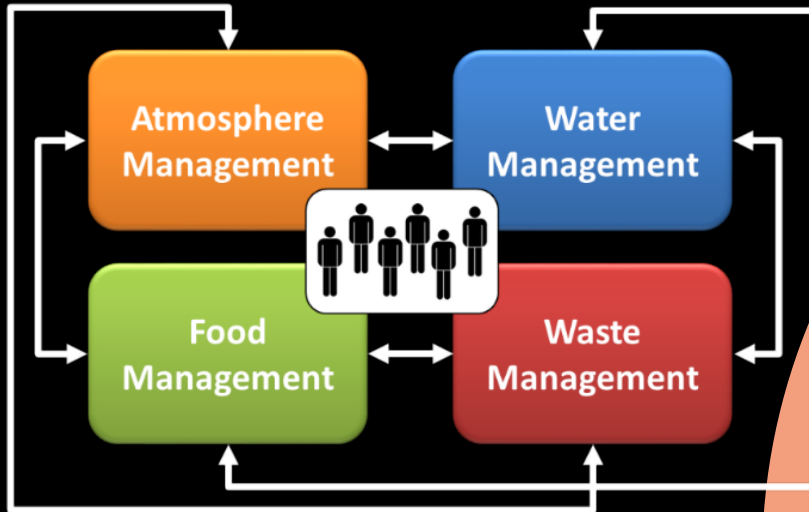




Surviving on Mars

Dr. Gisela Detrell

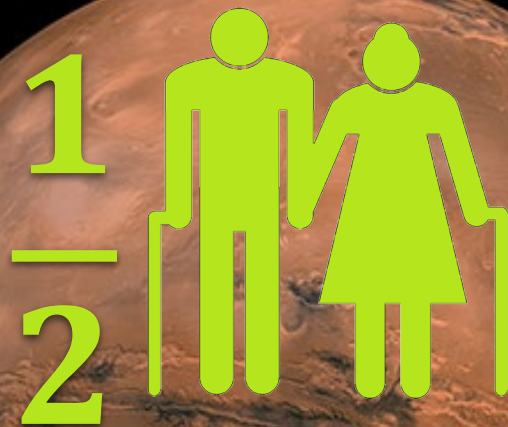
19th October 2022

12th EASN International Conference
on Innovation in Aviation and Space
for opening New Horizons



Institute of Space Systems
University of Stuttgart

Surviving on Mars – Gisela Detrell



1
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2



1
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3



Surviving on Mars – Gisela Detrell



Surviving on Mars – Gisela Detrell





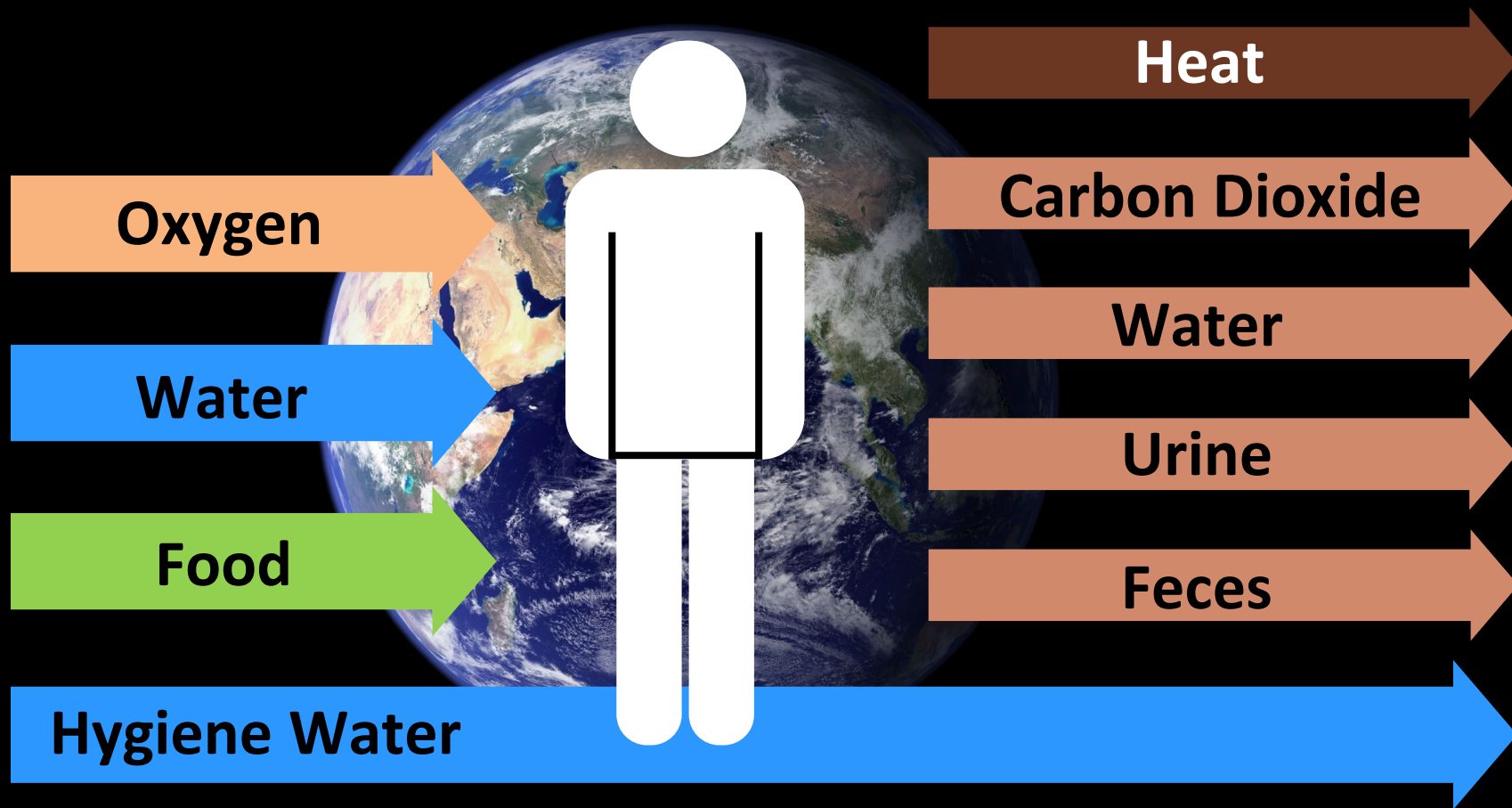
WELCOME TO

NIJWA

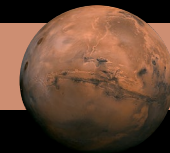
Surviving on Mars – Gisela Detrell



Life Support System – Human needs



Surviving on Mars – Gisela Detrell



Life Support System – Human needs

Oxygen

3.000 kg

Food

2.500 kg

Water

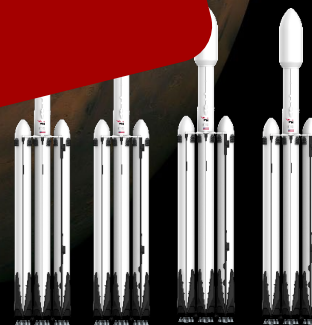
13.000 – 37.000 kg

1 Family

From Barcelona
to Mars,
and back!

300M €

Credits: NASA



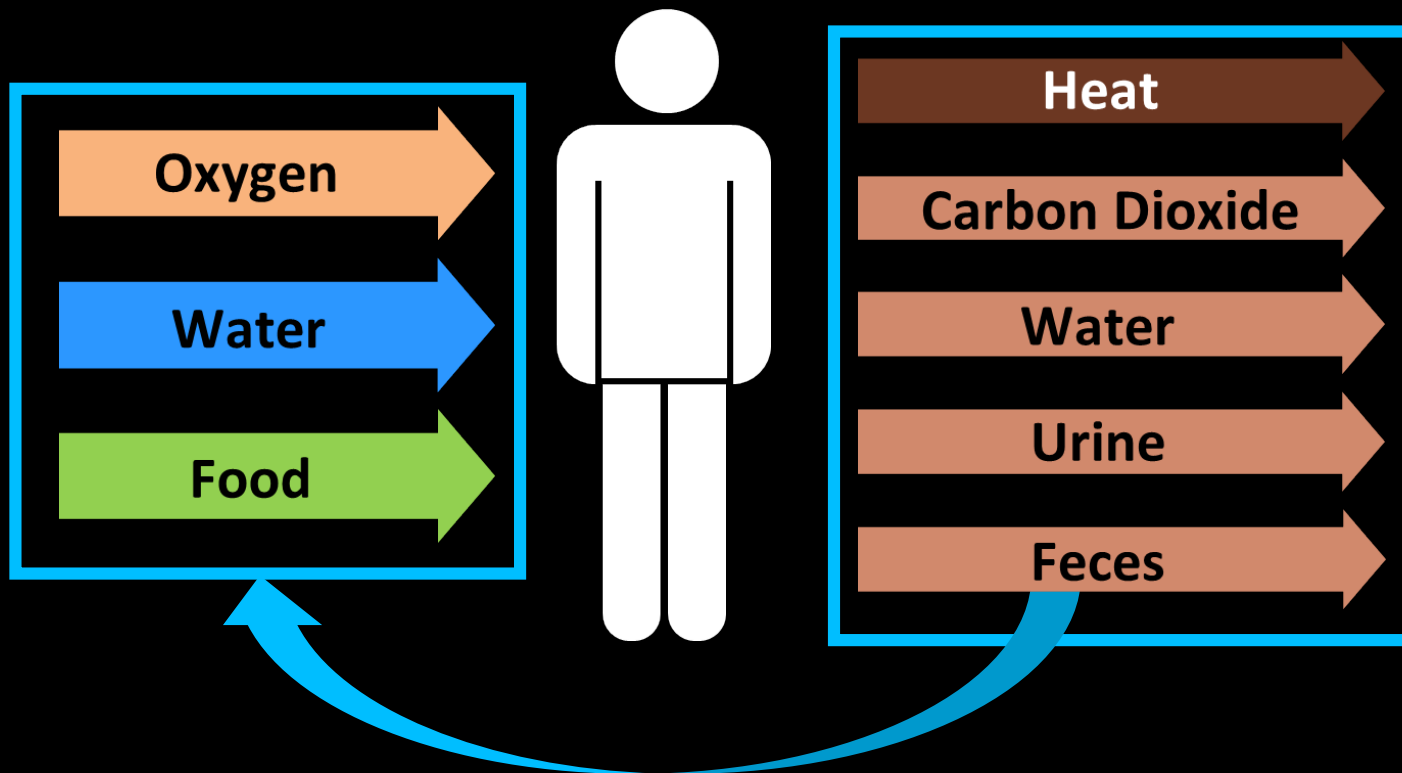
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Life Support System – Human needs

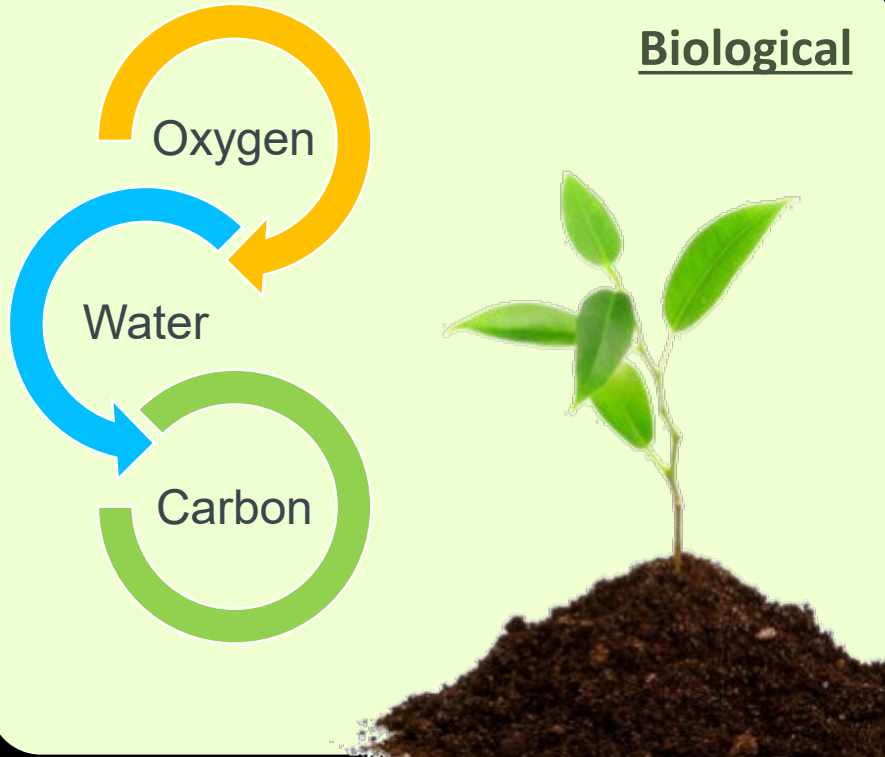


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Life Support System – Technologies

Biological



Physico-chemical



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The LSS on-board the International Space Station



Cumulative Crew Time on Orbit:
8021 days

Credits NASA



Credits NASA

42% O₂ from CO₂

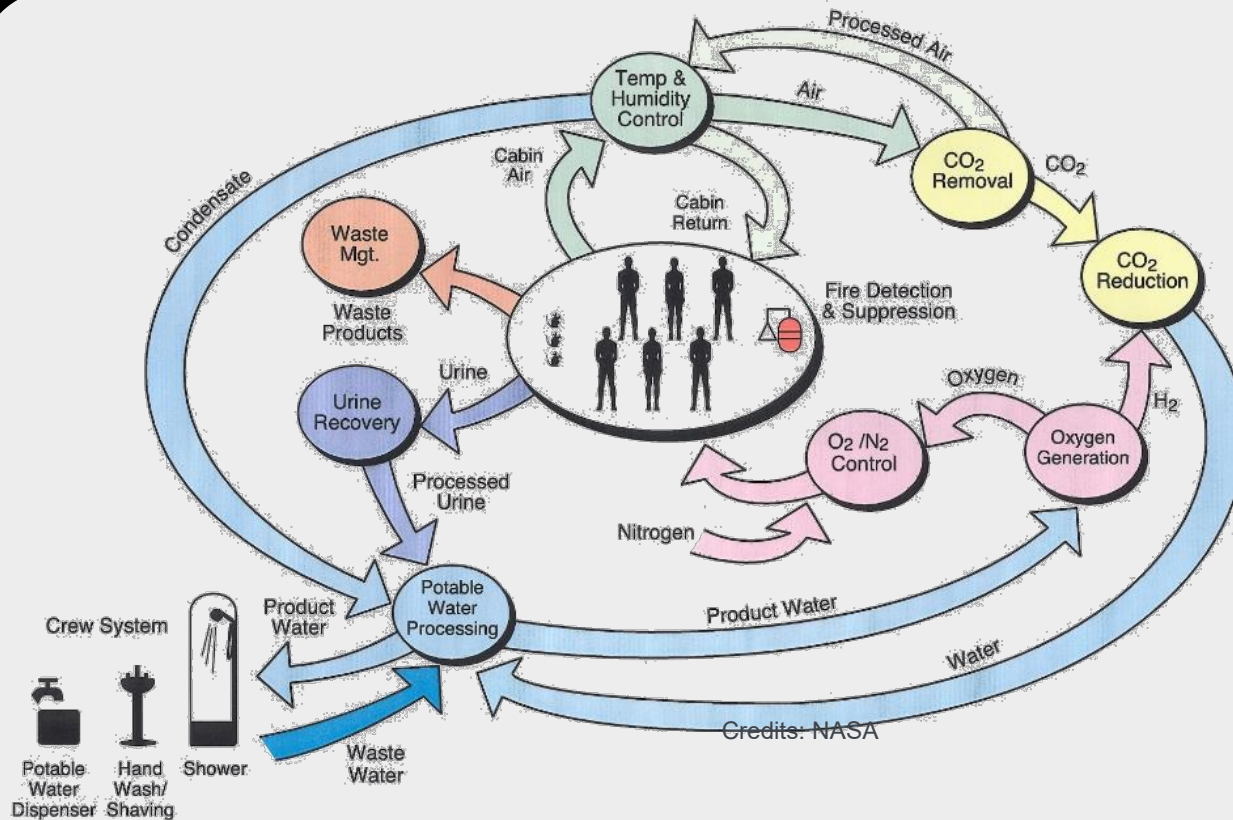
90% H₂O recycling

0% Food Production

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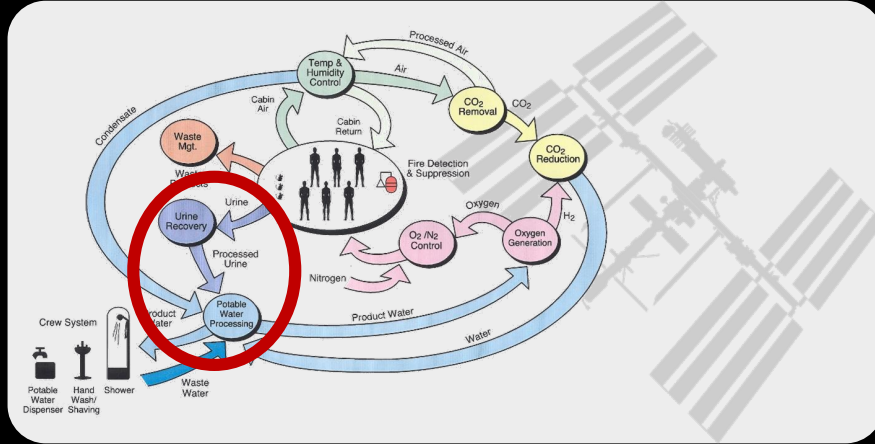
The LSS on-board the International Space Station



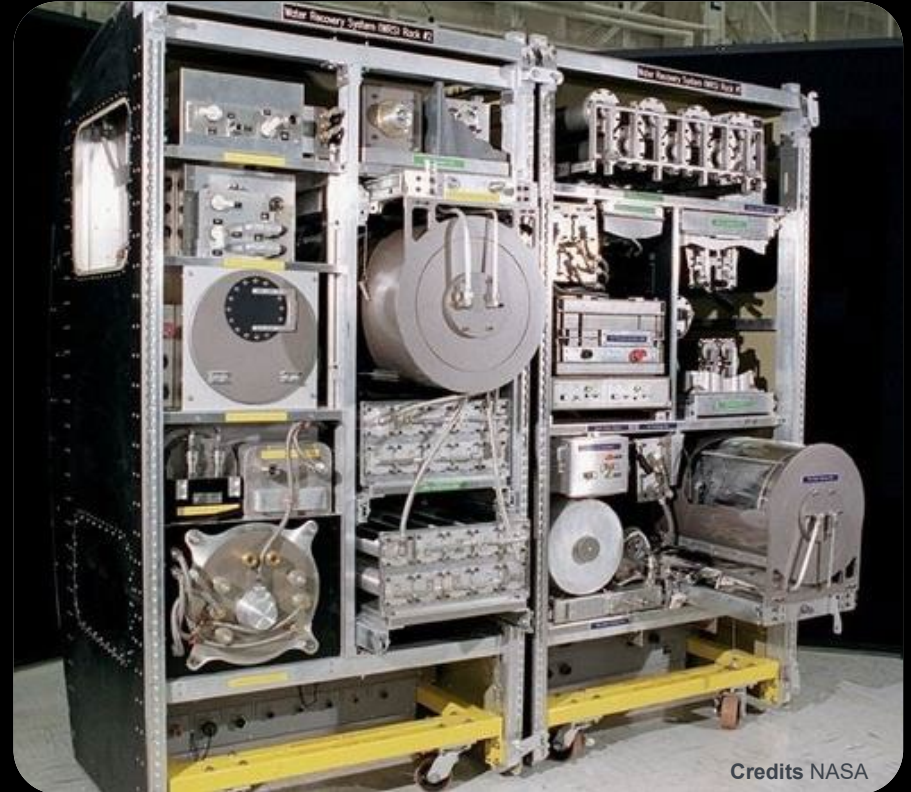
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The LSS on-board the International Space Station



ISS Urine and Water Processing Assemblies



Credits NASA

Waste Water:

- Multifiltration

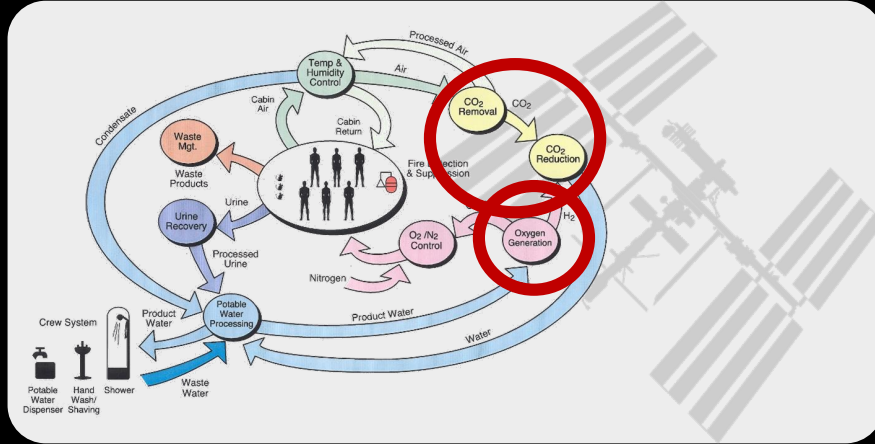
Urine:

- Vapor Compression Distillation – VCD

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The LSS on-board the International Space Station



CO₂ Removal:

- Vozdukh
- CDRA

CO₂ Reduction:

- CRA - Sabatier

Carbon Dioxide
Removal Assembly
(CDRA)



Elektron units in the Zvezda
service module



O₂ Production – Water Electrolysis:

- Elektron
- Oxygen Generator System (OGS)



Carbon Reduction
Assembly (CRA)

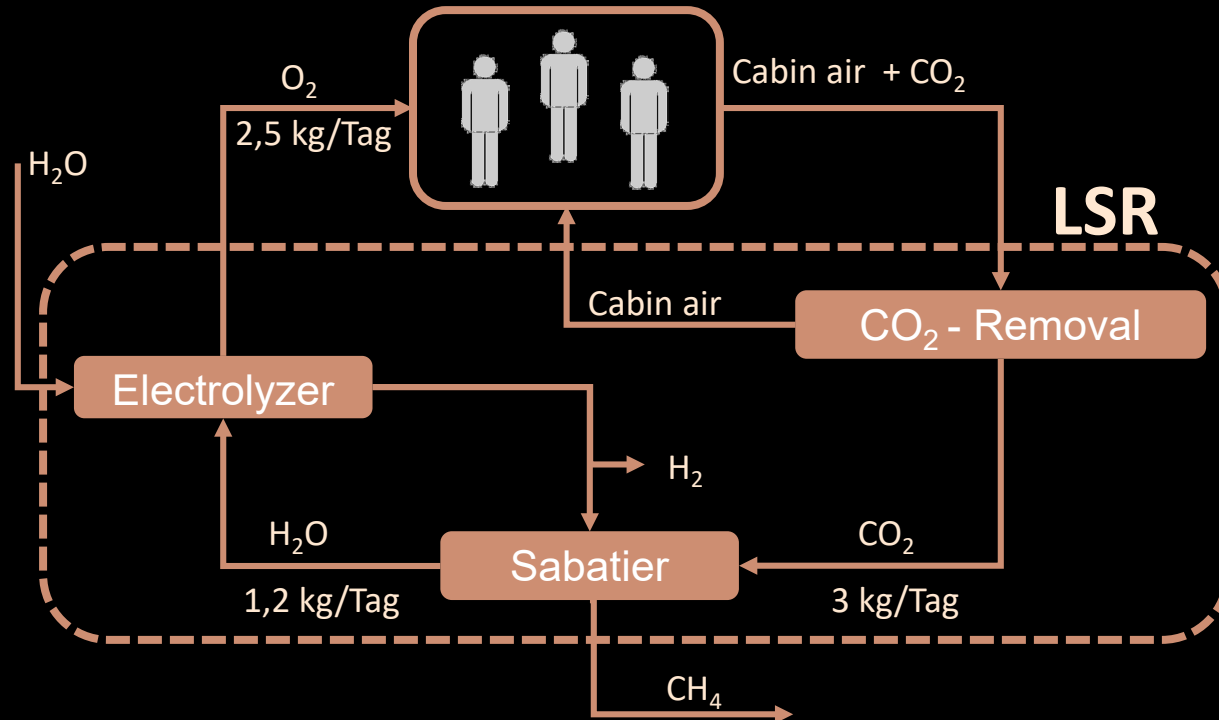
Surviving on Mars – Gisela Detrell



The LSS on-board the International Space Station

Life Support Rack (LSR)

Also known as Advanced Close-Loop System (ACLS)



Credits Airbus

A close-up, high-resolution image of the planet Mars, showing its reddish-brown surface, polar ice caps, and prominent dark volcanic features.

ISS Food



Credits NASA



Credits ESA



Surviving on Mars – Gisela Detrell



Life Support Systems – Experiments



C.R.O.P.®
DLR Köln



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Life Support Systems – Experiments

VEGGIE



Advanced Plant Habitat Facility



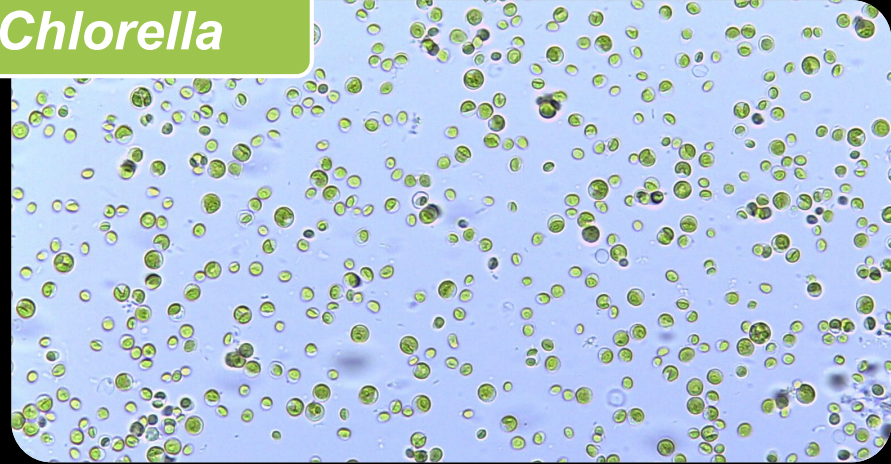
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Life Support Systems – Experiments



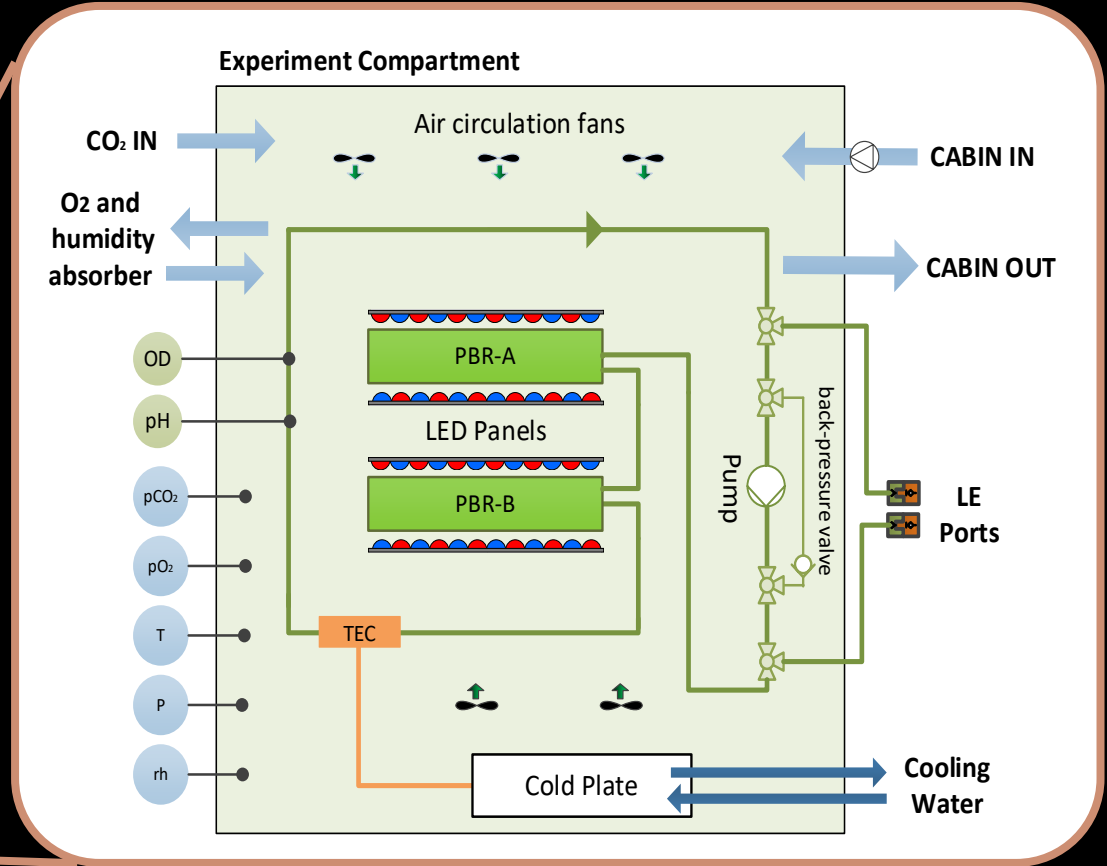
Chlorella



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Life Support Systems – Experiments



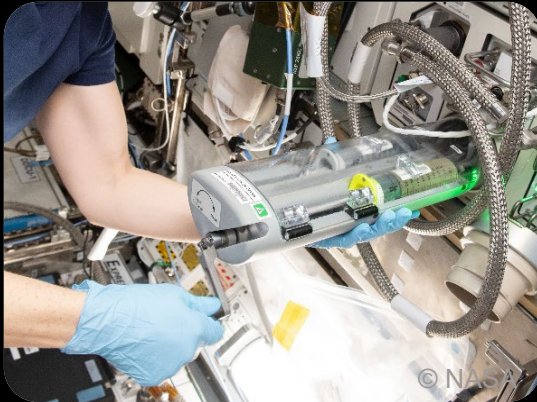
Surviving on Mars – Gisela Detrell



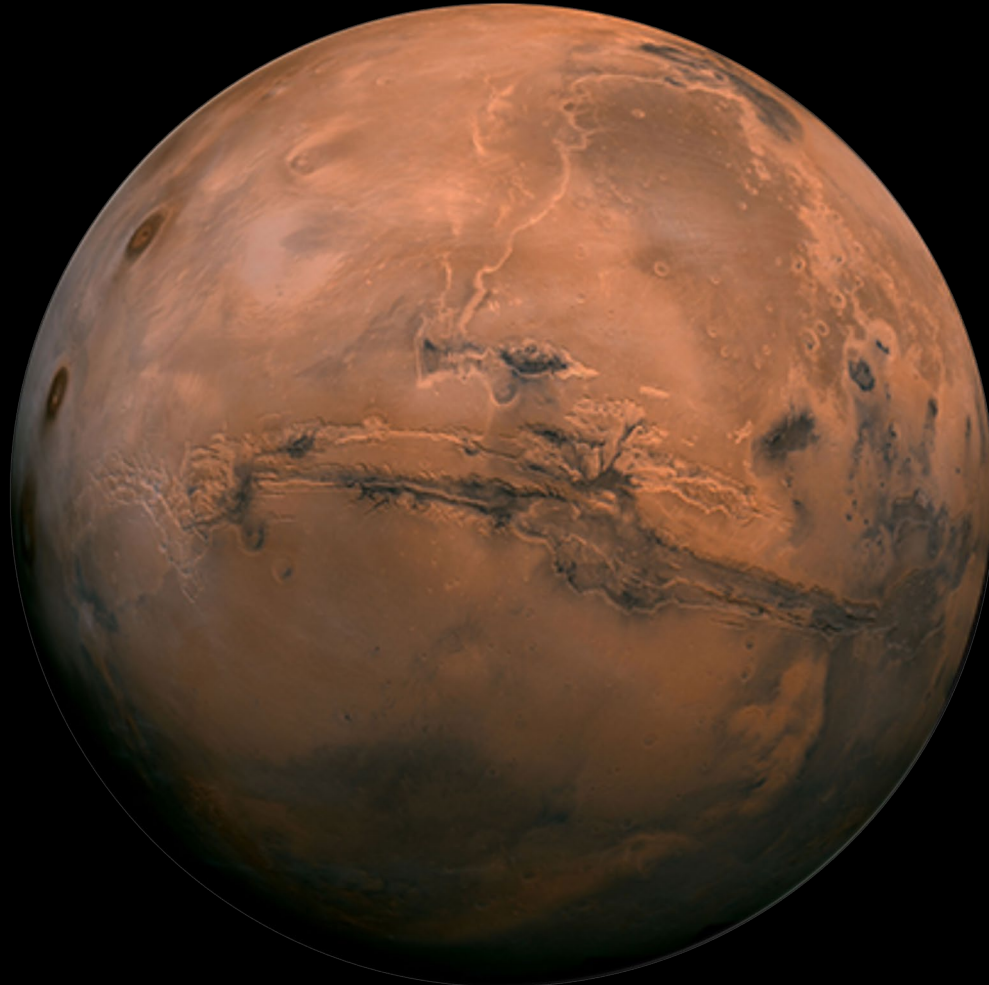
Life Support Systems – Experiments



May 4th 2019



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Credits: NASA

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AGRICULTURAL MODULE

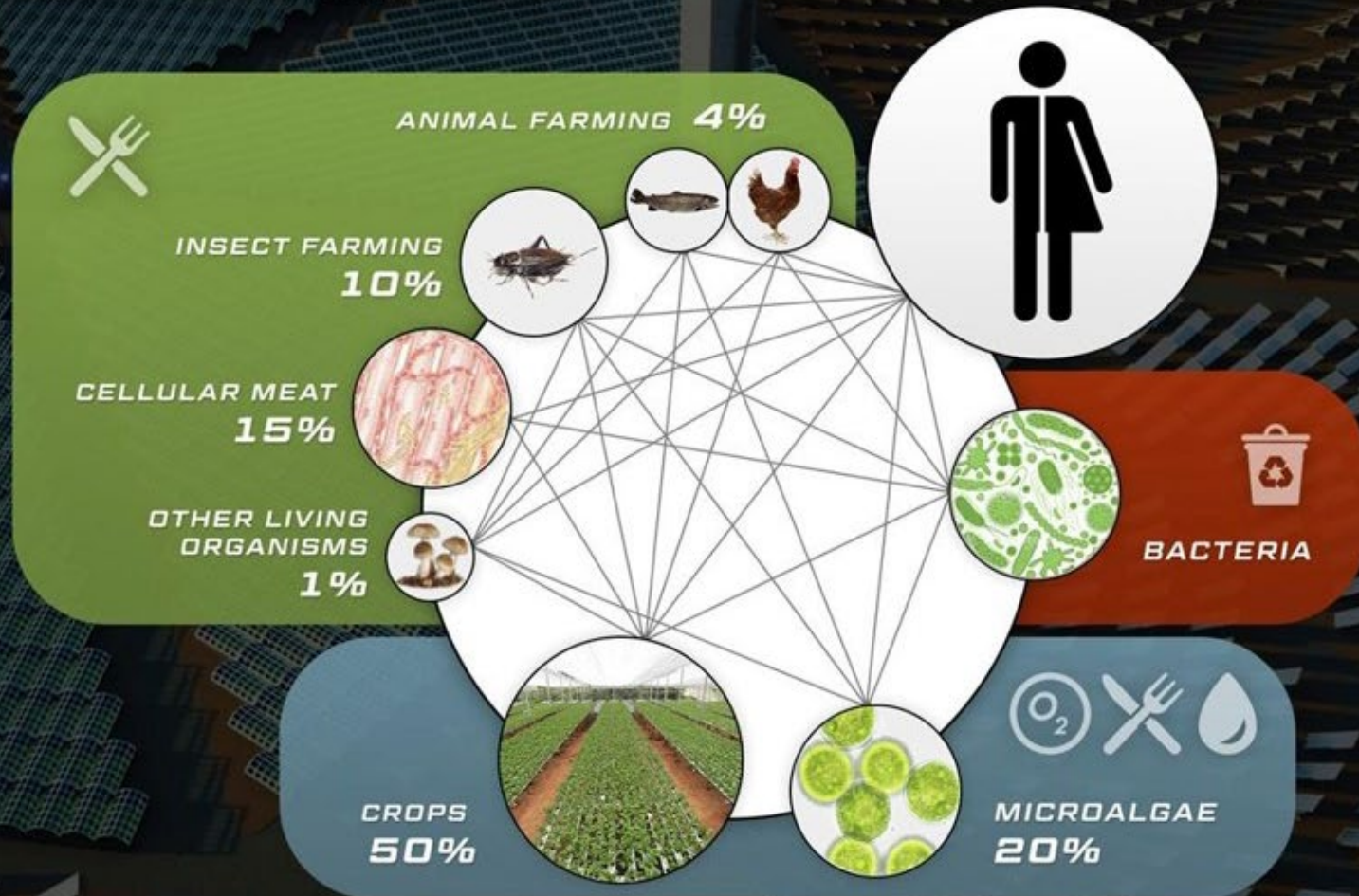
Credits: ABIBOO Studio / SONet

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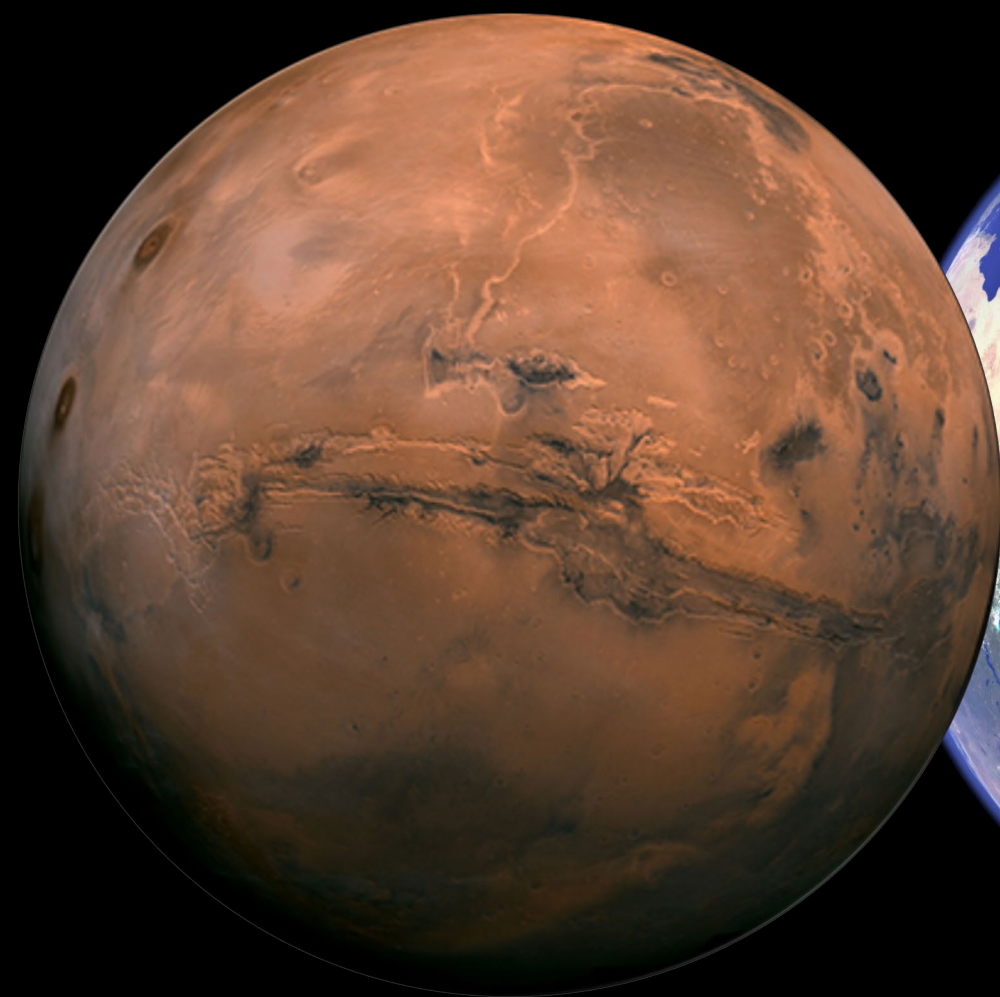


LIFE SUPPORT SYSTEM

NULVA



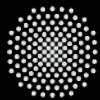
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Credits: NASA



Credits: NASA



Universität Stuttgart
Institut für Raumfahrtssysteme

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