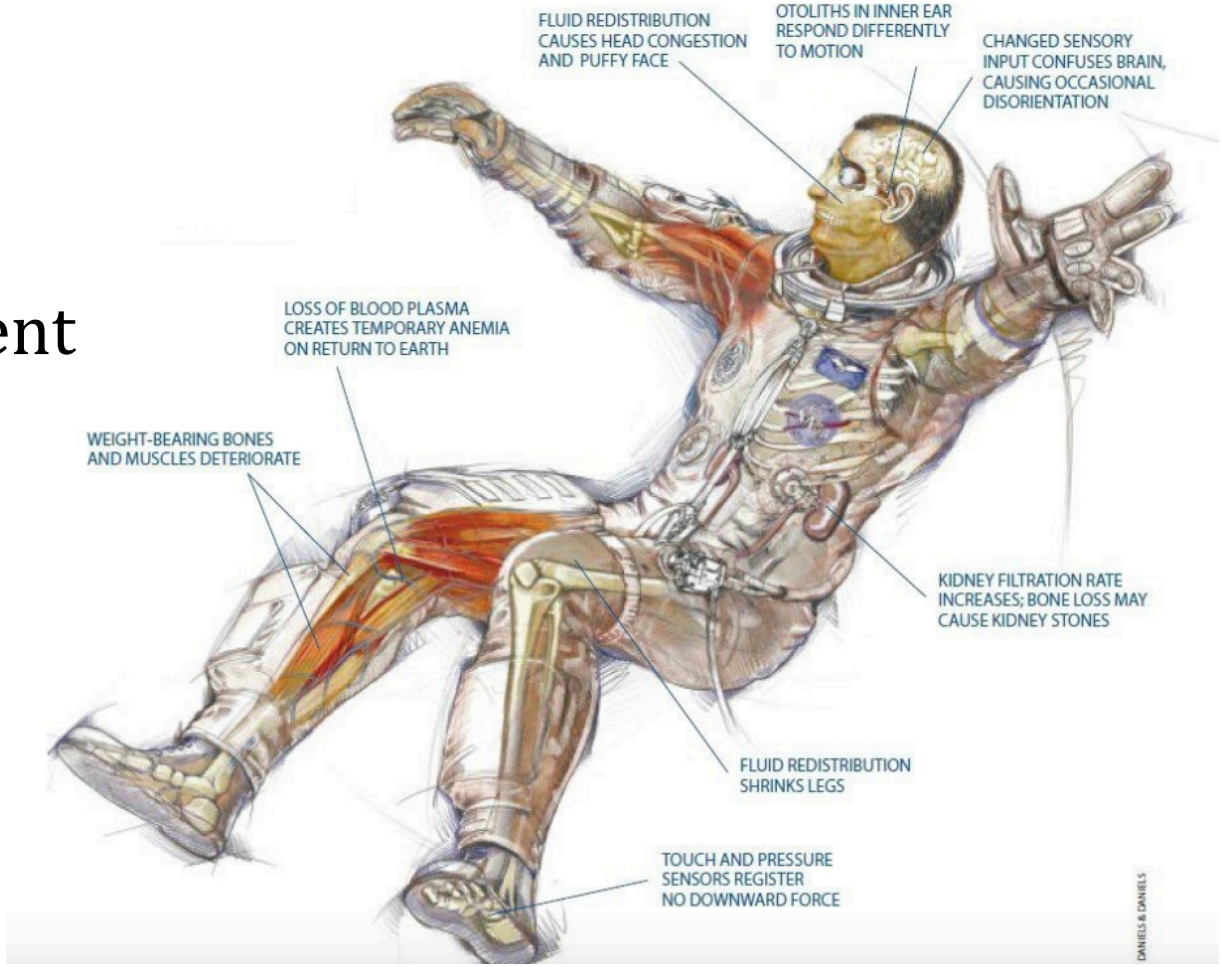

To confine our attention to
terrestrial matters would be
to limit the human spirit.
Stephen Hawking

The GLOBAL EXPLORATION ROADMAP



HUMAN SPACEFLIGHT RISKS ARE CHARACTERIZED BY SPACEFLIGHT HAZARDS

- Cosmic radiation
- Isolation and confinement
- Low/zero gravity



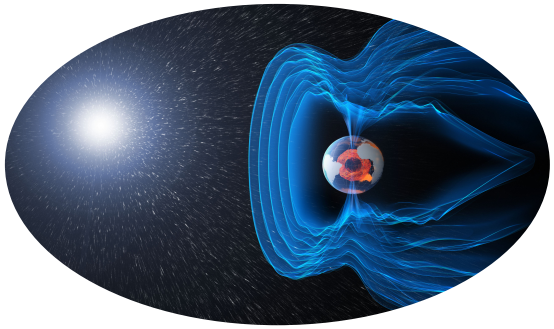

"We choose to go to the Moon in this decade and do the other things, not because they are easy, but because they are hard."
-John F Kennedy

ESA's Human Research Programme

Bedrest studies

Parabolic flight experiments
and Ground-Based Facilities programme

Isolation and confinement studies



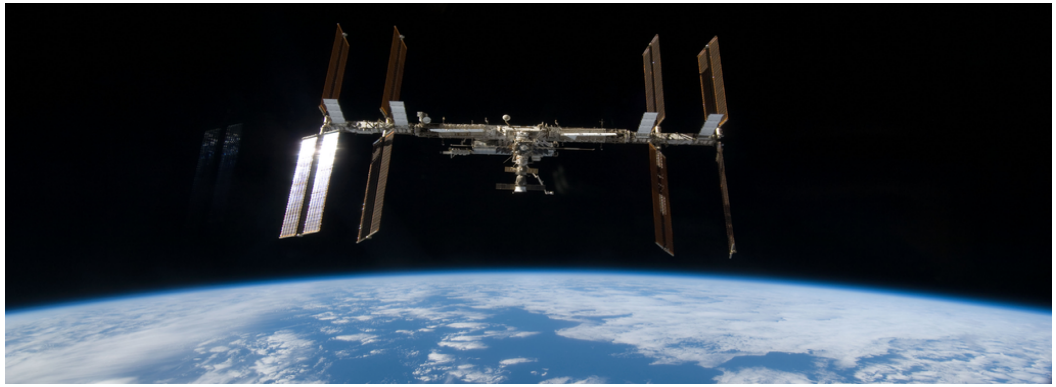
Space radiation studies

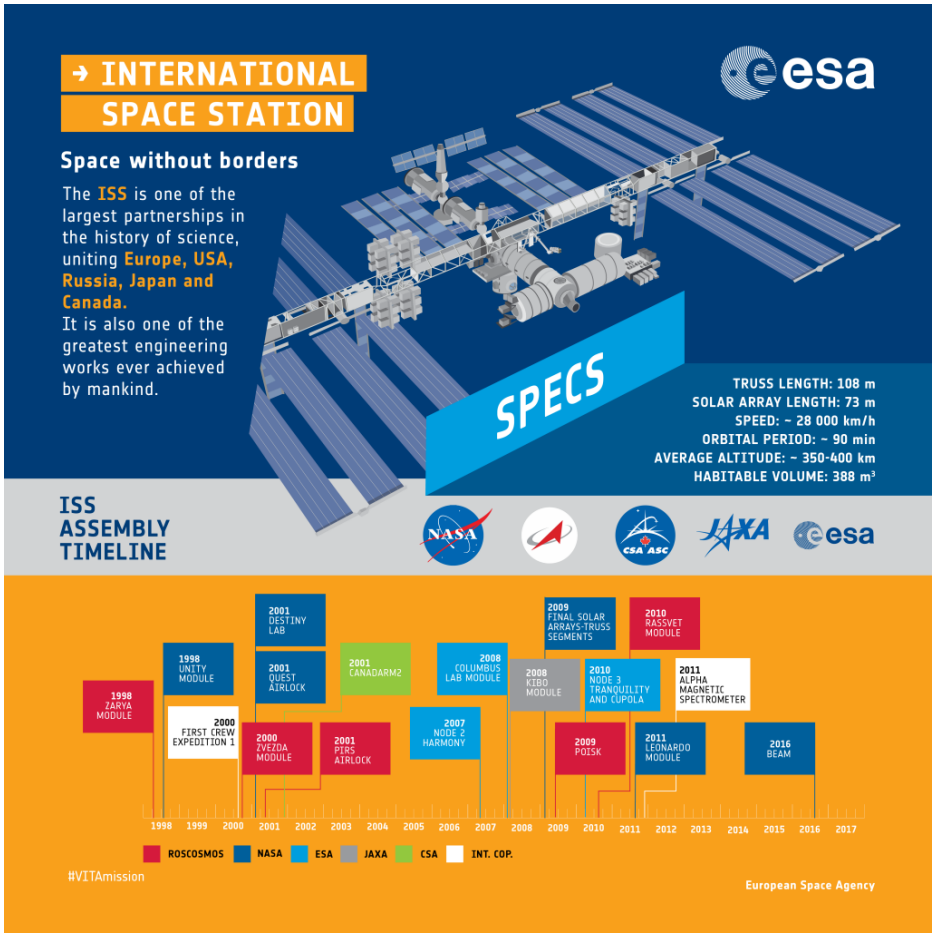
ISS experiments

"Innovative" studies

INTERNATIONAL SPACE STATION

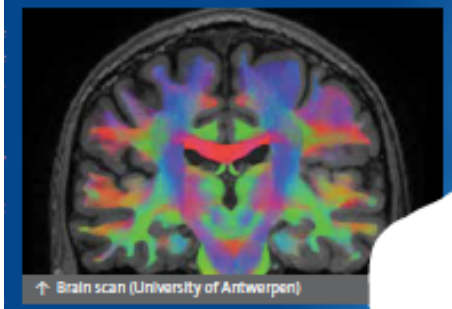
- First exploration and permanently **manned outpost** in space
- A successful international partnership and **close cooperation** between the Unites States, Russia, Canada, Japan and ESA, which represents 10 participating States





INTERNATIONAL SPACE STATION

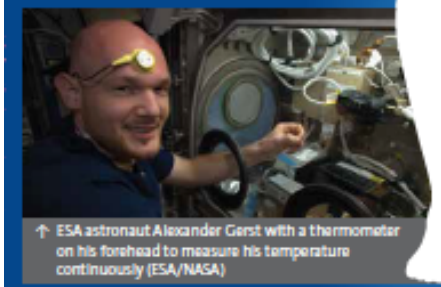
INTERNATIONAL SPACE STATION



↑ Brain scan (University of Antwerpen)

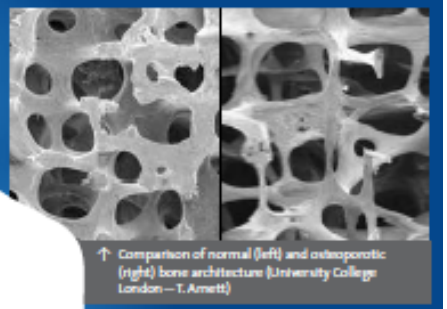
↑ Testing GRIP prototype on weightless parabolic flight

↑ Space food for the Energy experiment

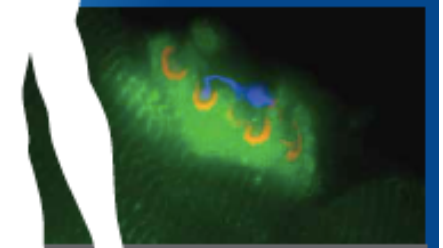


↑ ESA astronaut Alexander Gerst with a thermometer on his forehead to measure his temperature continuously (ESA/NASA)

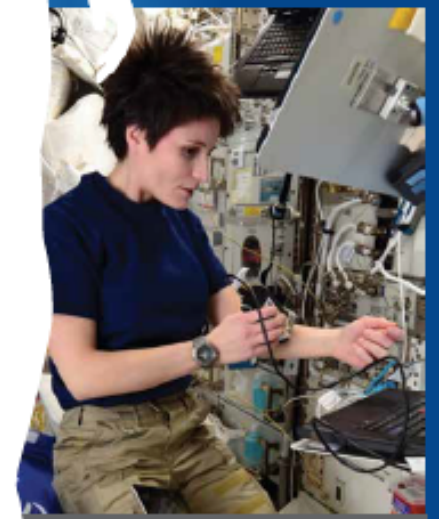
Ageing
Cardiovascular
Immunology
Muscle and bone
Neurophysiology
Nutrition
Respiratory system
Thermoregulation



↑ Comparison of normal (left) and osteoporotic (right) bone architecture (University College London – T. Arnett)

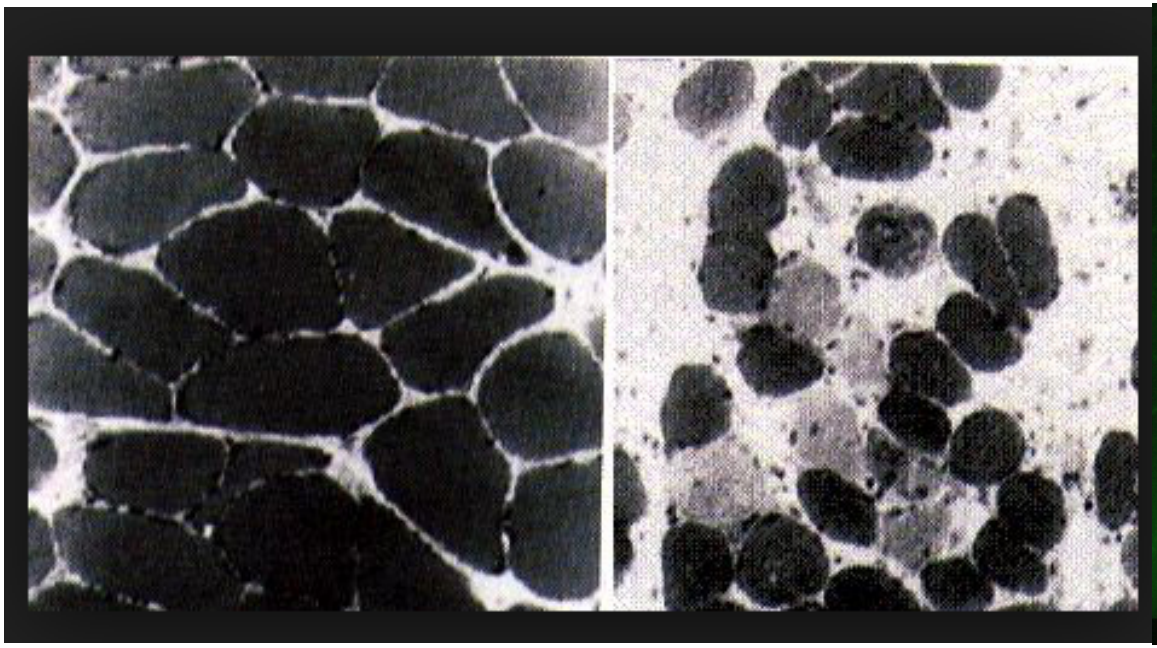


↑ Laser image of a calf muscle (Charité)

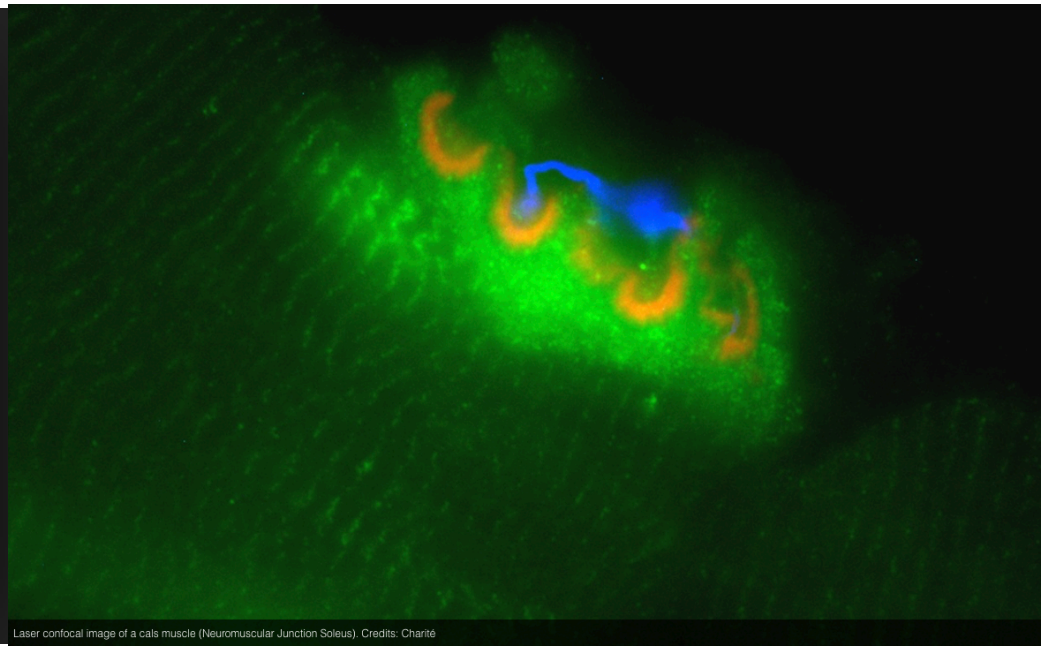


↑ ESA astronaut Samantha Cristoforetti running the Skin-B experiment (ESA/NASA)

INTERNATIONAL SPACE STATION

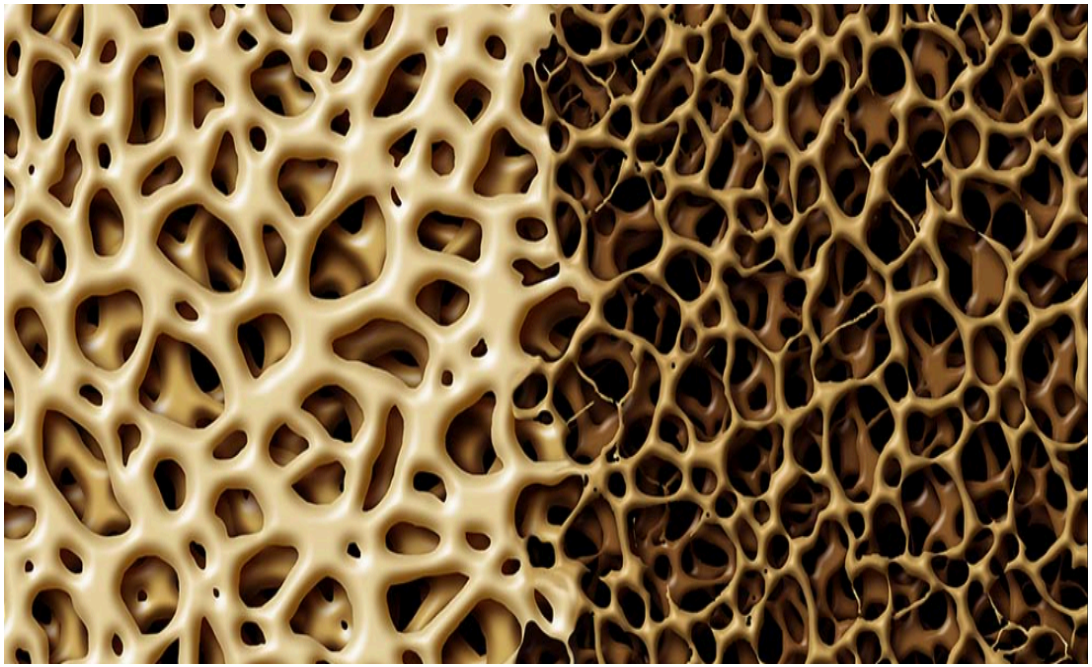


Cross sections of rat muscle show the effect of space on muscles.
Left=Earth, right=space. (Credit: NASA)

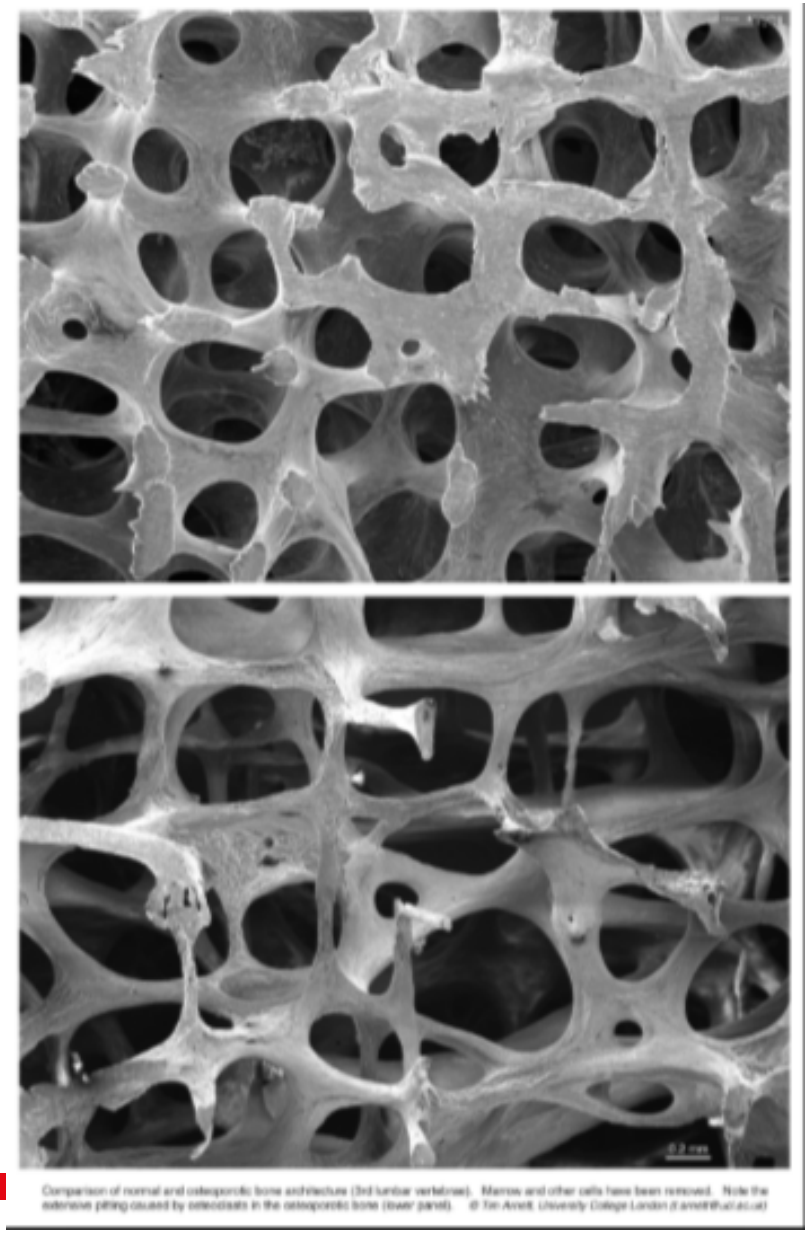


Laser image of human calf muscle (Credit: Charite)

INTERNATIONAL SPACE STATION



Bone before and after spaceflight
(Credit: CALM technologies)



Comparison of normal (top) and osteoporotic (bottom) bone architecture (Credit: T. Arendt)

INTERNATIONAL SPACE STATION

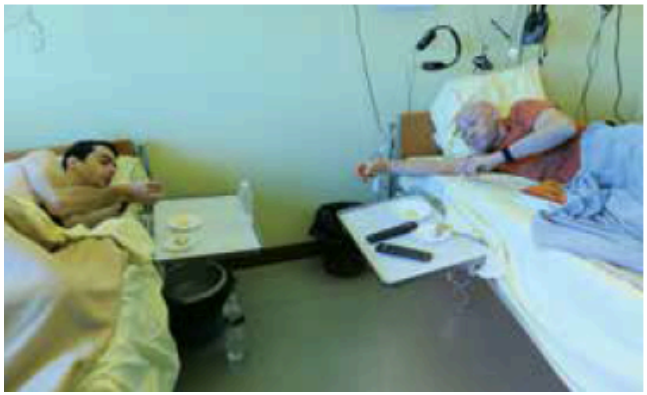
INTERNATIONAL SPACE STATION

S122E008916

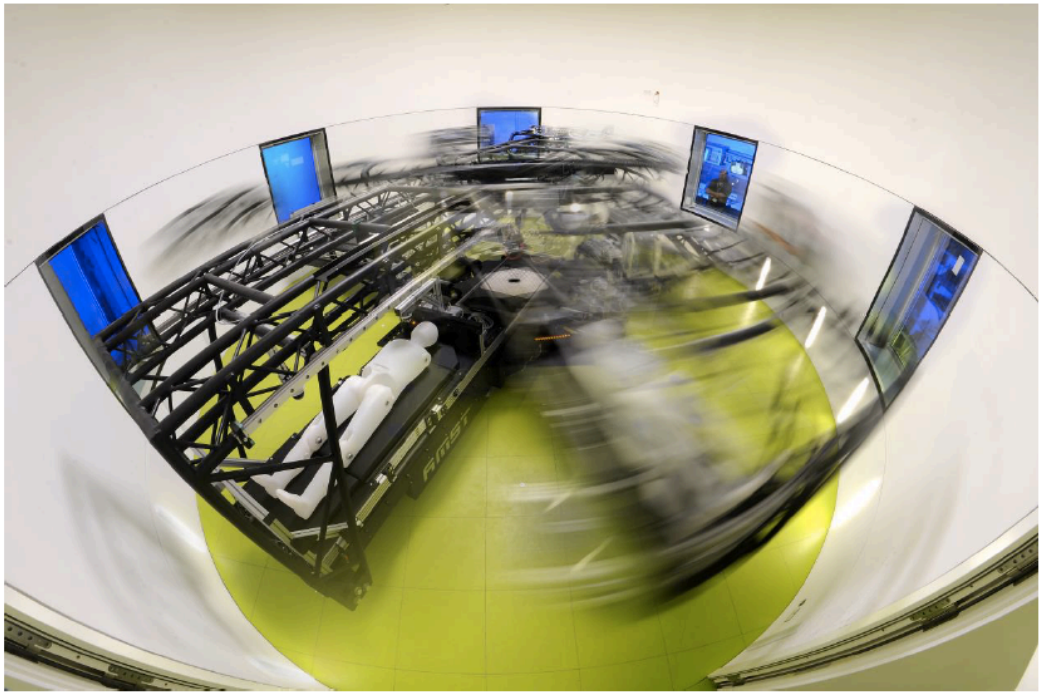
Bedrest Studies

What are bedrest studies?

Bedrest studies involve putting normal subjects in bed with their heads down at six degrees below horizontal for five to 60 days. During this time the participants are asked to perform all normal daily activities while staying in that position 24 hours a day. Scientific experiments are conducted on the volunteers almost every day so investigators can study the physiological adaptation of the body to this new postural condition. Bedrest studies allow scientists to evaluate countermeasure effectiveness.

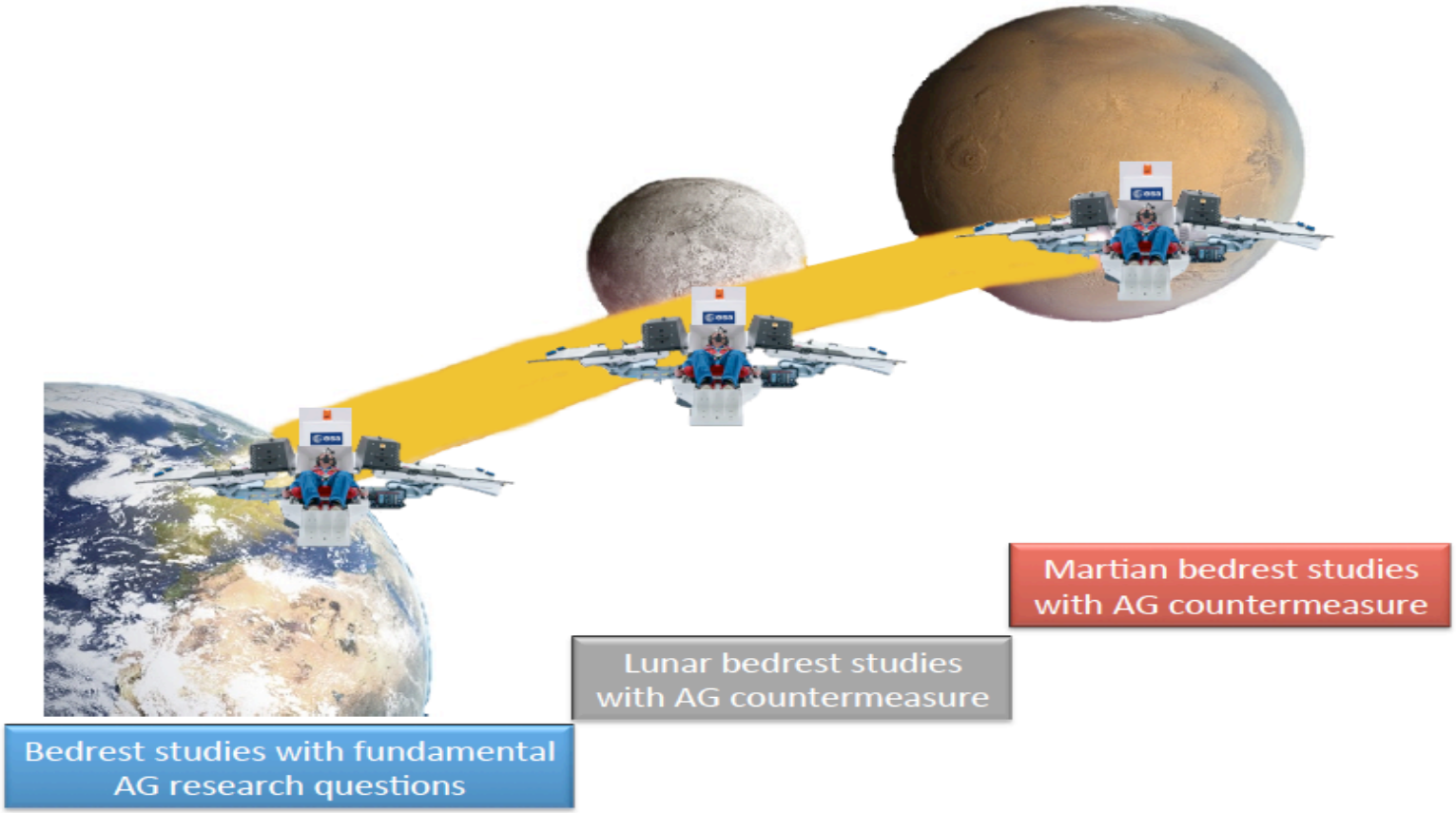


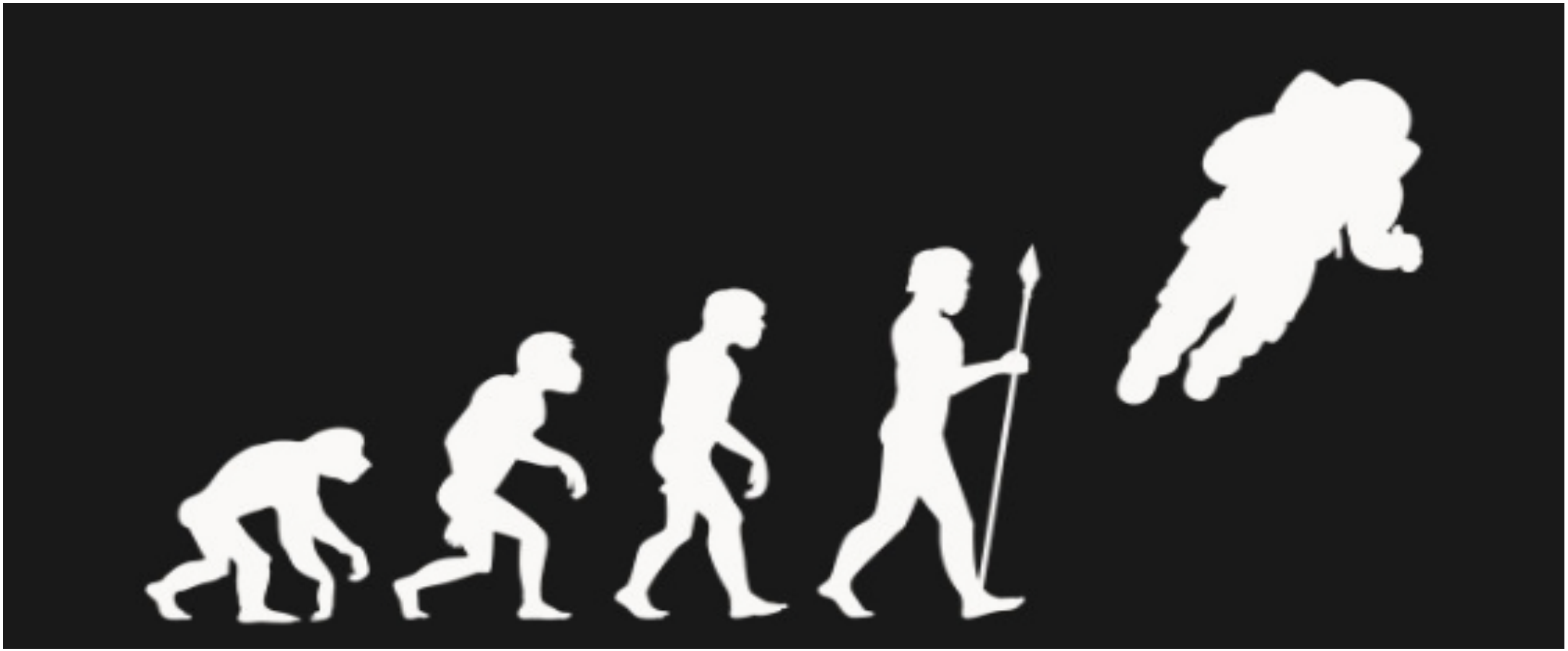
Bedrest Studies and Artificial Gravity



BEDREST STUDIES AND ARTIFICIAL GRAVITY

ESA'S MULTI-YEAR BEDREST PROGRAMME PLAN



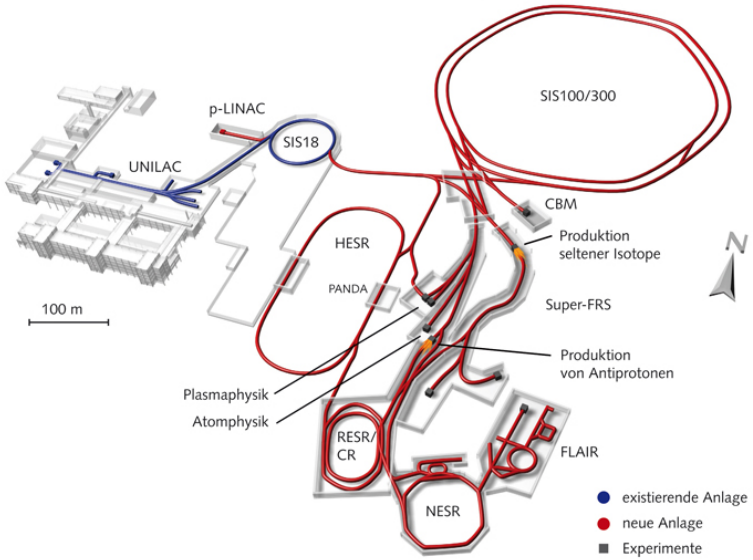


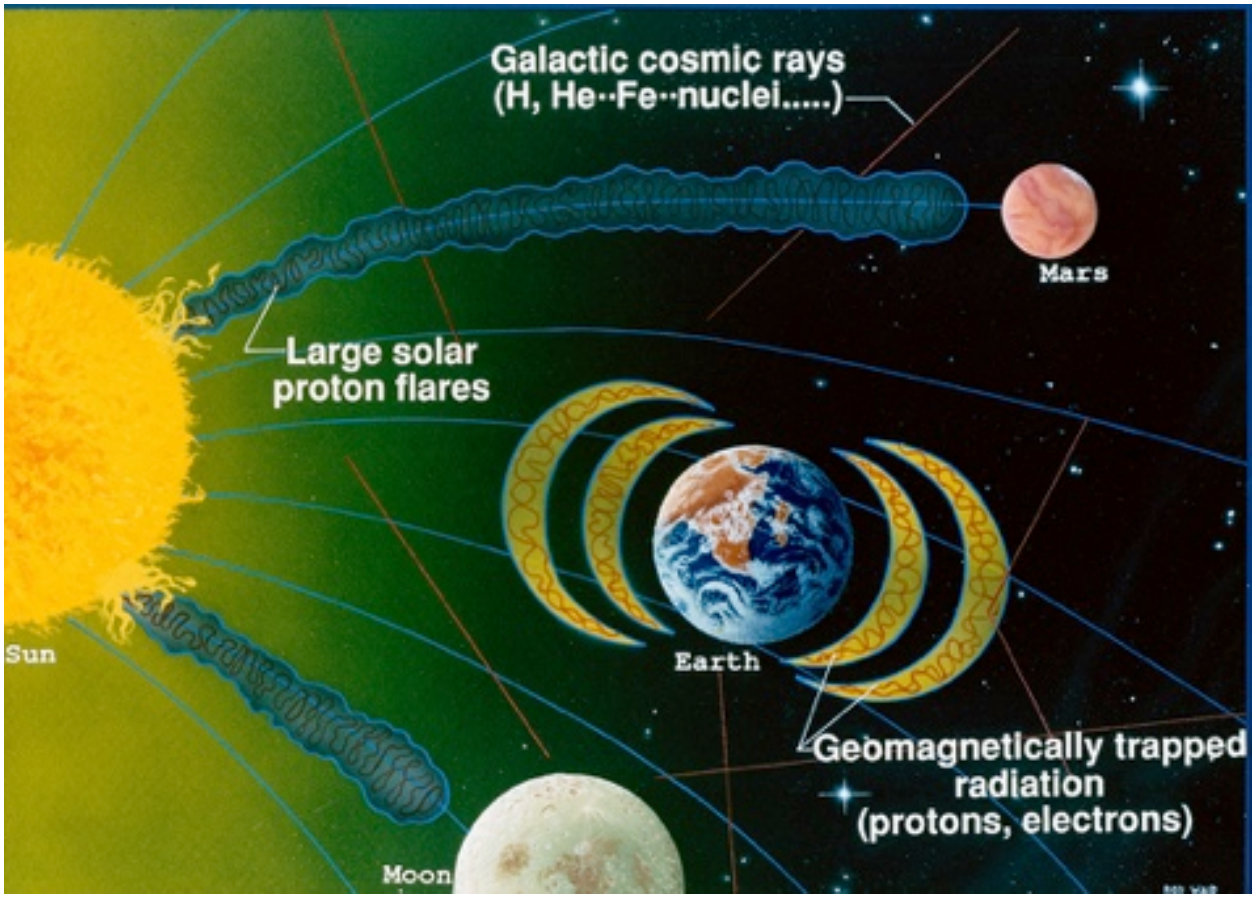
CONCORDIA STATION

CONCORDIA STATION

SPACE RADIATION STUDIES

IBER programme:
Investigations into Biological Effects of Radiation

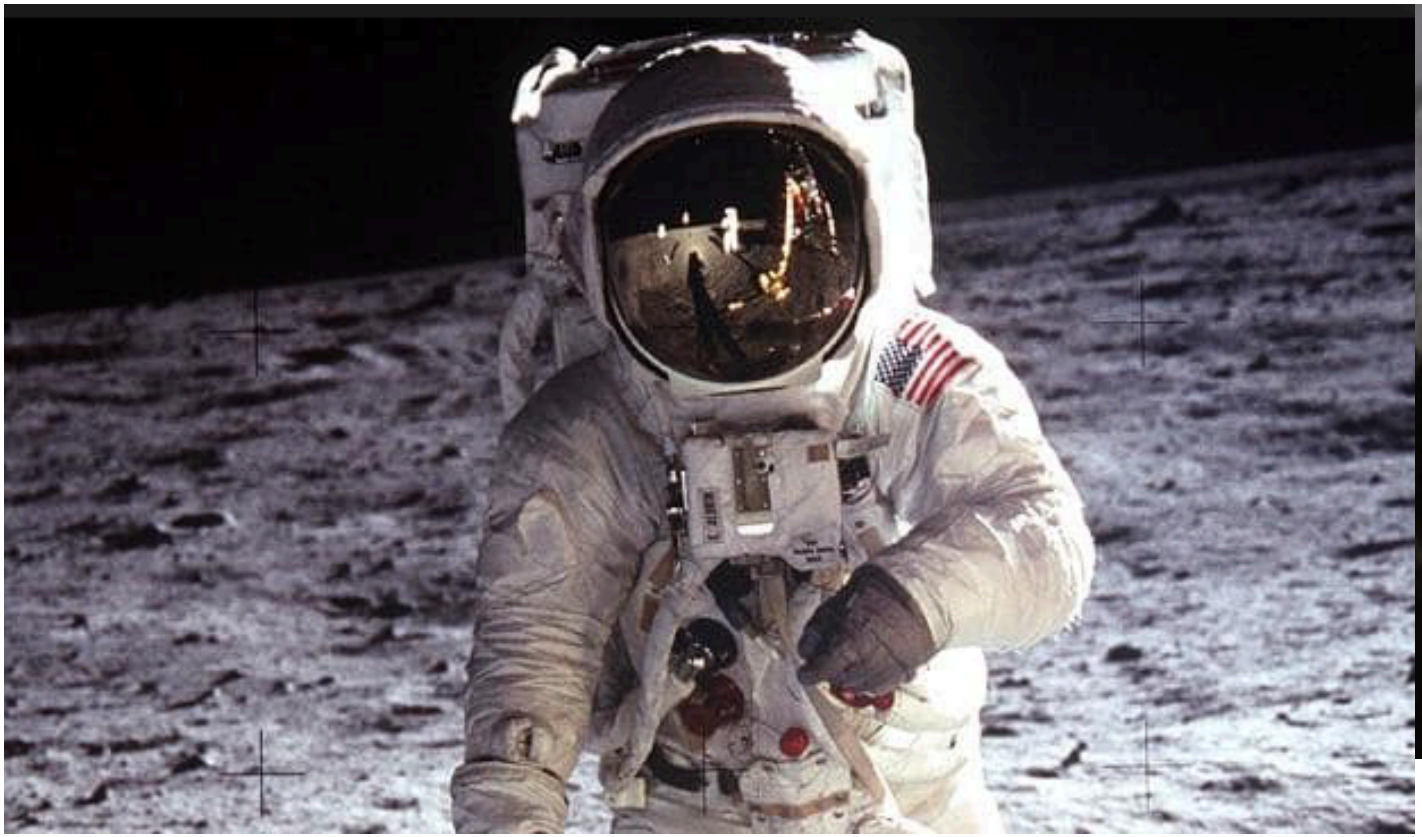




PARABOLIC FLIGHT CAMPAIGN STUDIES

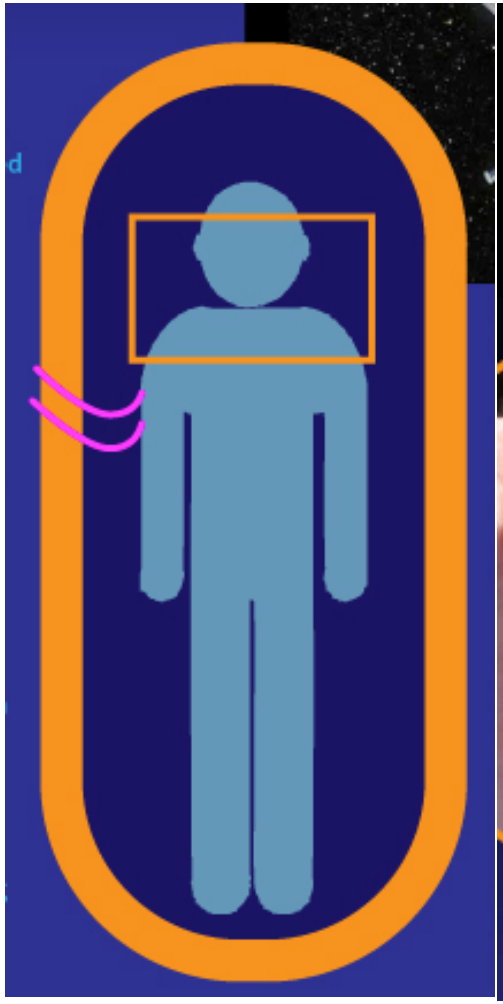
ESA UN

MOON DUST



Eugene Cernan in the Lunar Module Challenger. (Image credit: NASA)

HIBERNATION AND TORPOR



Space trips to the other planets would require months of travel through the vacuum of space. Maintaining the crew's health is a vital concern. If the crew could be induced to hibernate, the problems of survival become easier to solve.

HIBERNATION, NOT FREEZING

Preble's Mouse hibernates during the colder half of the year. (CREDIT: U.S. Fish and Wildlife Service)

Hibernation is a type of torpor, or reduced metabolism caused by hypothermia. Unlike in cryogenics, the body does not actually freeze.

A 10 degree drop in body temperature reduces metabolic rate by 50 to 70 percent.

Astronaut Dave Bowman monitors hibernating crew members on the voyage to Jupiter in "2001: A Space Odyssey." (1968)


Low
Earth
Orbit
Moon
Mars
esa
we explore. you benefit.
Human Spaceflight and Robotic Exploration


EUROPEANS: ONCE EXPLORERS, ALWAYS EXPLORERS.