

SPACE



SILVANA MIRANDA

Switch *to*
Space 4

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OCTOBER 2ND 2024

HEALTH CHALLENGES IN SPACE



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UNIVERSITY
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BIOSCIENCE ENGINEERING

SILVANA MIRANDA

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HEALTH CHALLENGES IN SPACE

AND HOW TO OUTCOME

THEM

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UNIVERSITY
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BIOSCIENCE ENGINEERING

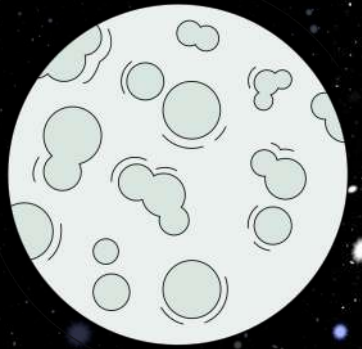
SILVANA MIRANDA

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OUTLINE

1 The Space Environment

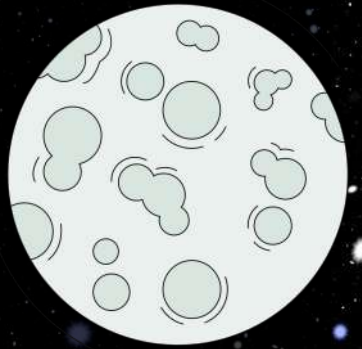


OUTLINE

1 The Space Environment

2. Human Health Challenges for Space Exploration

Current and Proposed
Countermeasures



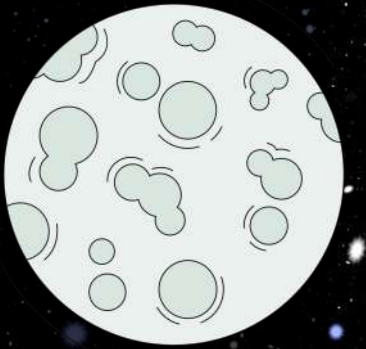
OUTLINE

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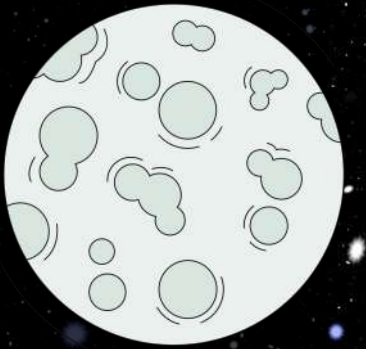
3. Industry Collaboration
Opportunities



OUTLINE

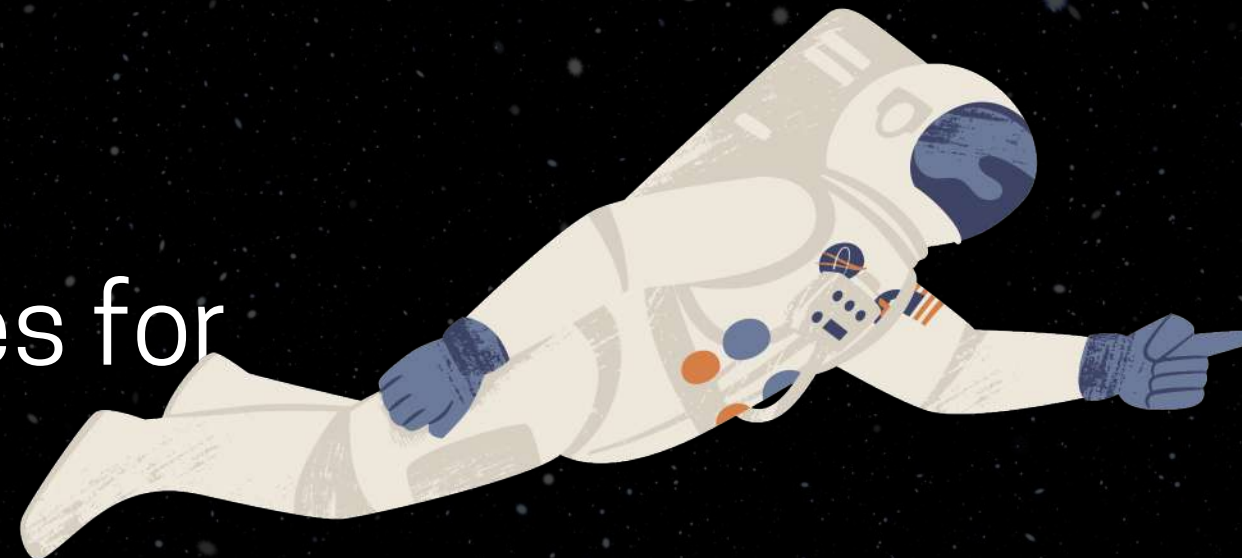
1 The Space Environment

3. Industry Collaboration
Opportunities



2. Human Health Challenges for
Space Exploration

Current and Proposed
Countermeasures



4. Engaging the
Next Generation

OUTLINE

1 The Space Environment

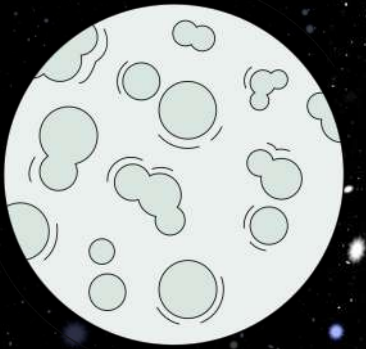
2. Human Health Challenges for
Space Exploration

Current and Proposed
Countermeasures

3. Industry Collaboration
Opportunities

4. Engaging the
Next Generation

5. Take to Space
Message



THE SPACE ENVIRONMENT

1



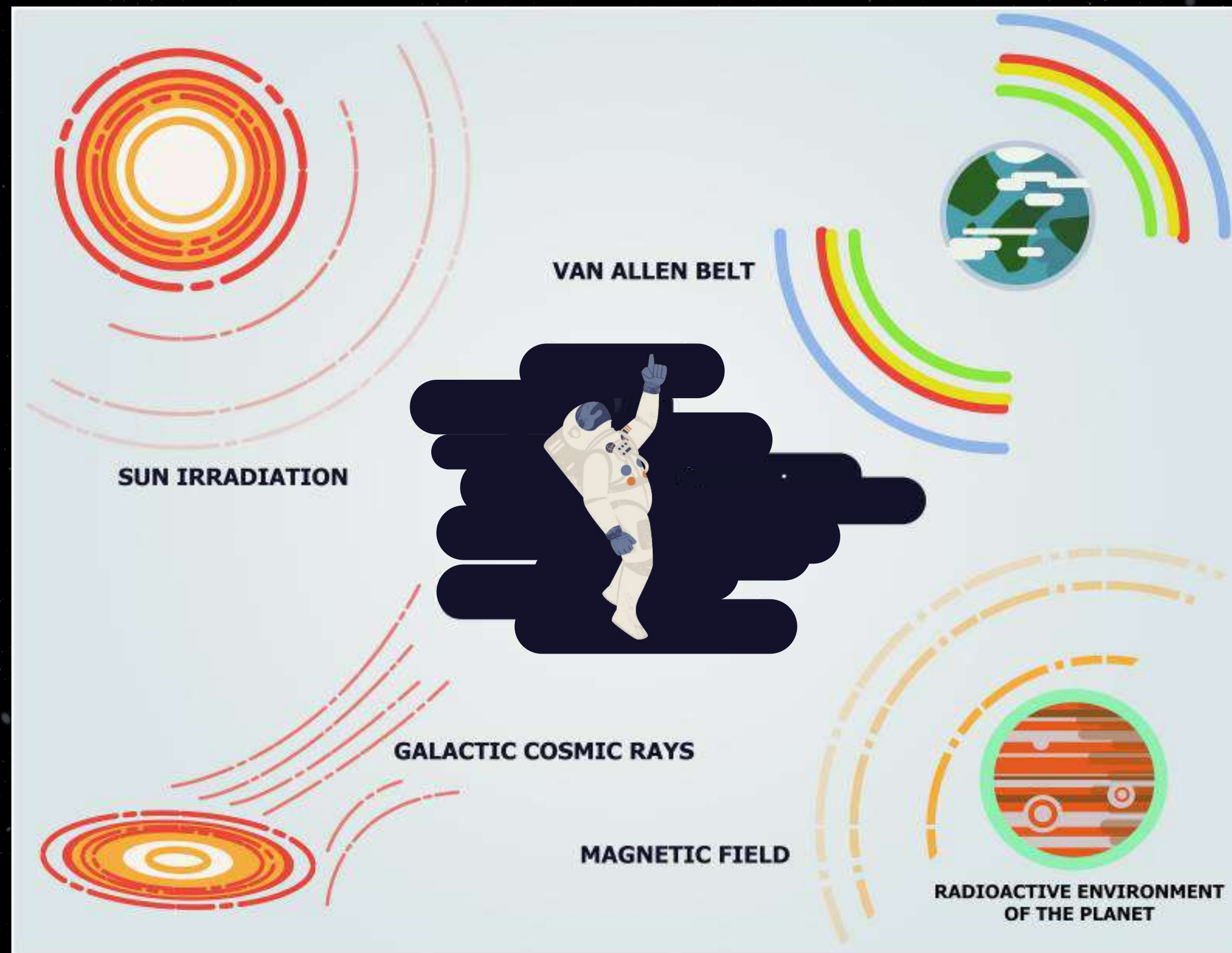
THE SPACE ENVIRONMENT

1





SOURCES OF IONIZING RADIATION IN SPACE





EFFECTS RADIATION EXPOSURE

2

Chronic or late effects

- Cancer
- Cataract
- Degenerative diseases
 - Brain
 - Lung
 - Cardiovascular
 - Reproductive system
 - Immune system

Acute effects

- Acute radiation syndrome
 - Prodromal syndrome
 - Hematopoietic syndrome
- Skin effects

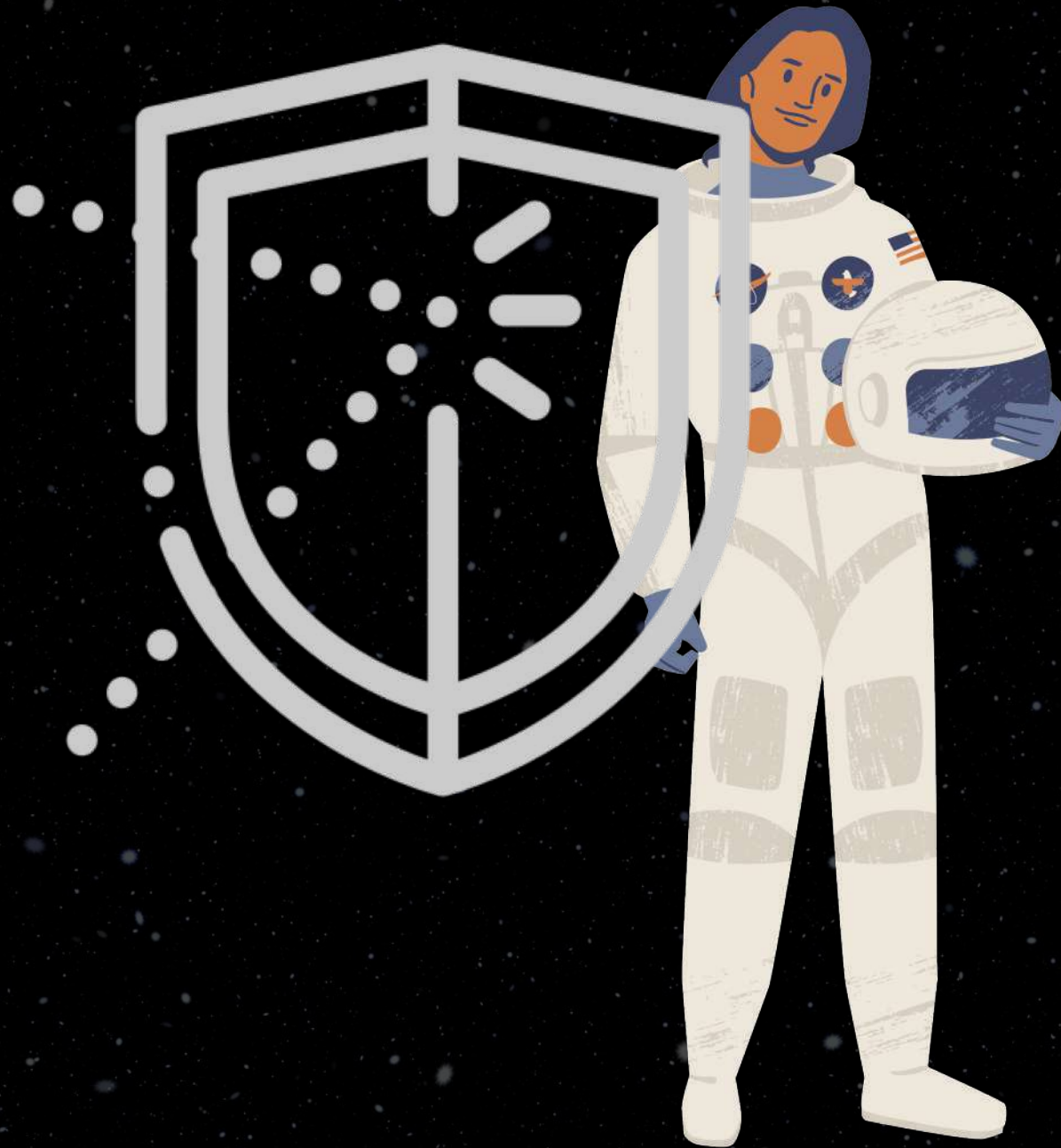




COUNTERMEASURES TO RADIATION

2

EXPOSURE



Shielding

Operational

Dietary

Pharmacological



COUNTERMEASURES TO RADIATION

2

EXPOSURE

Shielding



RADSHIELD 2024

European Space Radiation Shielding Workshop
12-13 June 2024 | ESA/ESTEC



Credit: ESA

© ESA/Foster + Partners



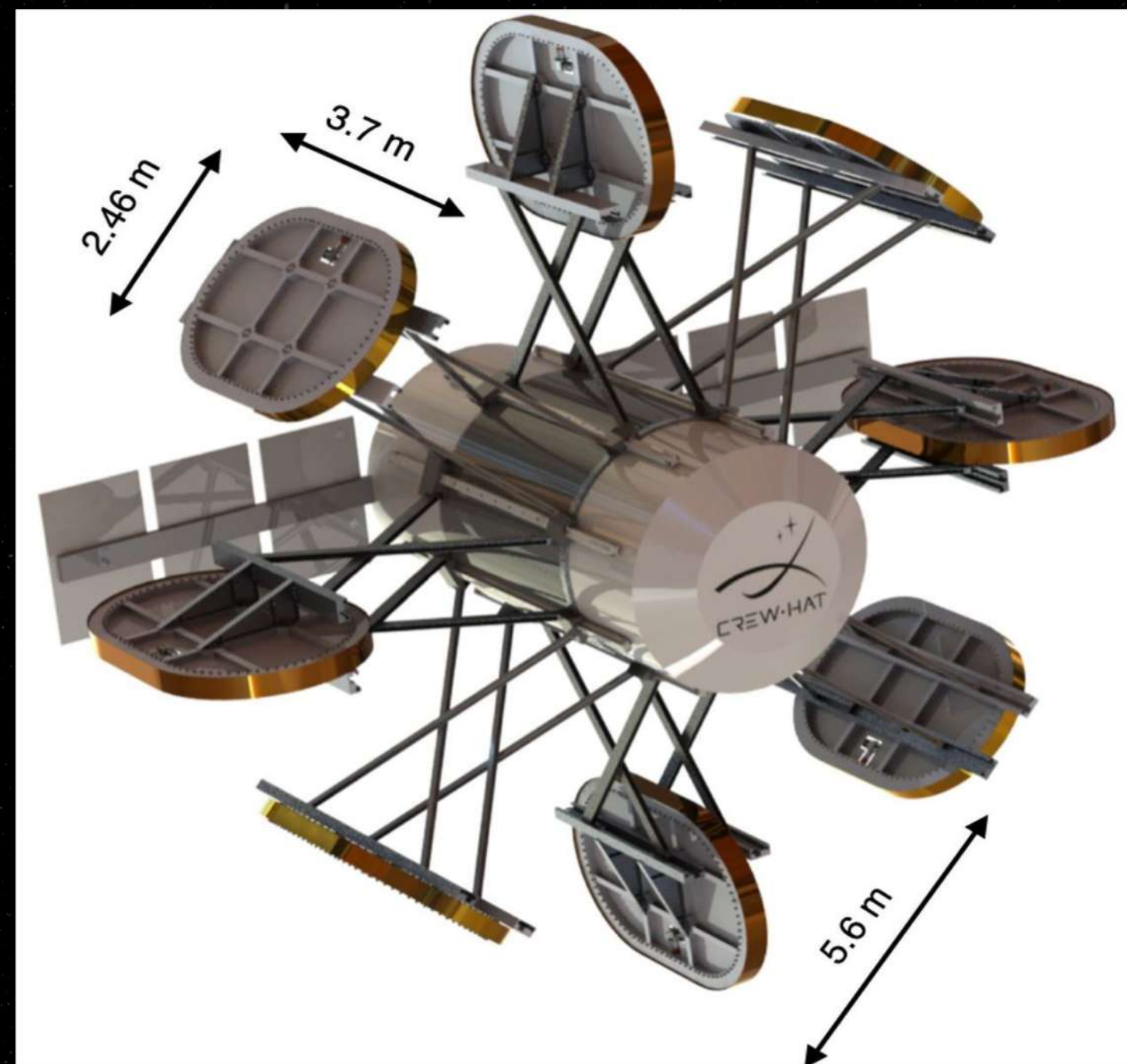
COUNTERMEASURES TO RADIATION

2

EXPOSURE



Shielding



Graphic depiction of the CREW HaT concept Credits: Elena D'Onghia



COUNTERMEASURES TO RADIATION

2

EXPOSURE



Shielding

Operational



Credit: NASA



COUNTERMEASURES TO RADIATION

2

EXPOSURE



Shielding

Operational

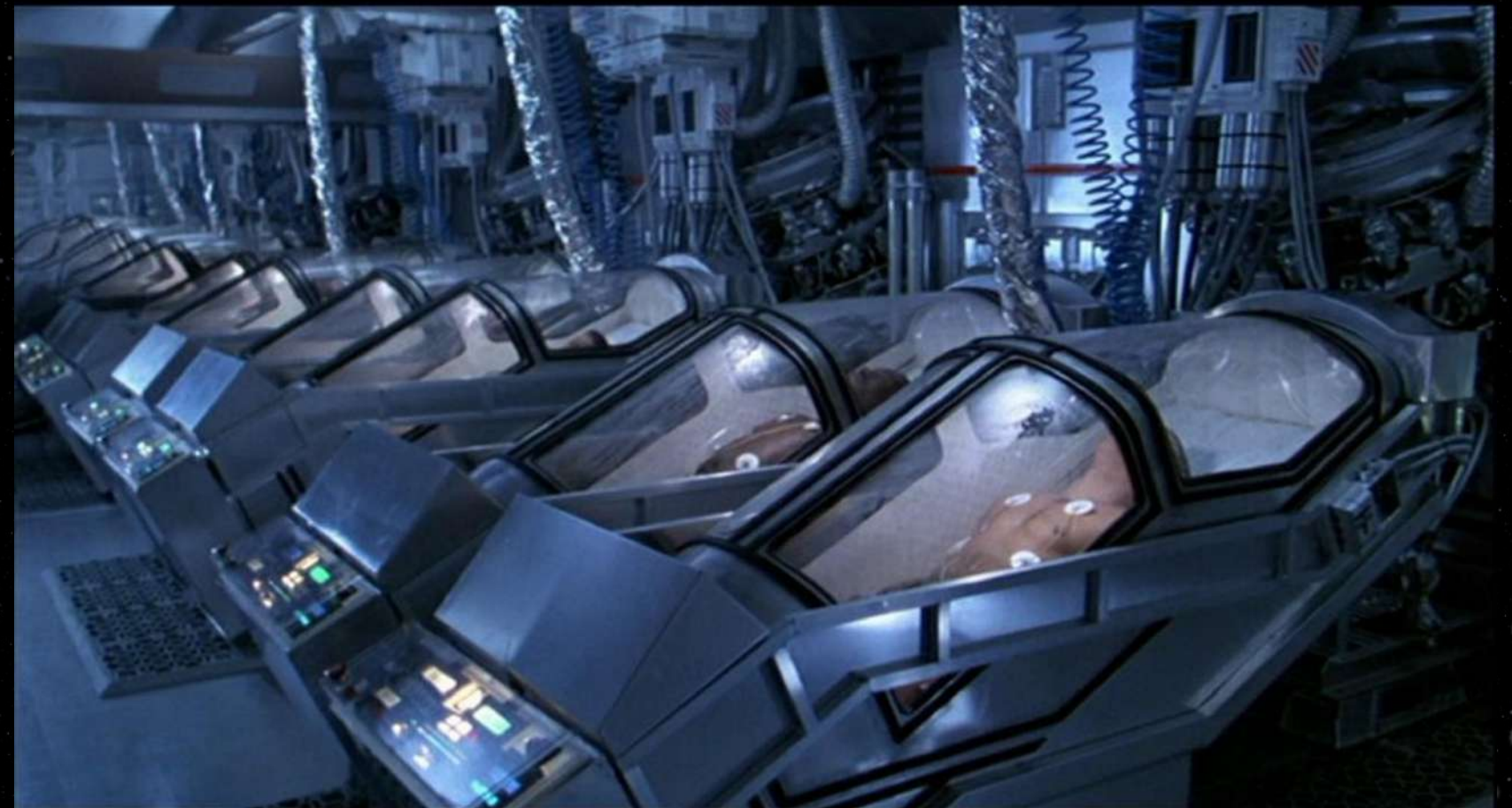


Image credit: 20th Century Fox, Alien



COUNTERMEASURES TO RADIATION

2

EXPOSURE



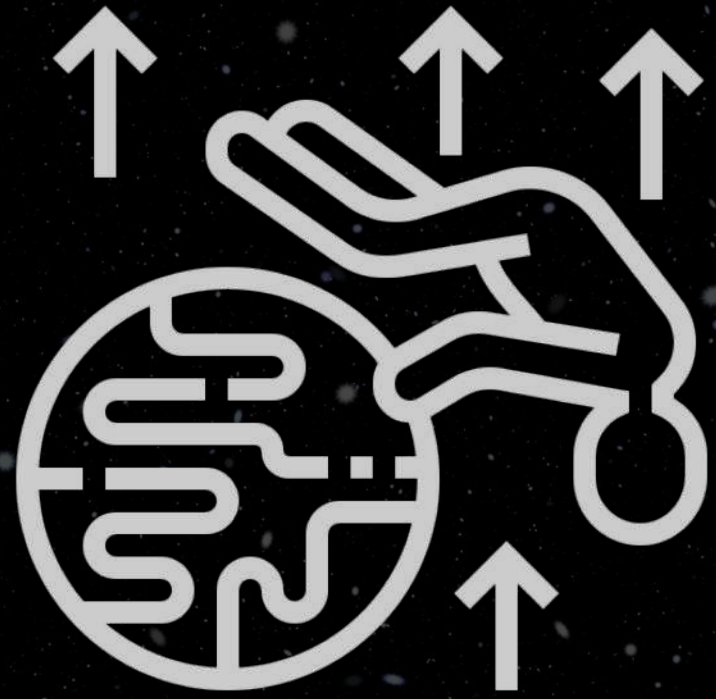
Shielding

Operational

Dietary

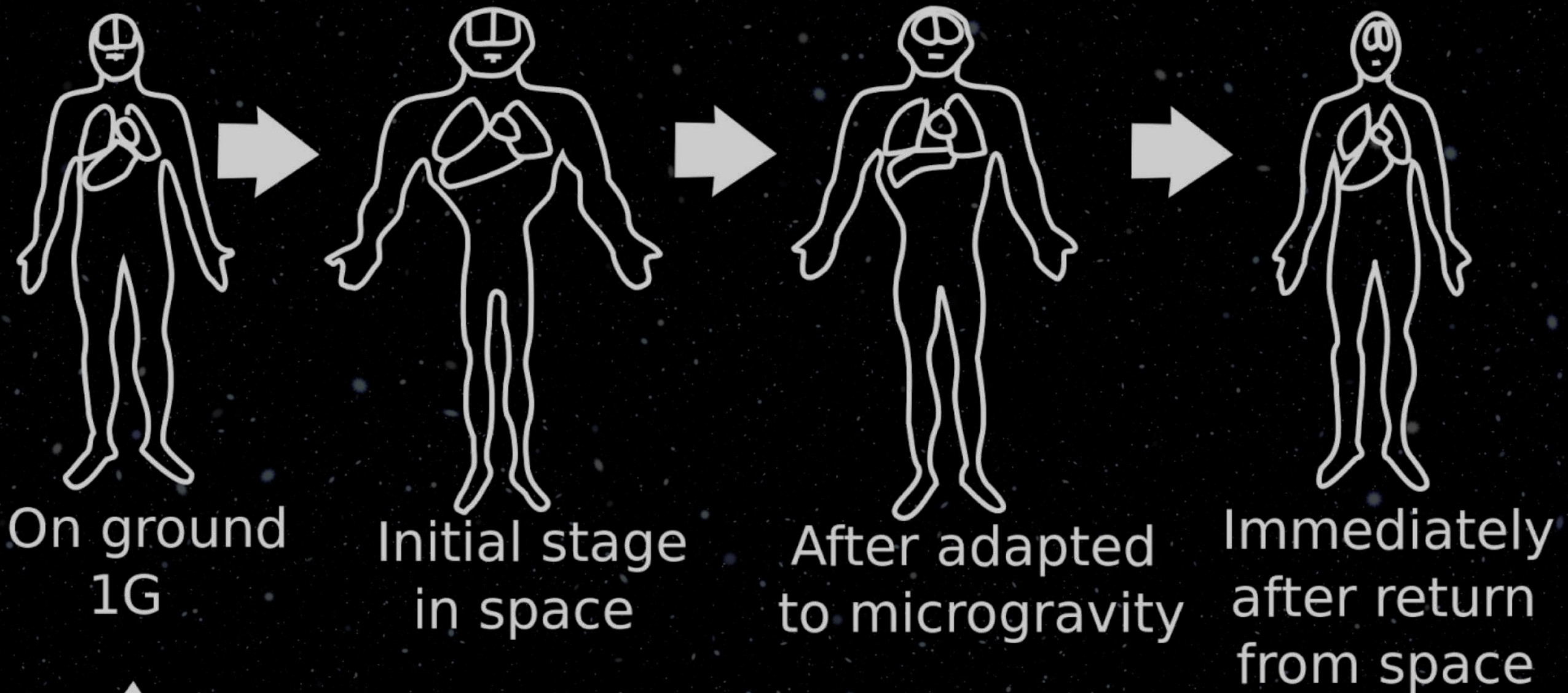
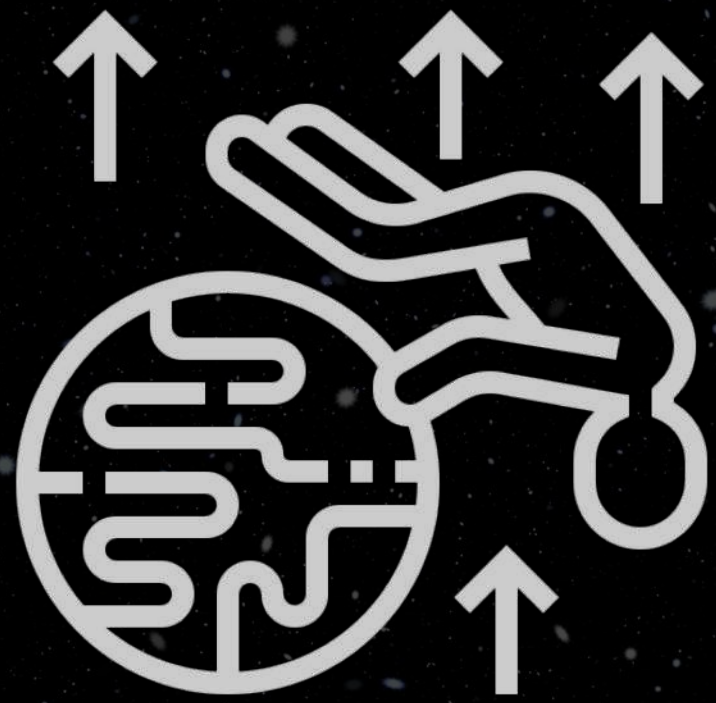
Pharmacological

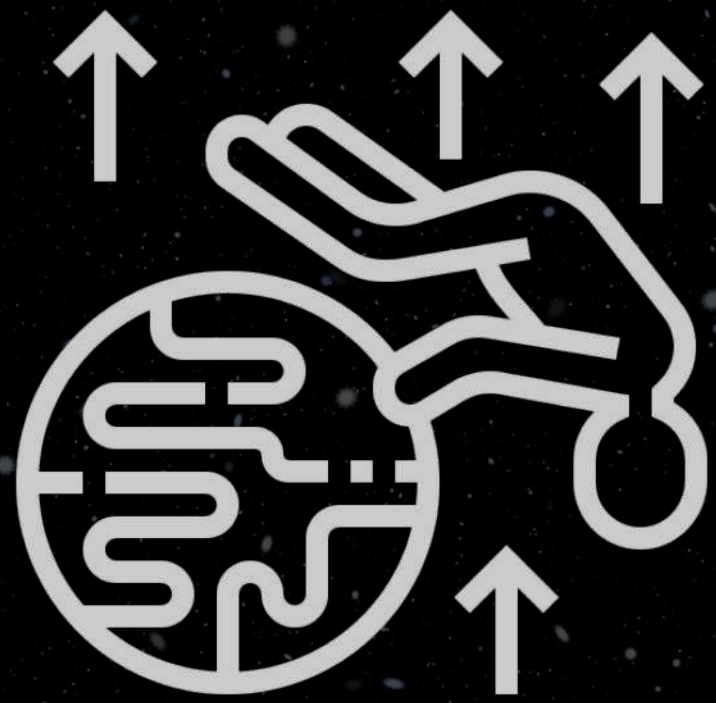
ALTERED GRAVITY



Credit: NASA

ALTERED GRAVITY EFFECTS

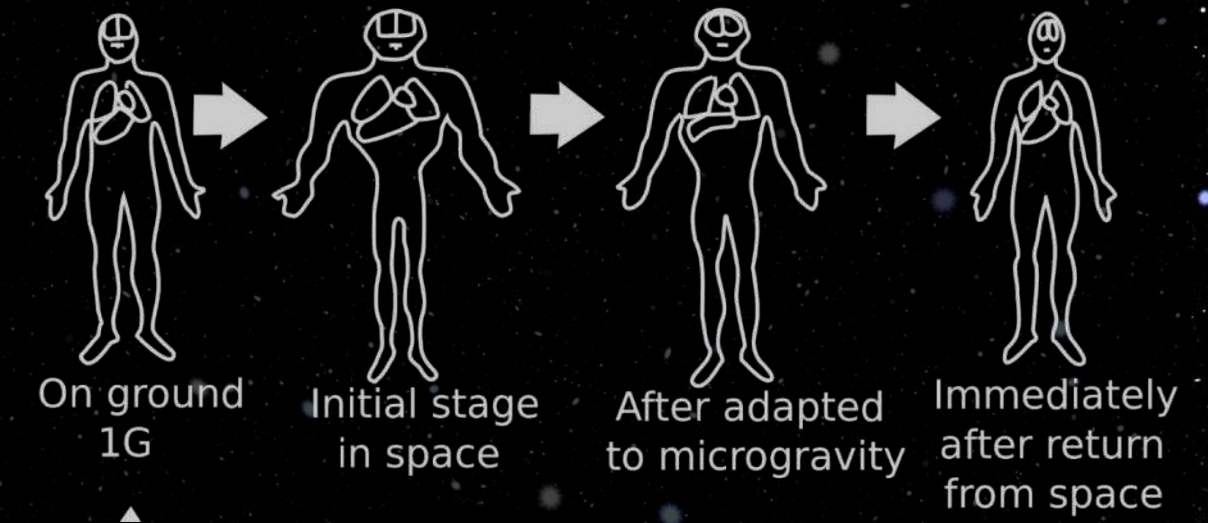




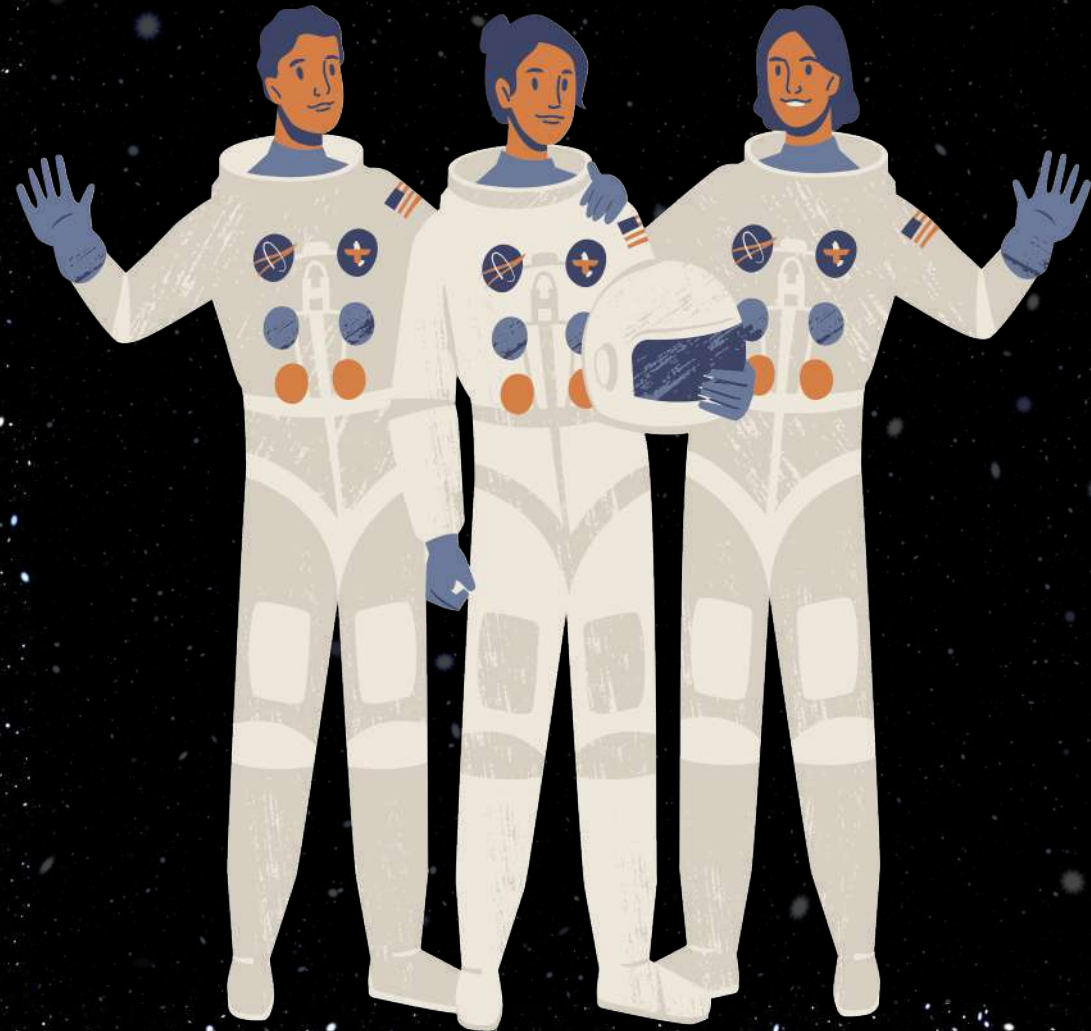
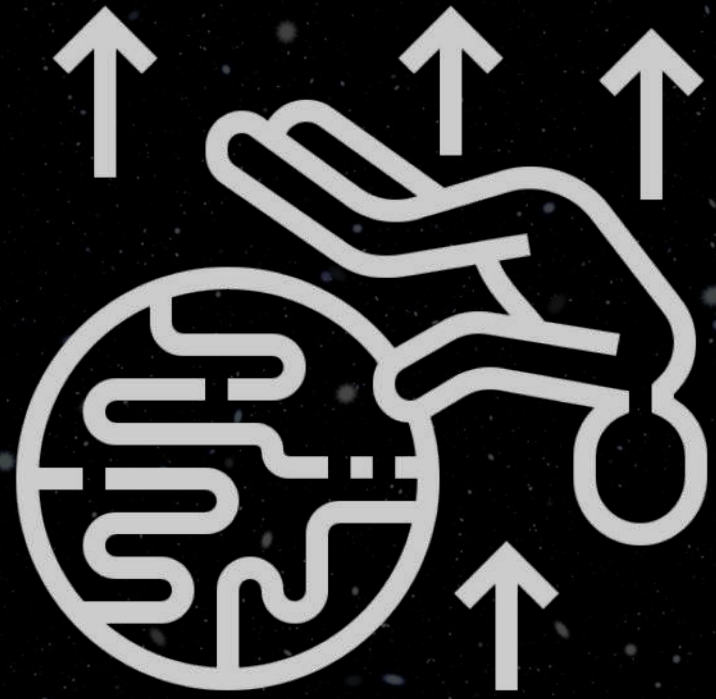
ALTERED GRAVITY EFFECTS

Intracranial pressure
Vision impairment
Cardiovascular deconditioning

Muscle atrophy
Bone density loss
Altered kidney function



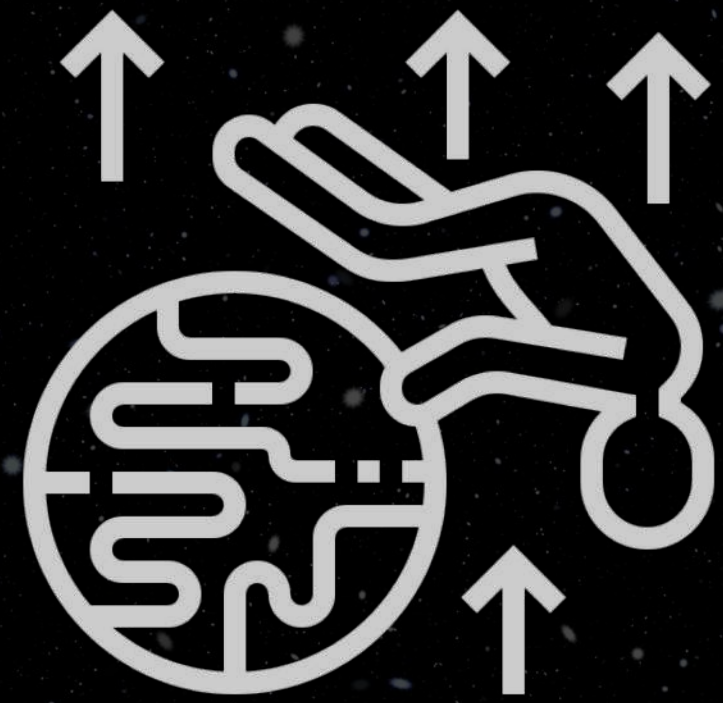
COUNTERMEASURES FOR ALTERED GRAVITY 2



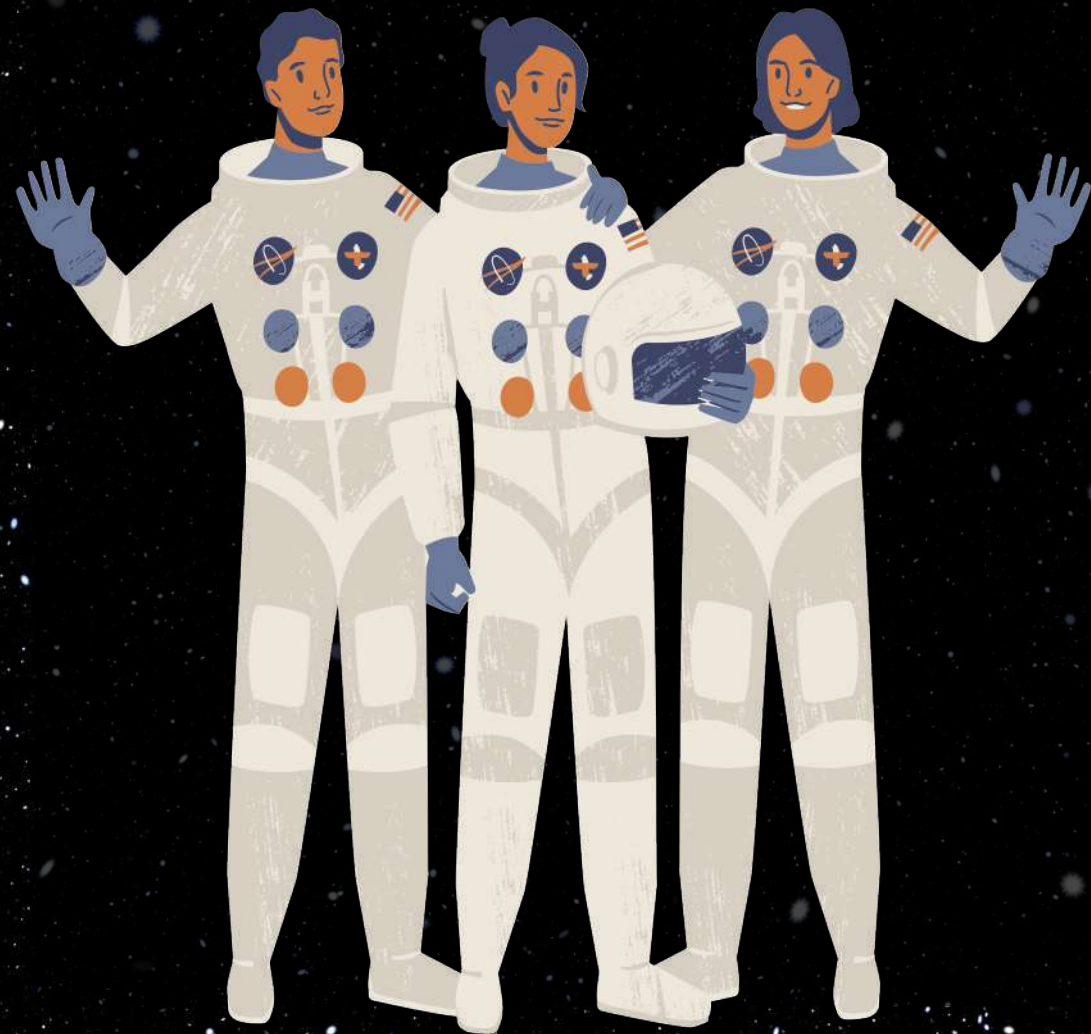
Credit: NASA



Exercise, Exercise,
Exercise!

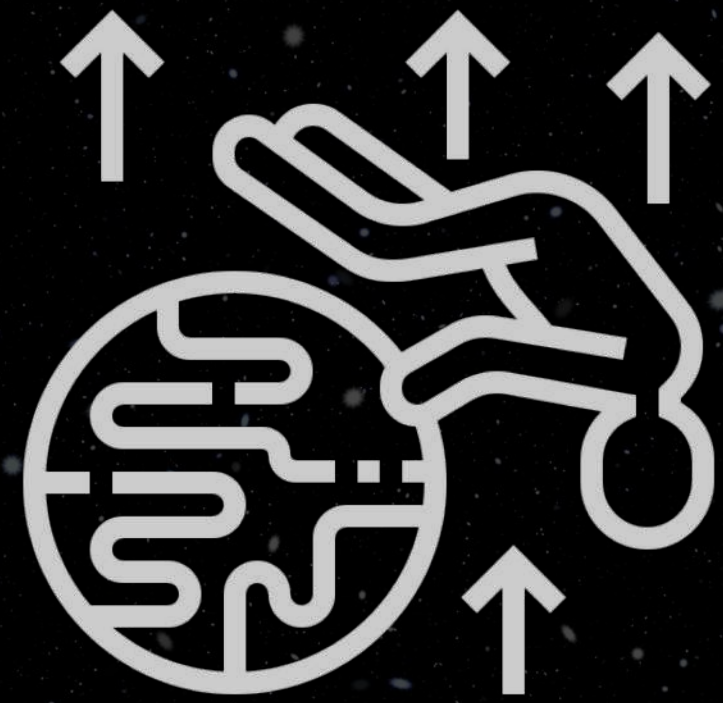


COUNTERMEASURES FOR ALTERED GRAVITY

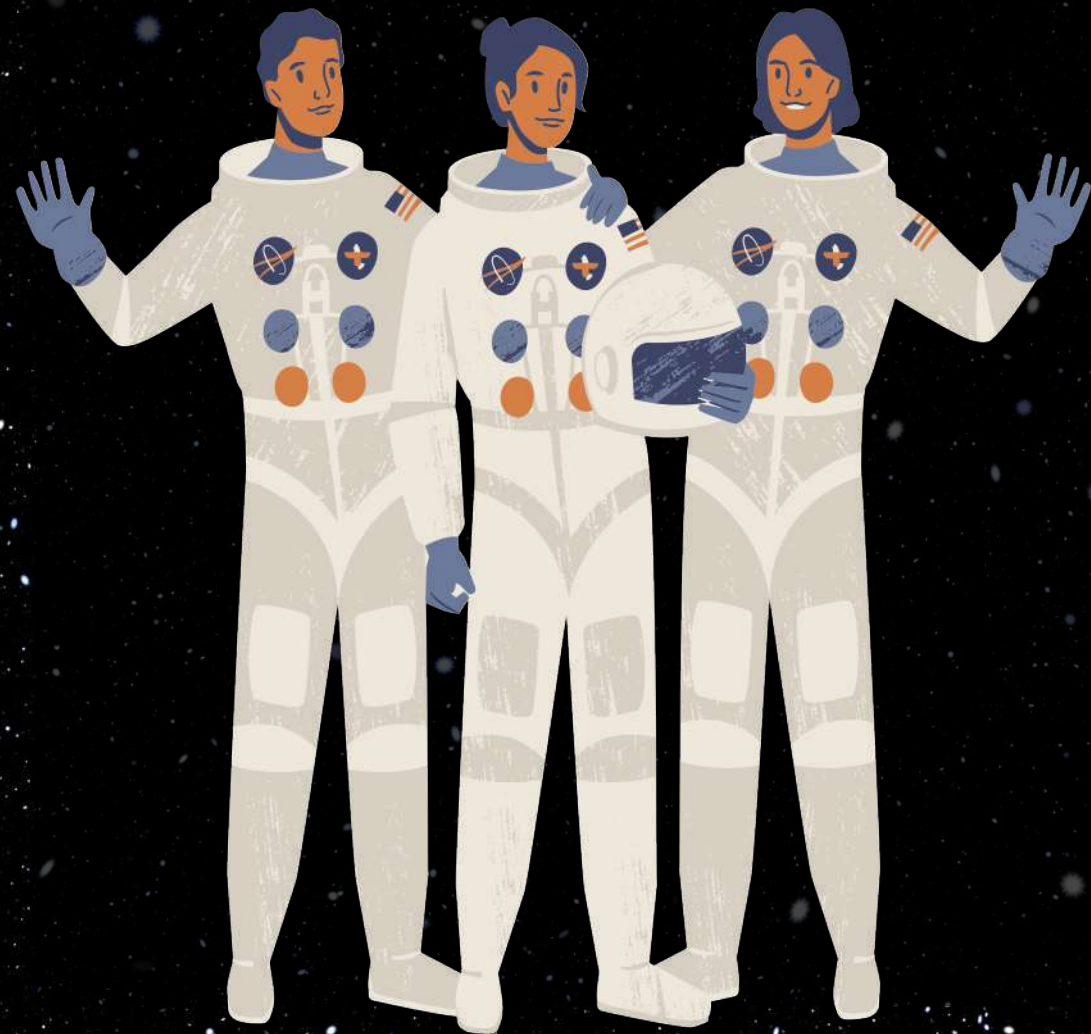


Lower body
negative pressure
devices

Credit: NASA



COUNTERMEASURES FOR ALTERED GRAVITY ²



Diet and
pharmacologic
intervention

Credit: NASA



SOURCES OF PSYCHOLOGICAL STRESS 2

Heavy work(load)



Distance from Earth



SOURCES OF PSYCHOLOGICAL STRESS 2

Sleep disruption

And circadian
rhythm dysfunction



Credit: NASA



SOURCES OF PSYCHOLOGICAL STRESS 2

Isolation

Hostile environment



Credit: NASA



STRESS MANAGEMENT IN SPACE

2

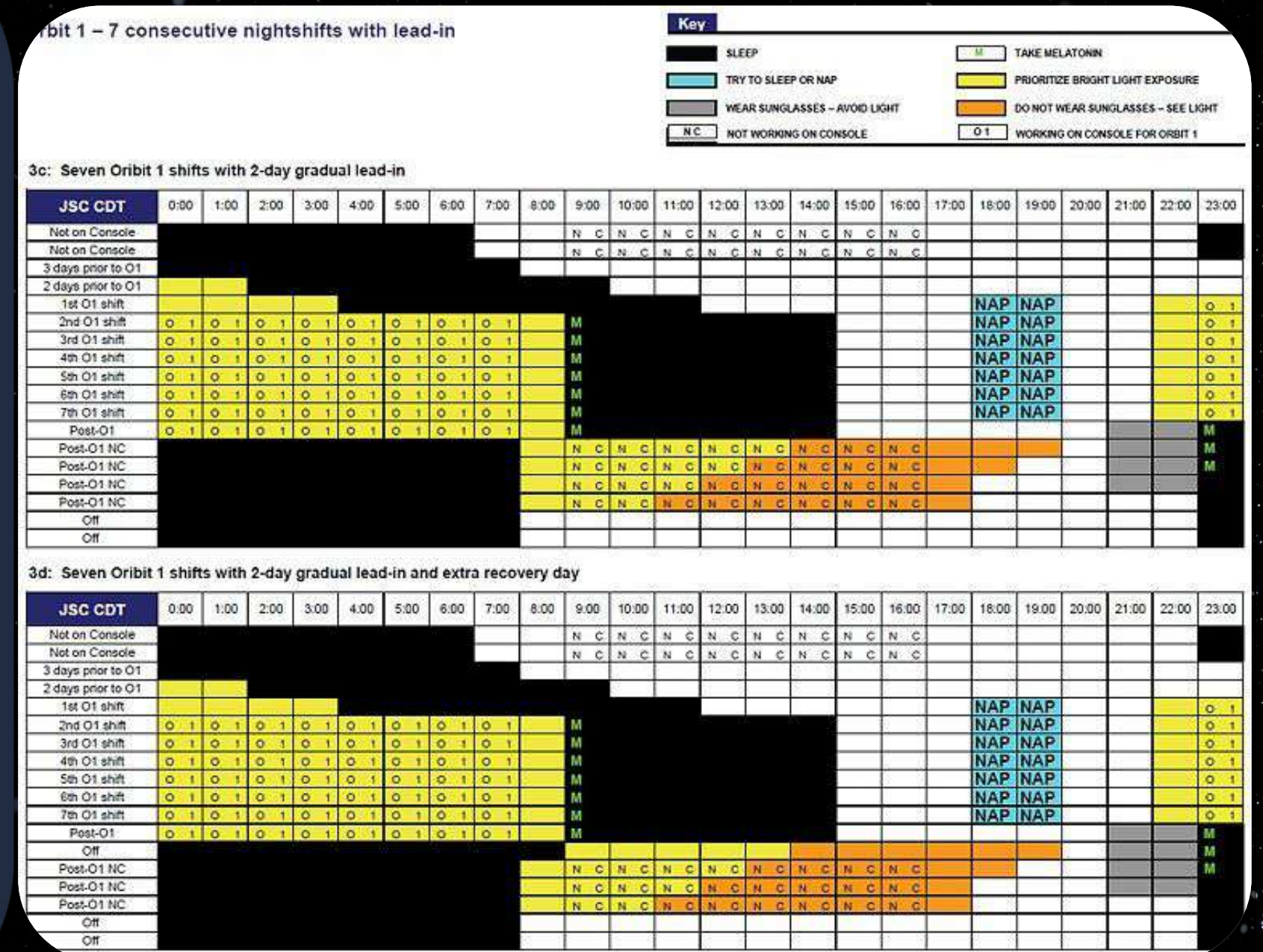
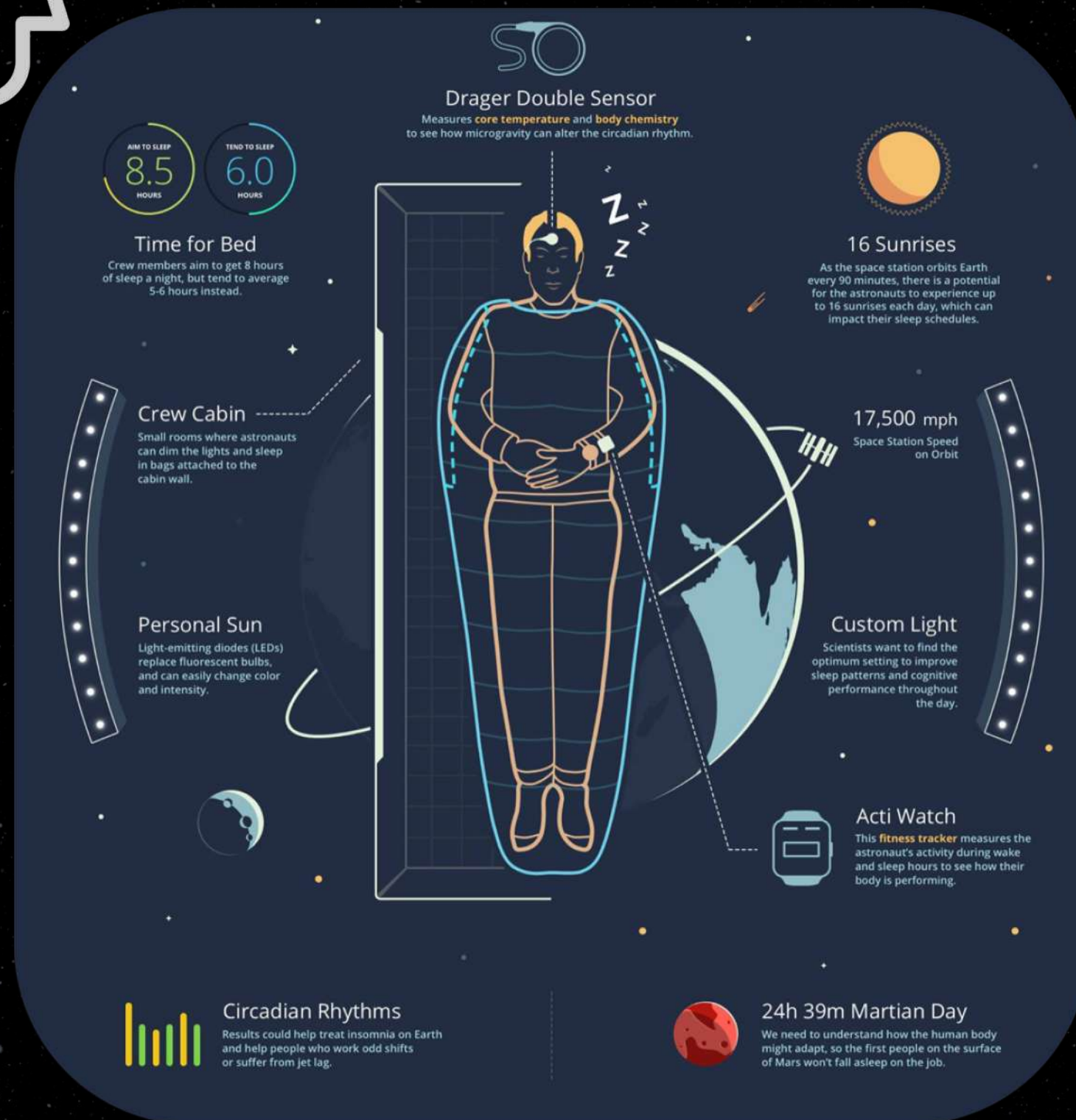


Credit: NASA



STRESS MANAGEMENT IN SPACE

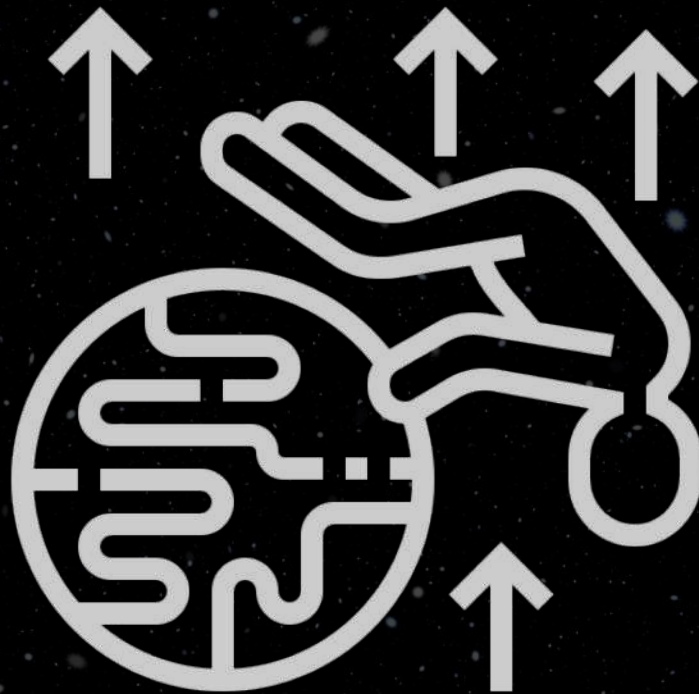
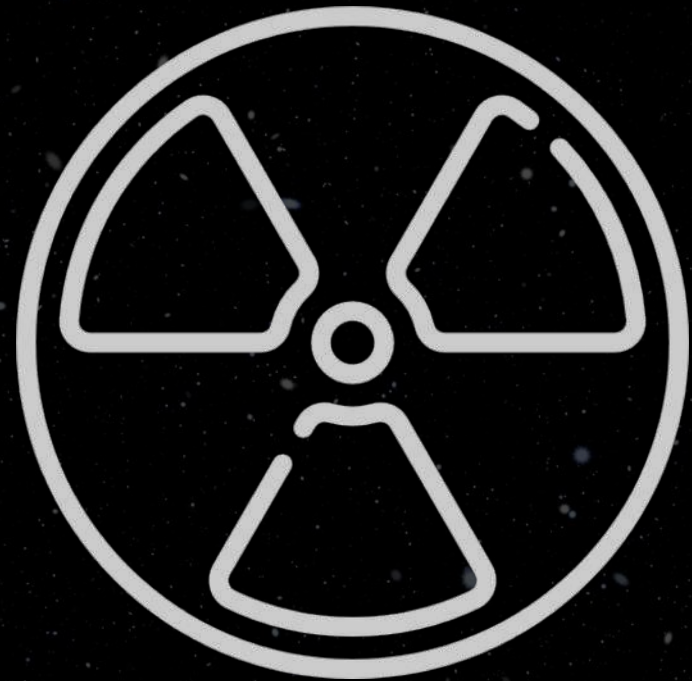
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Credit: NASA

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SPACE: A GROWING FRONTIER FOR INNOVATION ³



INSPIRING FUTURE SCIENTISTS, ENGINEERS, AND INNOVATORS

4



Current opportunities for university students



The Space Training Catalogue

FORTIFYING OUR FUTURE IN SPACE

Take ^{to} Space
Message

5



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THANK YOU!



SFDSMIRA@SCKCEN.BE



HEALTH CHALLENGES IN SPACE AND HOW TO OUTCOME THEM

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