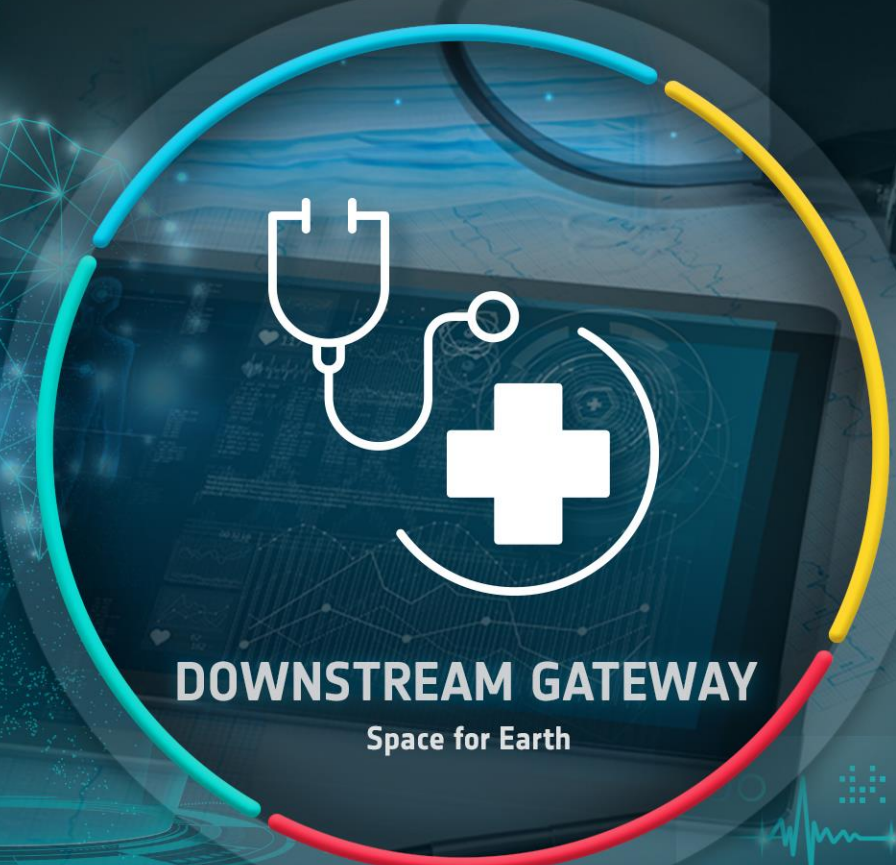


European Exploration Envelope Programme (E3P) Health Research and Applications Opportunities

A large circular graphic with a blue and yellow border. Inside, there is a white stethoscope icon and a white medical cross icon. The background of the circle shows a laptop screen with data and a globe.

DOWNSTREAM GATEWAY
Space for Earth

Jason Hatton,

SciSpace Team,

Directorate of Human Spaceflight and
Robotic Exploration

What does space exploration have to do with health?

- Humans in Space – Physiological changes, risks & countermeasures
 - Bone & Muscle Loss, metabolic changes
 - Cardiovascular & pulmonary deconditioning
 - Isolation and confinement
 - Ensuring Crew Health during Spaceflight
 - Parallels between spaceflight and terrestrial health
- General effects of microgravity & spaceflight (physical, chemical, biological processes)
 - Altered fluid physics
 - Alterations in Biological Systems
 - Unique scientific knowledge, use of knowledge for terrestrial applications

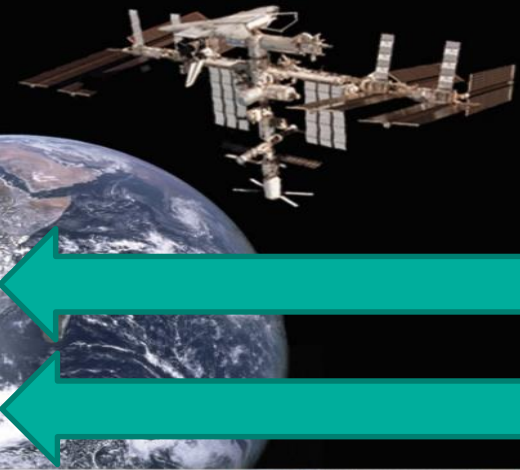
**Space
Environment**

*Microgravity
Vacuum
Isolated
Environment
Radiation*



European Exploration Envelope Programme (E3P)

Continuous Human Presence in Low Earth Orbit



Human and Robotic Exploration on and around the Moon

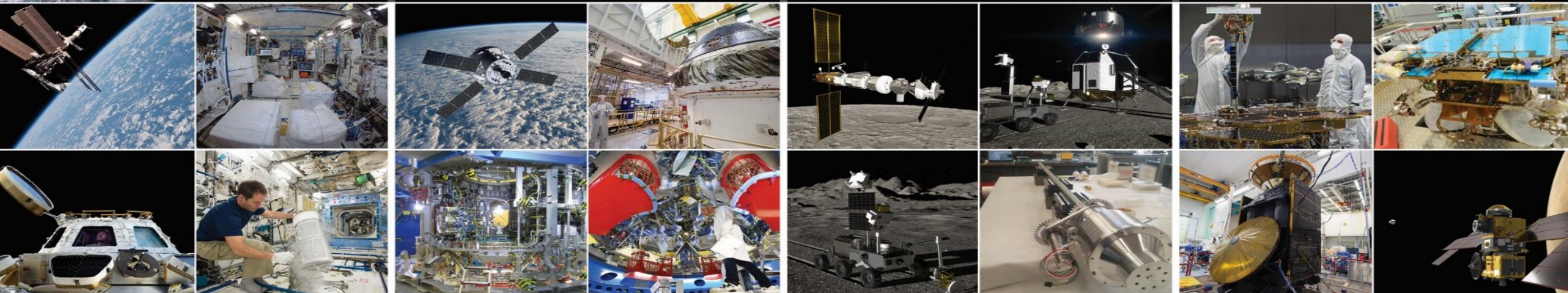


Robotic Exploration of Mars



Science (SciSpacE Element)

Technology to Enable Exploration (EXPERT Element)



E3P Entry Points: How to get access



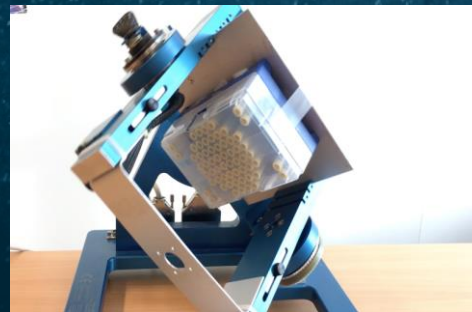
SciSpace Programme

Commercial Service Providers

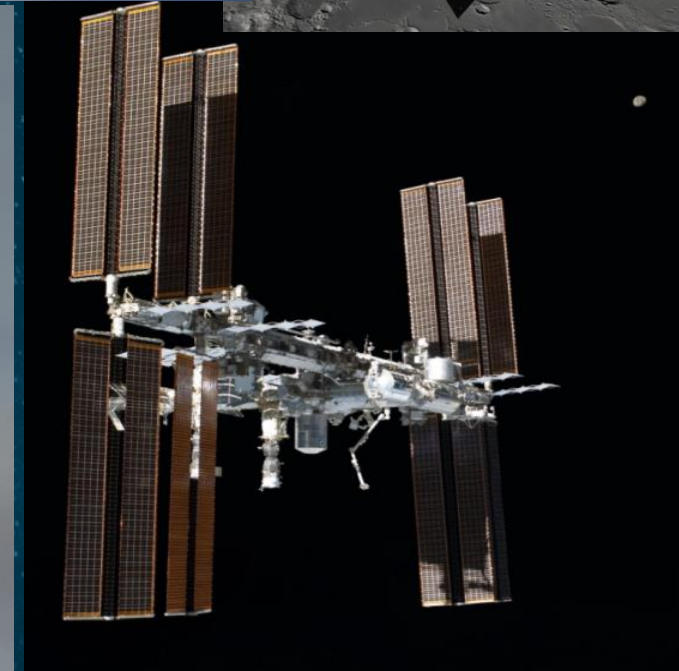
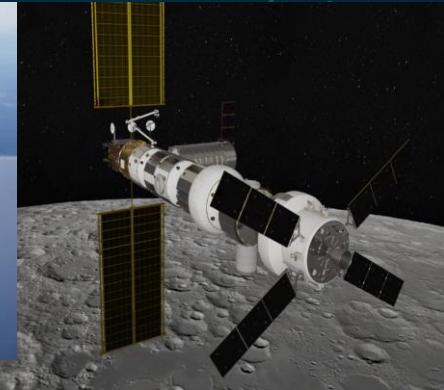
Business in Space Growth Network



Ground Platforms



Flight Platforms



SciSpaceE Activities relevant to Health

Human Physiology Research

- Physiological and Psychological Research on ISS Crew members
- Bedrest Studies
- Isolation Studies
- Countermeasures



Biology Research

- Flight and Ground studies on medically relevant cell tissue cultures and animal models
- Technology for tissue / organ culture and transport
- Radiation Research



Applied Life Science Research

- Wound Healing, Ageing,
- Personalised medicine, Nutrition

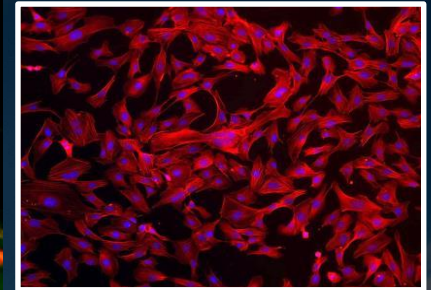
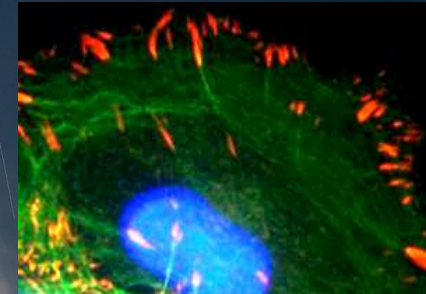


SciSpaceE Research Community

- 1500+ Scientists
- Cross-disciplinary
- Research networks

Science Data Center (in development)

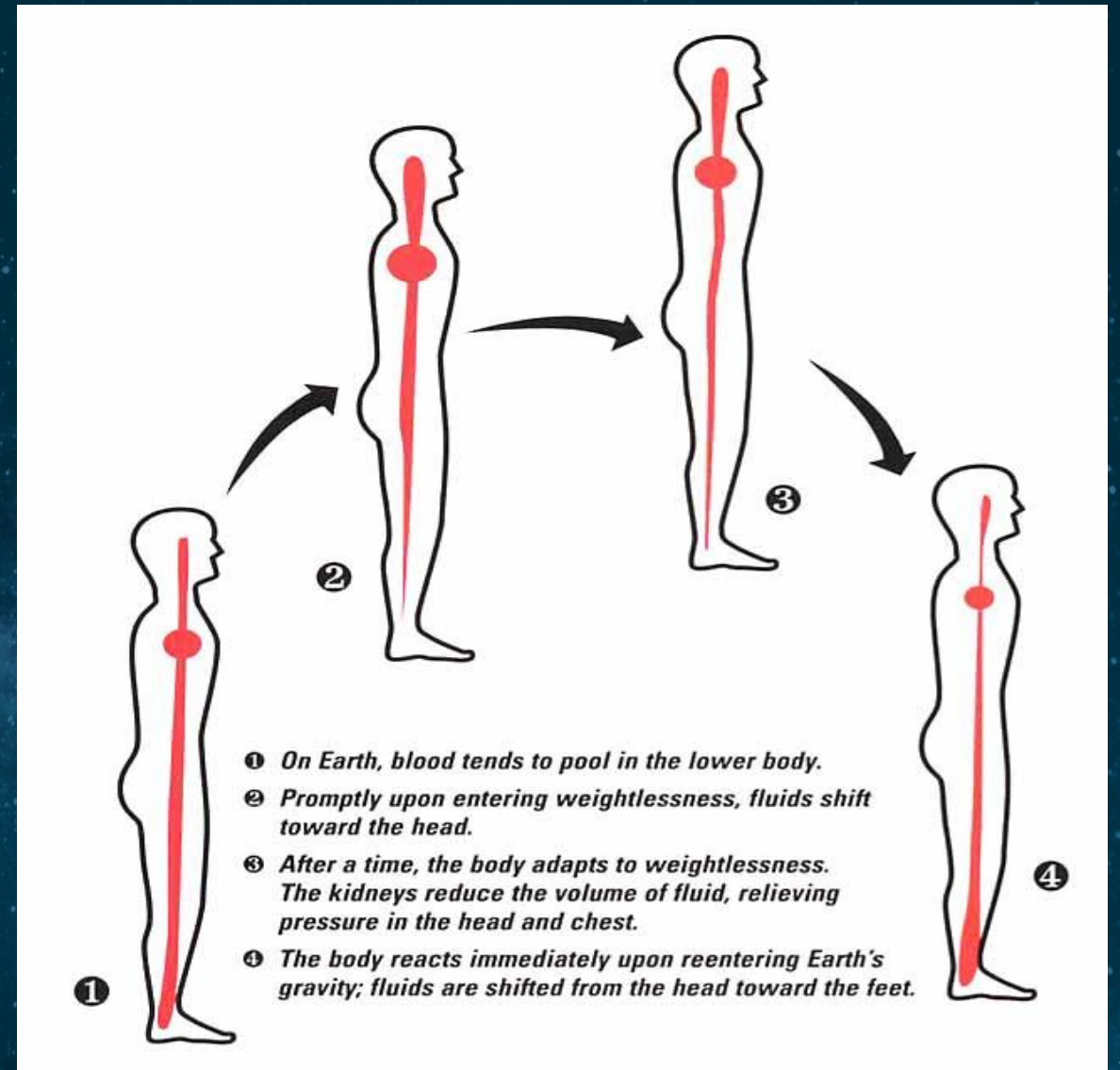
- Publications Links
- Access to data from previous experiments



Parallels Spaceflight ⇔ Ageing

Cardiovascular changes

- Astronauts exposed to microgravity experience a fluid shift towards the head, which is compensated by an overall drop in vascular blood pressure.
- On return to normal gravity orthostatic intolerance is often observed.
- Similarly, orthostatic intolerance occurs in sedentary or elderly patients when standing up.



Parallels Spaceflight ↔ Ageing

Cardiovascular changes

- Increased arterial stiffness can occur during ageing, this can increase the resistance of blood flow into the brain



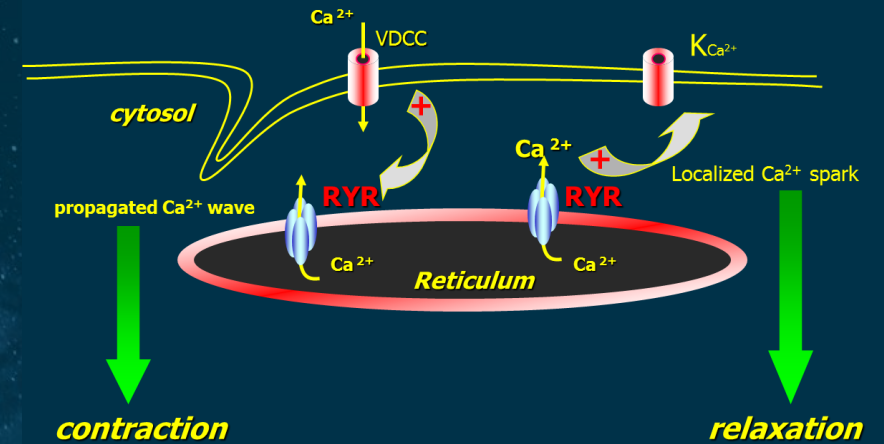
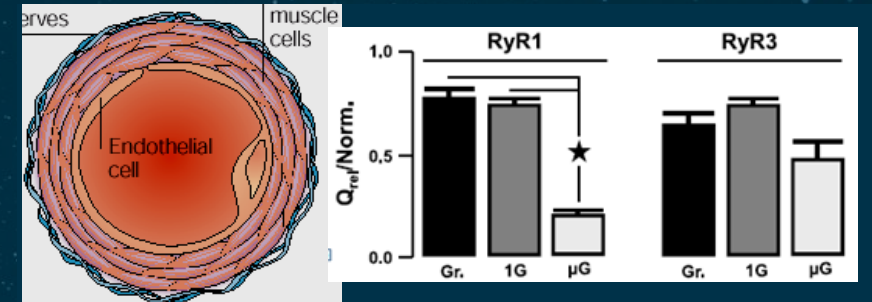
- The arterial baroreflex gain is increased in some astronauts following spaceflight. Arterial stiffness also altered in astronauts during spaceflight, although results not consistent



- 5-days Head Down Tilt Bed Rest elevated hormones of the renin-angiotensin-aldosterone system. This could promote vascular stiffness.

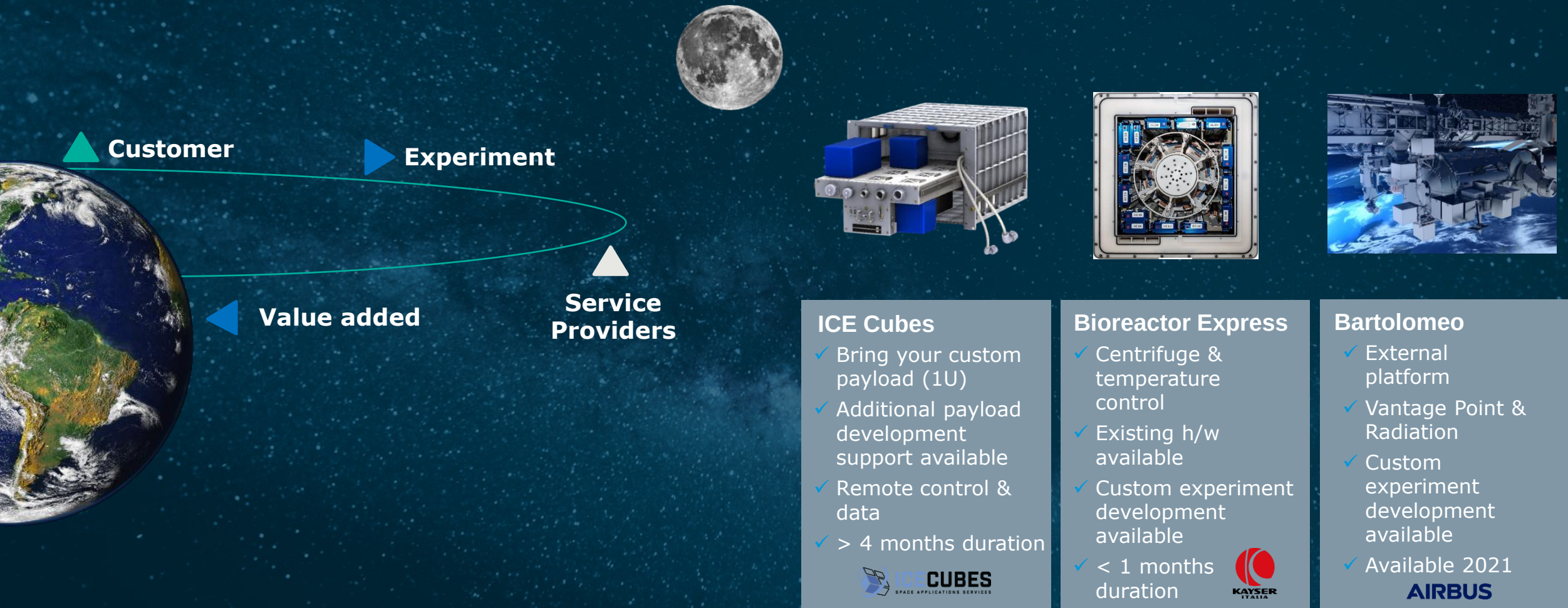


- In microgravity contractability of isolated vascular myocytes (muscle cells in vascular wall) due to reduced Ca^{2+} channel expression



Dabertrand, et al J Appl Physiol (2012)

Commercial Access to Space: Currently Available European ISS Commercial Services



The Business in Space Growth Network

To Space, Together



Develop your own programme to solve the challenges of the future already today.



Find Projects & work with commercial platforms



Mobilise Investment & get matching funding from ESA



Develop Solutions & Products that create lasting value



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