

Space for Intelligent Health



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European Space Agency

GRASP: Gravitational References for Sensimotor Performance

- neurovestibular science
- how a brain integrates signals coming from different sensors
- possibly influence of gravitational vector



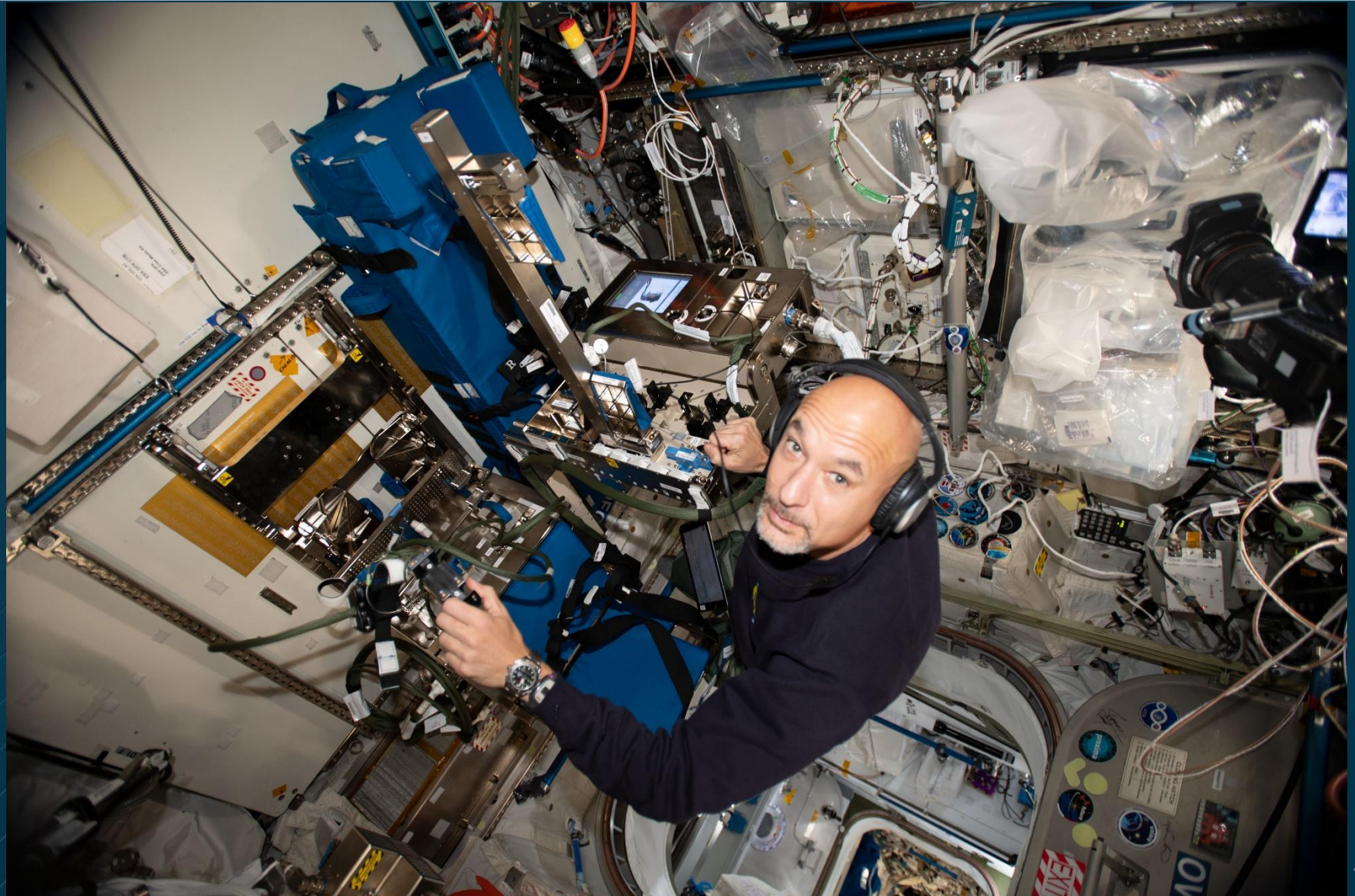
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- helpful for spacewalks
- development of most effective ways of controlling robots remotely from space
- help us better treat disorders relating to:
 - . Vertigo
 - . Dizziness
 - . Balance
 - . Spatial orientation
- help surgeons and other professionals who need to tele-operate equipment



GRIP 1/2

- how the central nervous system controls movements
- the forces astronauts use to manipulate objects with their hands



- 'manipulandum' is equipped with measuring instruments
- held between right thumb and index finger
- subjects carry out a variety of movements
- understand potential hazards for astronauts in different gravitational environments
- improve the design of haptic interfaces (Earth, deep space missions)



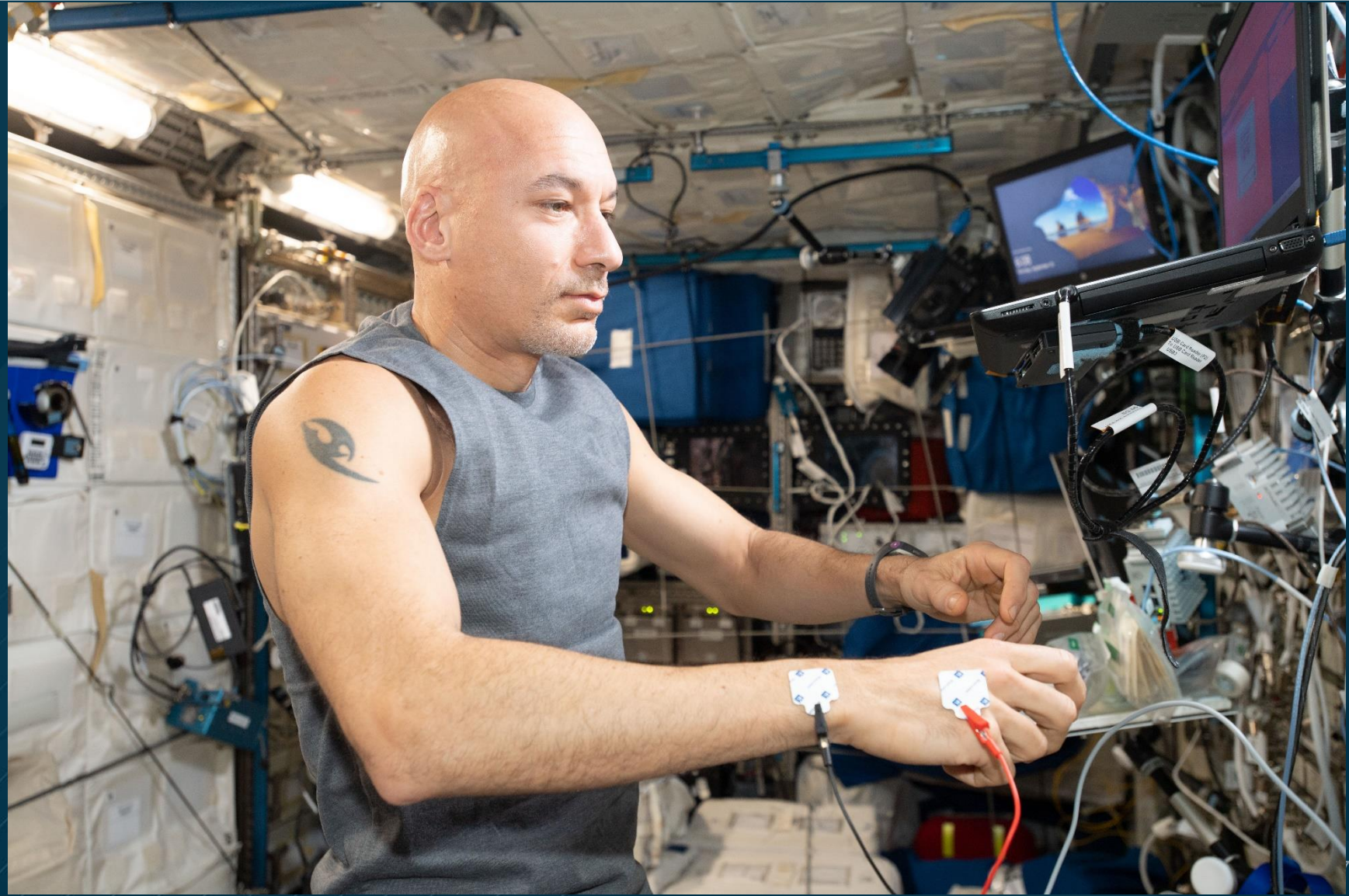
NutrISS: Nutrition Monitoring for the International Space Station experiment

- Uses EveryWear and a 'bioelectric impedance' device to measure bodily conductivity
- tracks fat to mass ratio
- carefully-tailored diet could limit typical microgravity-driven loss of bone and muscle



EveryWear: iPad-based application

- collects physiology and medical data from astronauts on the International Space Station
- connected to wearable biomedical sensors
 - . Exercise
 - . heart rate
 - . sleep quality



EveryWear:

- as food diary: astronauts scans barcode of food with the built-in tablet camera
- classify it as
 - . breakfast
 - . lunch
 - . dinner
 - . snack
 - . water consumption



CSA experiment

- smart shirt system measures vital signs:
 - . temperature
 - . heart rate
 - . respiration
 - . Movement
- Data transmitted to EveryWear tablet application



Acoustic Diagnostics

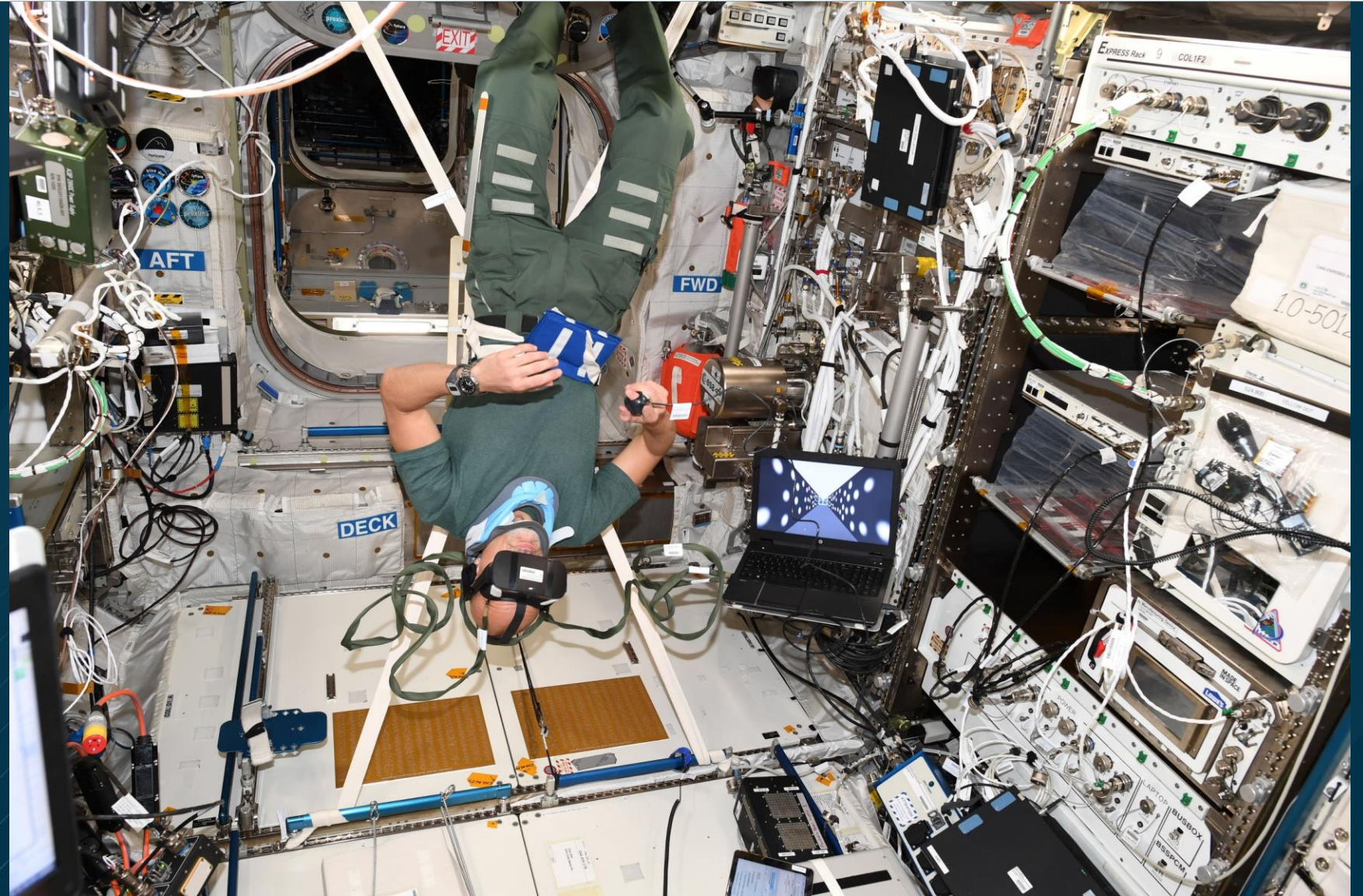
- ASI/ University of Rome Tor Vergata experiment,
- effects of background noise of the ISS on hearing
- Passive side of hearing: measures response



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Time

- time perception subjectively speeds up in microgravity
- several tests measure how subjects perceive passage of time
- collecting data on neurological mechanisms
- also psychological – individual perception



Optical Coherence Tomography (OCT)

- seeks to understand vision changes during long-term space missions
- Maps choroid thickness
 - . increase in orbit
 - . affects vision



Amyloid Aggregation

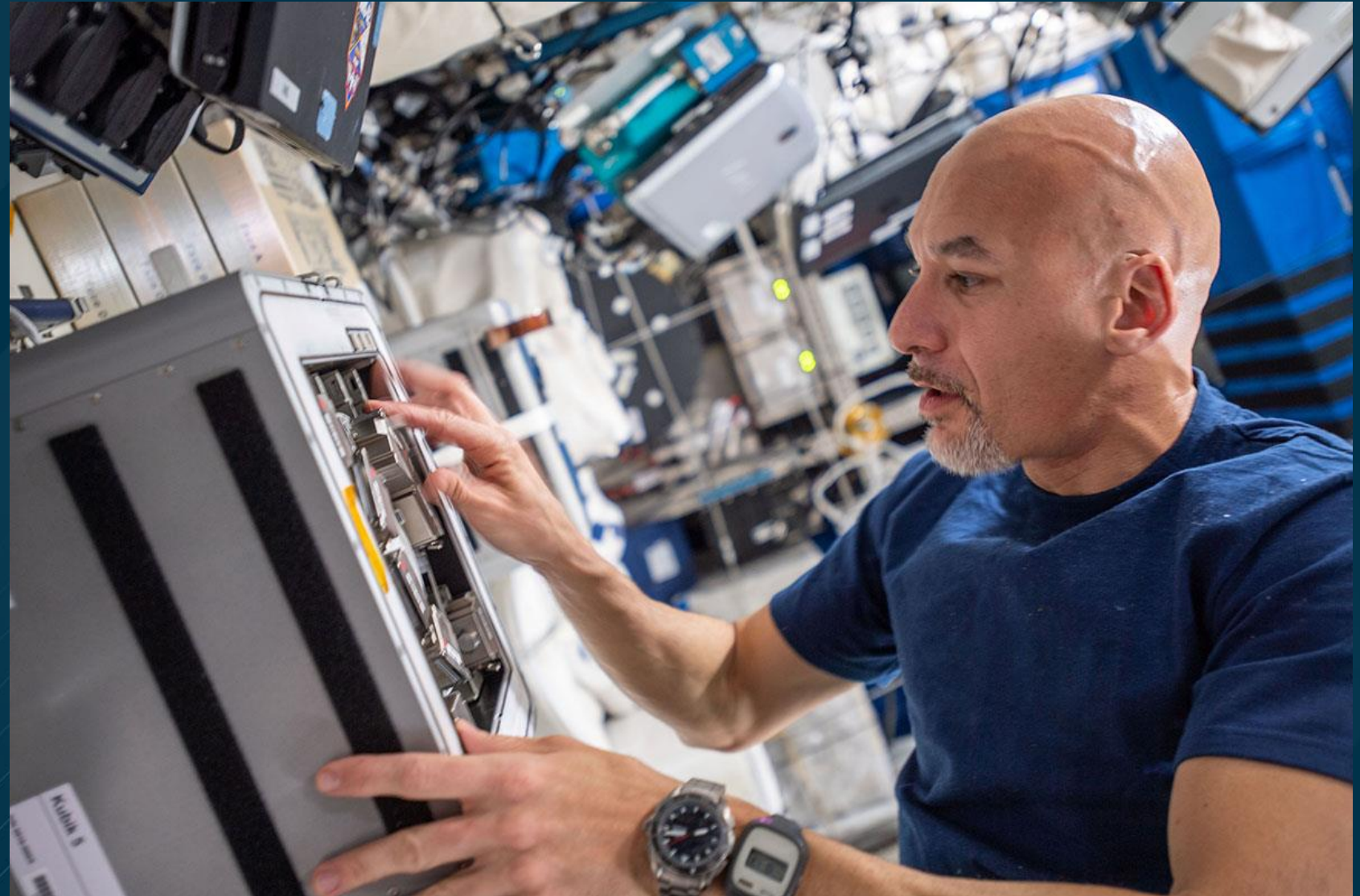
- studies aggregation of amyloid proteins
- connected to Alzheimer's disease



- studies how organisms evolve to adapt to space environment.
- *Bacillus subtilis* bacteria will be grown in specially designed environmental hardware in a range of condition
- adaptation process might occur differently in
 - . microgravity
 - . general space environment

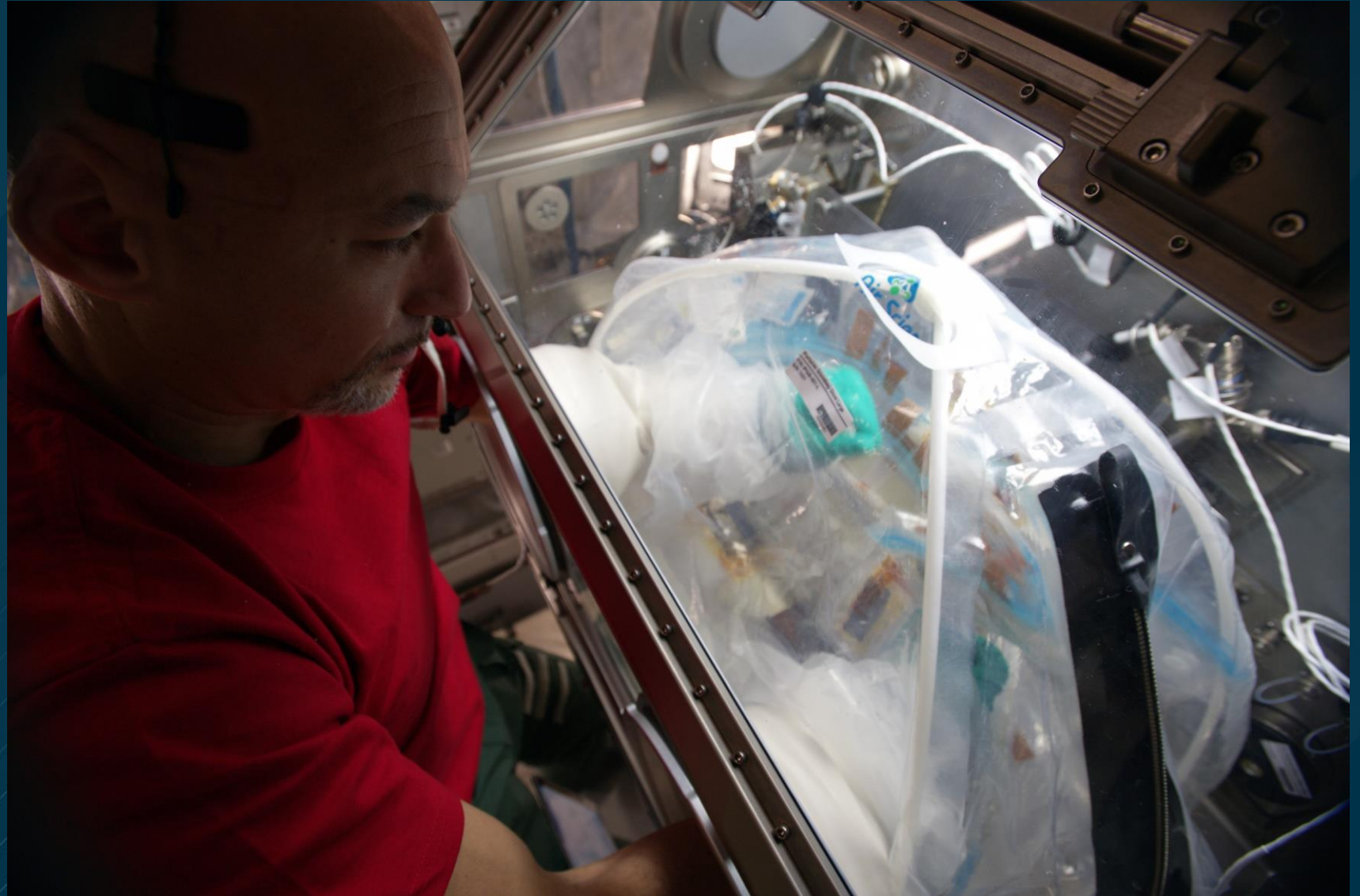


- Rock mining bacteria
- Possible changes in microgravity
 - . physical
 - . behavioural



Goodyear:

- formation of silica particles, a common material used in consumer tires
- investigation of unique forms of precipitated silica could be considered in tires



Fluid Science: RUBI

RUBI - Reference mUltiscale Boiling Investigation

installed in the Fluid Science Laboratory (FSL), in Columbus: Multiscale Boiling.

- large heat fluxes can be transferred with small temperature differences
- high performance of boiling is interesting for heat transfer applications:
 - . power plants
 - . refrigeration systems
 - . and electronics cooling







