Installer une base sur Mars ?

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TEMA 2050 - Objectif Mars – 20/09/2024

LES PRINCIPALES CONTRAINTES SUR MARS

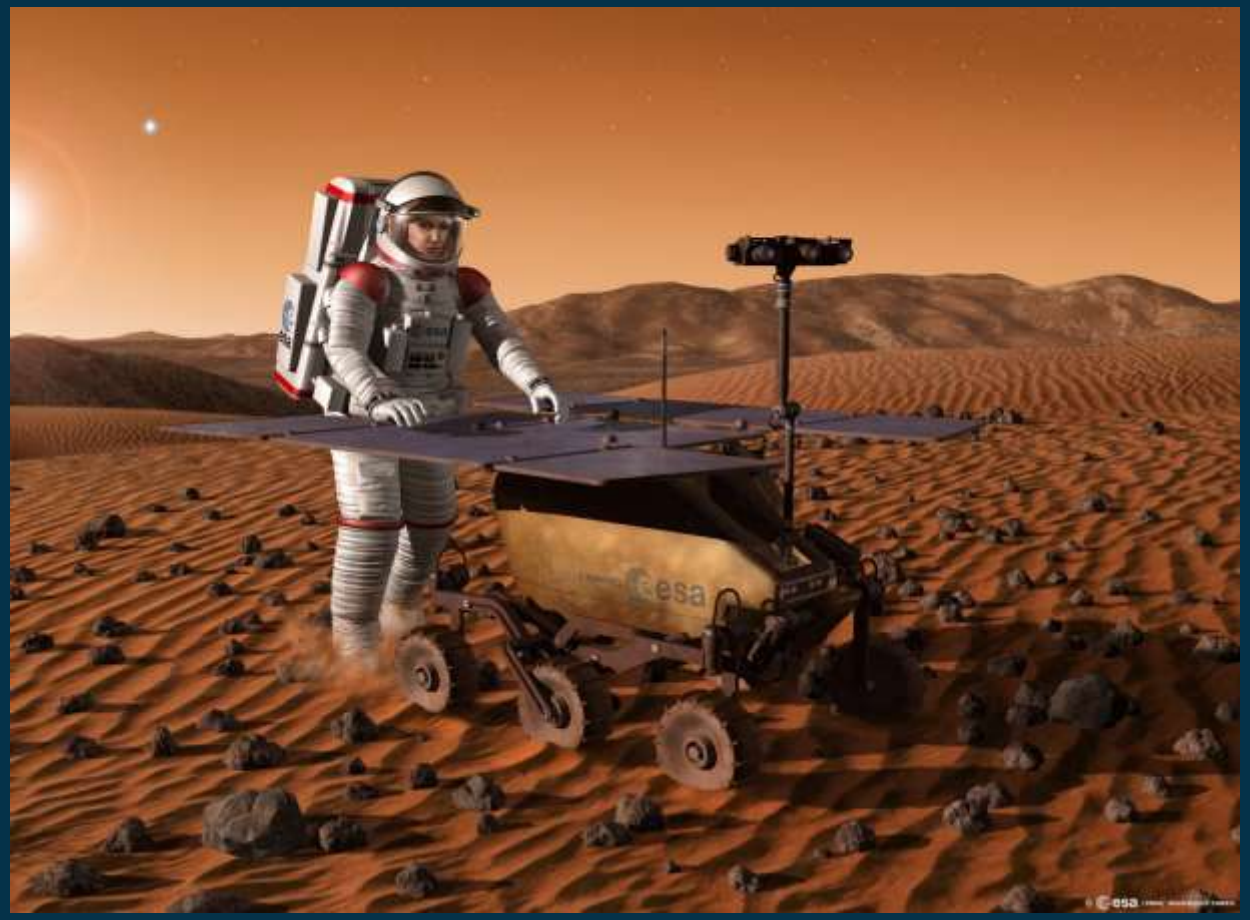
Atmosphère 100 fois moins dense que sur Terre

Champ de gravité environ 40% celui de la Terre

Radiations ionisantes

À distance de la Terre

Environnement clos / Confinement



PRINCIPAUX BESOINS HUMAINS

CONSOMMABLES

- O_2 Oxygène
- H_2O Eau
- Nourriture

ENVIRONNEMENT

- Composition de l'atmosphère
- Température
- Pression
- Humidité
- Ventilation

SORTIES

- CO_2 Dioxide de Carbon
- Urine + Transpiration
- Déchets Solides
- Contaminants (Microbien, Chimique)

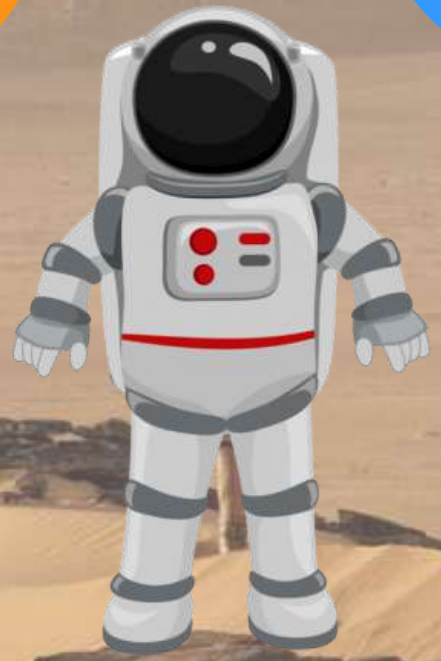
Credits: The Martian

LES PRINCIPALES FONCTIONS D'UN SYSTEME SUPPORT-VIE

Contrôle de l'environ-nement

Gestion de l'atmosphère

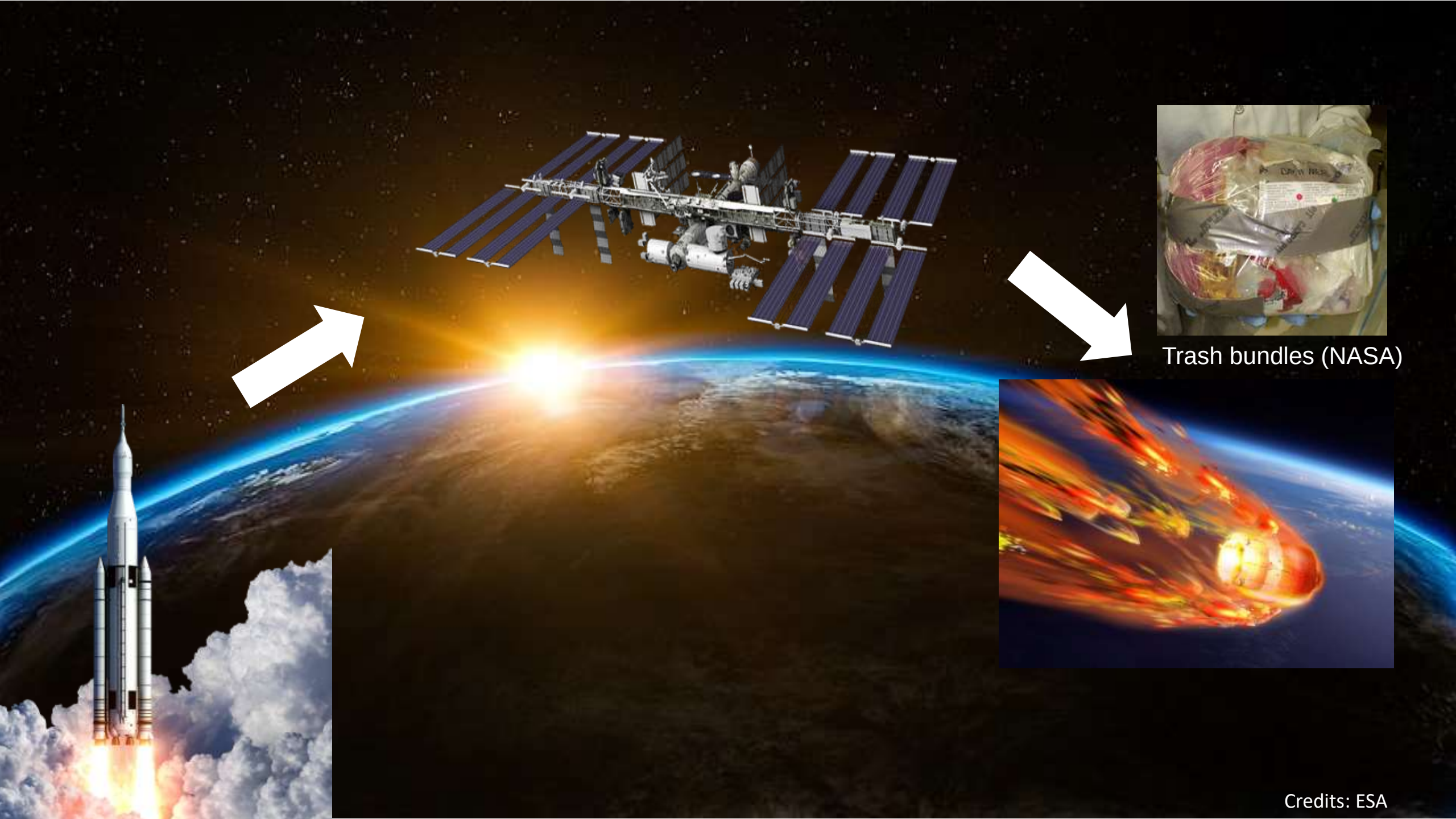
Gestion de l'eau

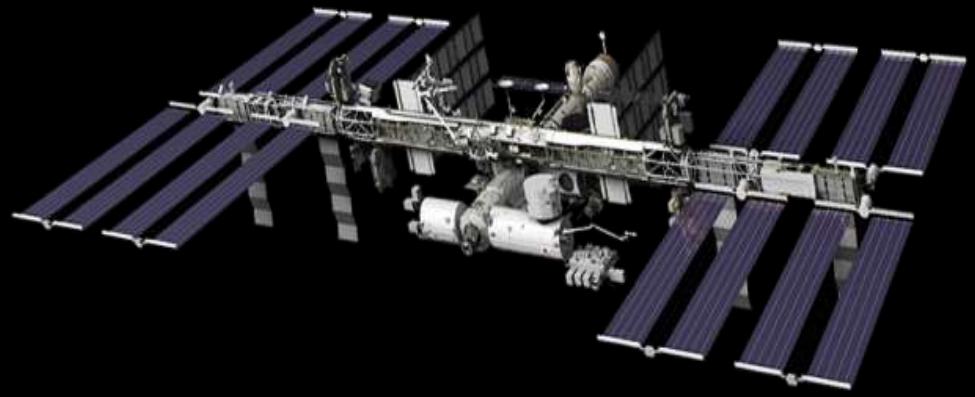


Gestion des déchets

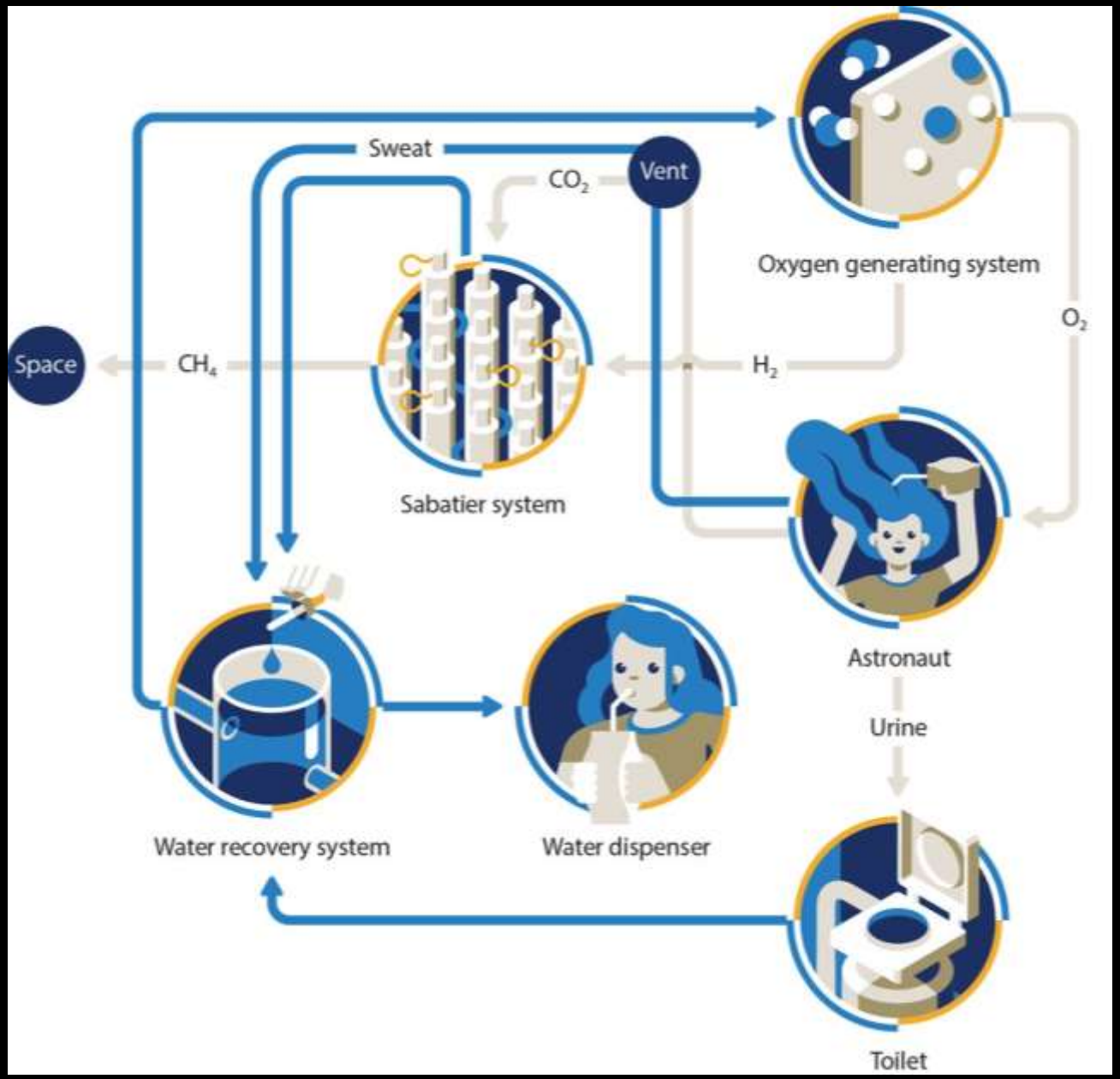
Gestion de la nourriture

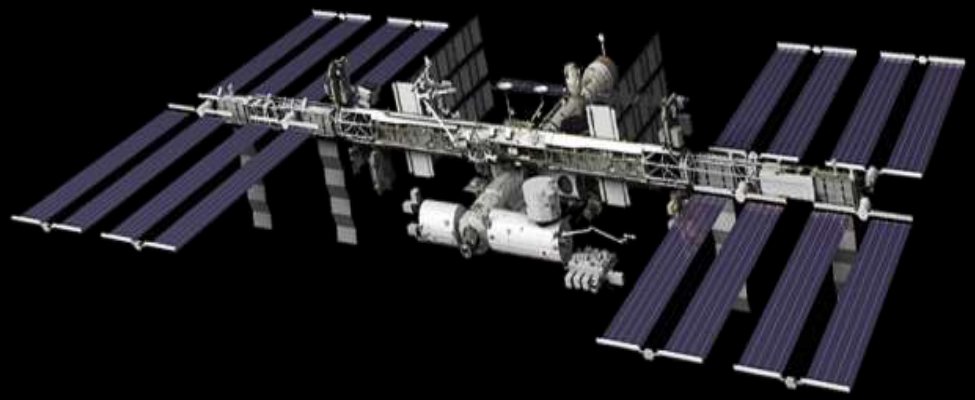
Credits: The Martian


Trash bundles (NASA)
Credits: ESA



Credits: NASA





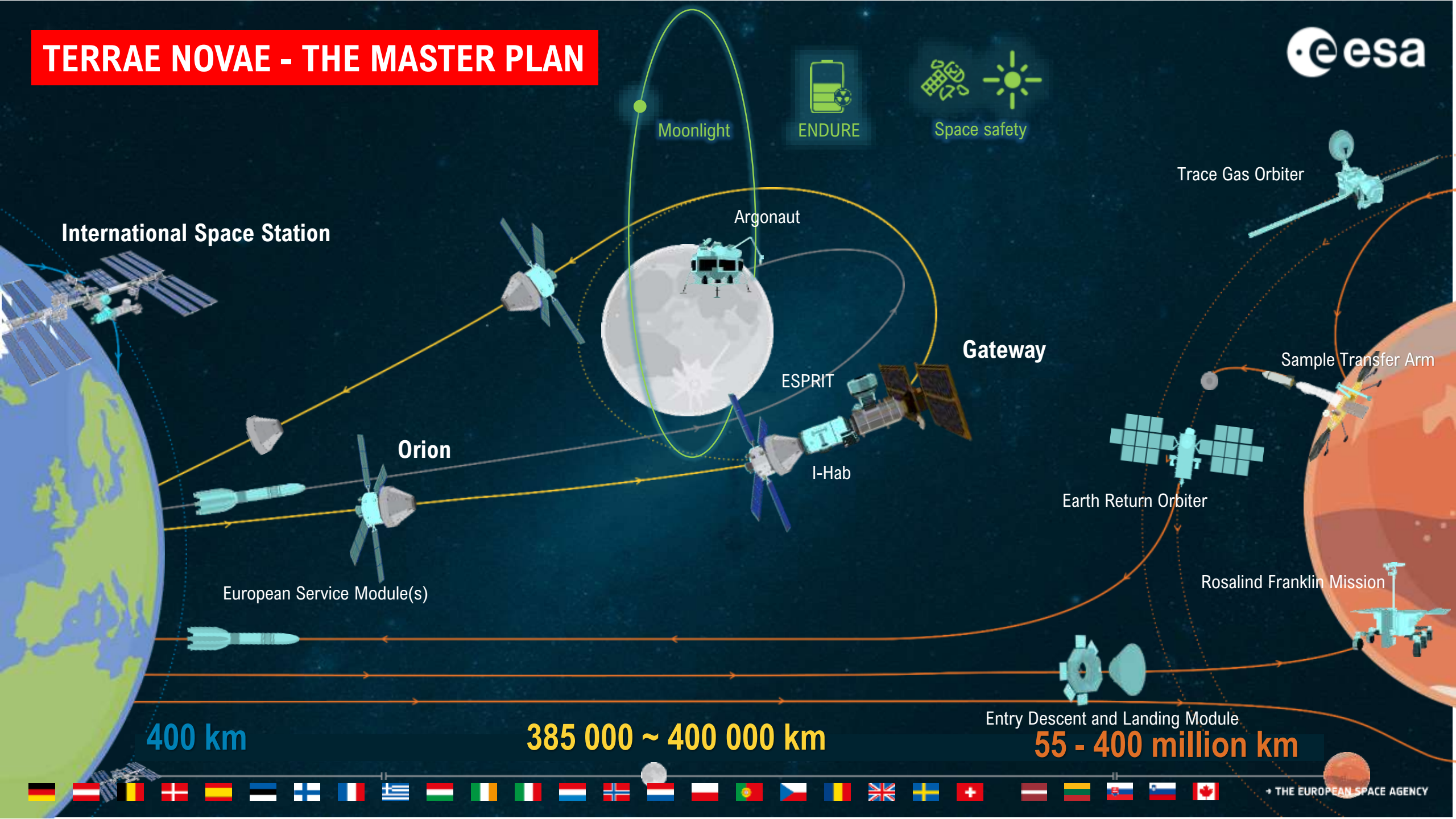
Credits: NASA/ESA


Salmon

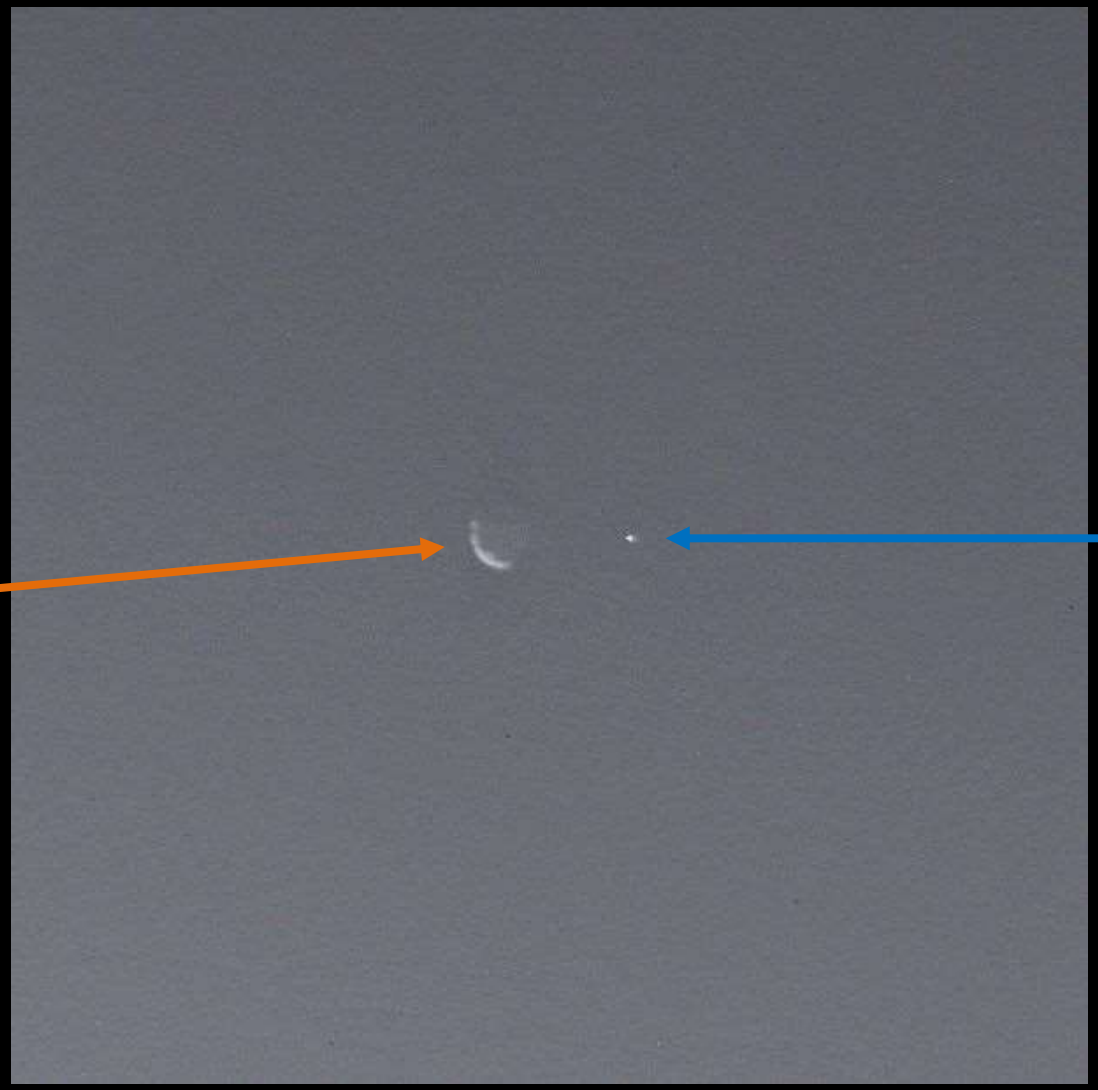

To A/L


esa

TERRAE NOVAE - THE MASTER PLAN



La Terre vue de Mars



Credit: NASA/JPL-Caltech/MSSS. NASA PIA26362

RAPIDE CALCUL DANS LE CAS D'UN VOYAGE VERS MARS

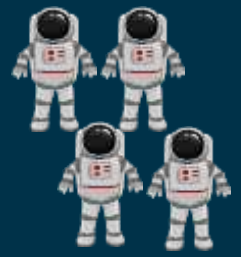
- **Consommables Métaboliques**
  - 5 kg/j/pers.

~ 20t

- **En comptant l'eau pour les activités d'hygiene**
  - 20kg/j/pers.

~ 80t

4



~1000 jours

≈ 100 t

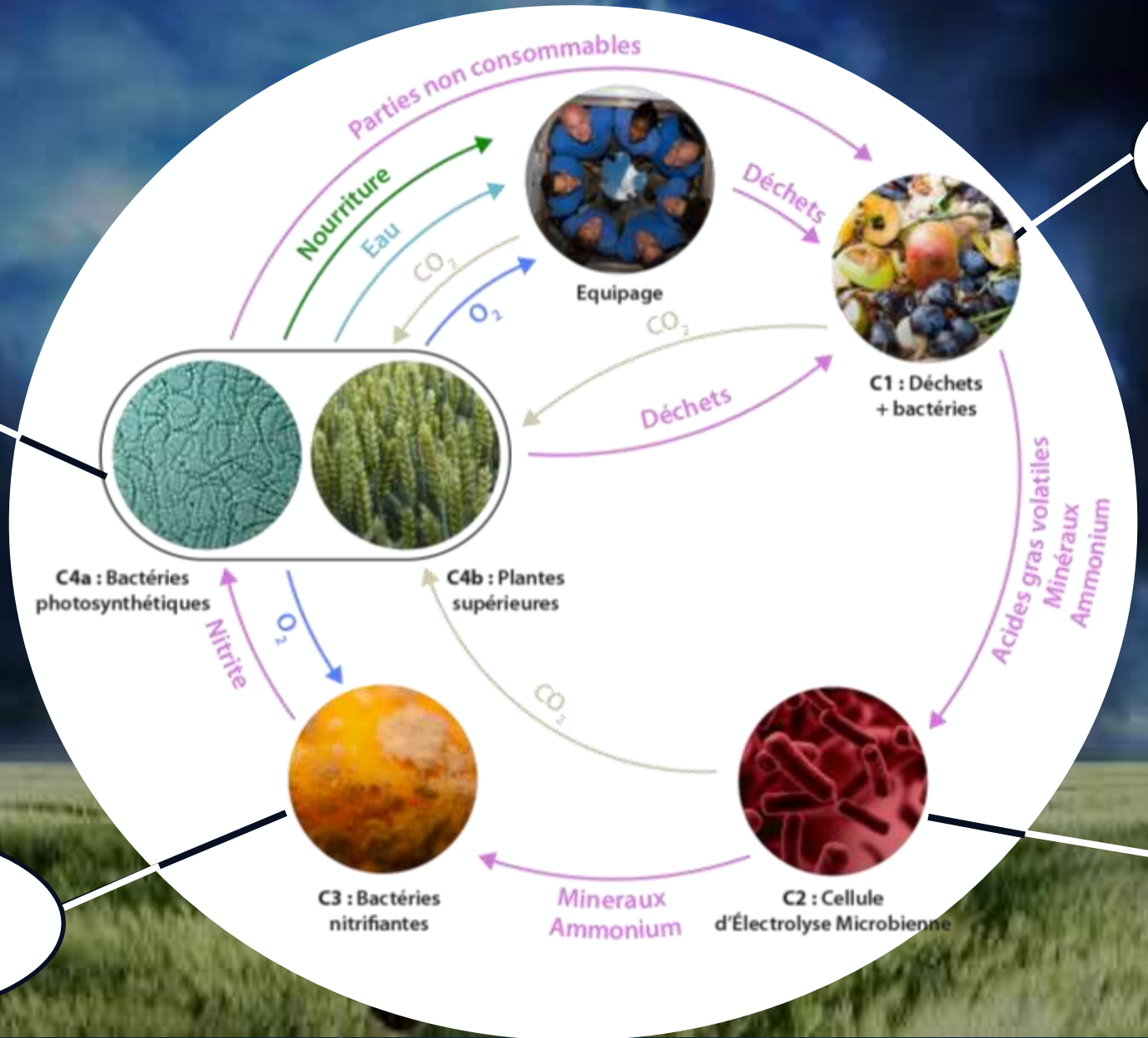
MELISSA
MICRO-ECOLOGICAL
LIFE SUPPORT SYSTEM
ALTERNATIVE

esa

The concept, inspired of an ecosystem

Credits: The Martian

LA BOUCLE MELiSSA: LES 5 COMPARTIMENTS



Liquéfaction des déchets

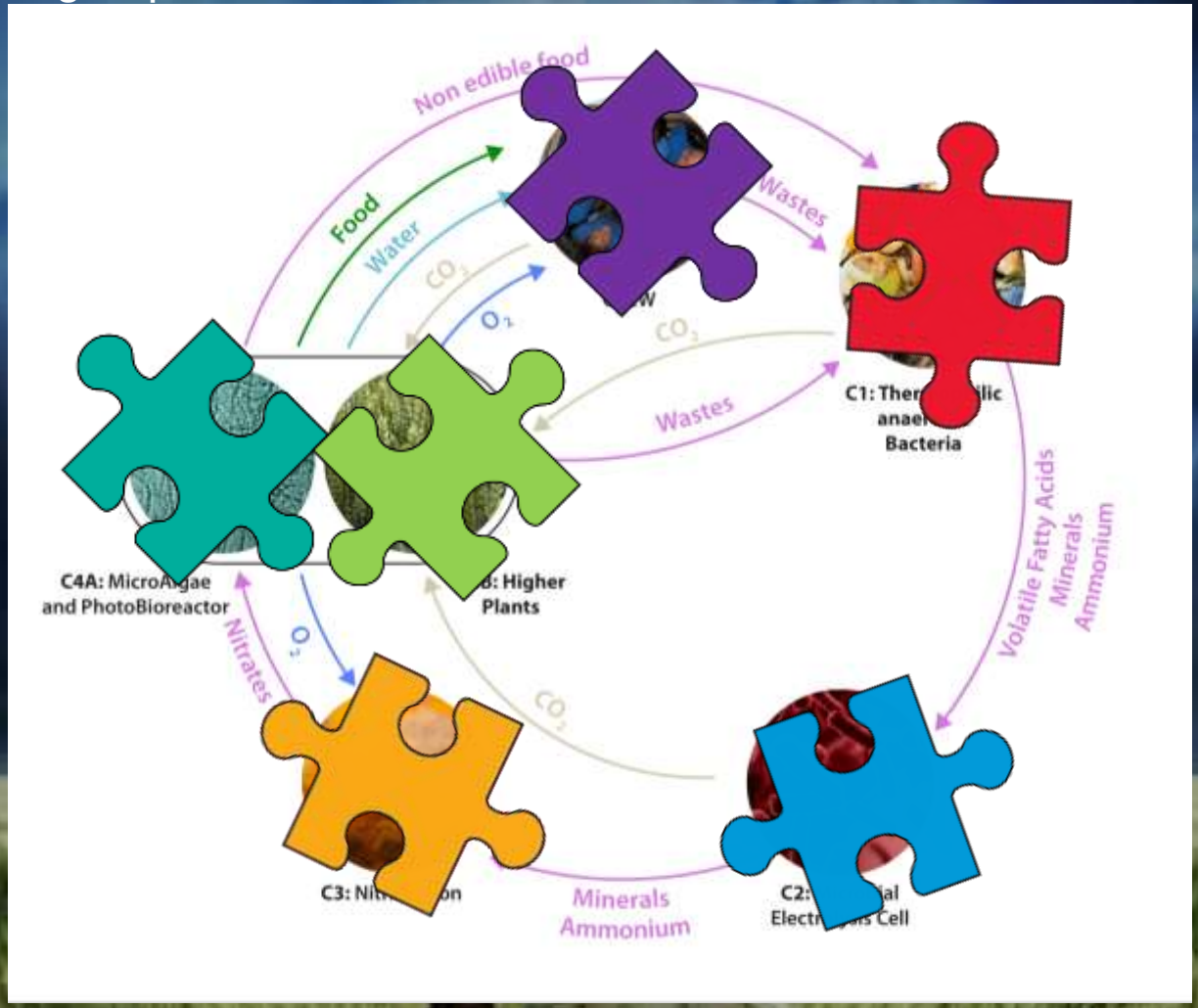
Production de nourriture, d'eau et d'oxygène

Élimination du carbone organique

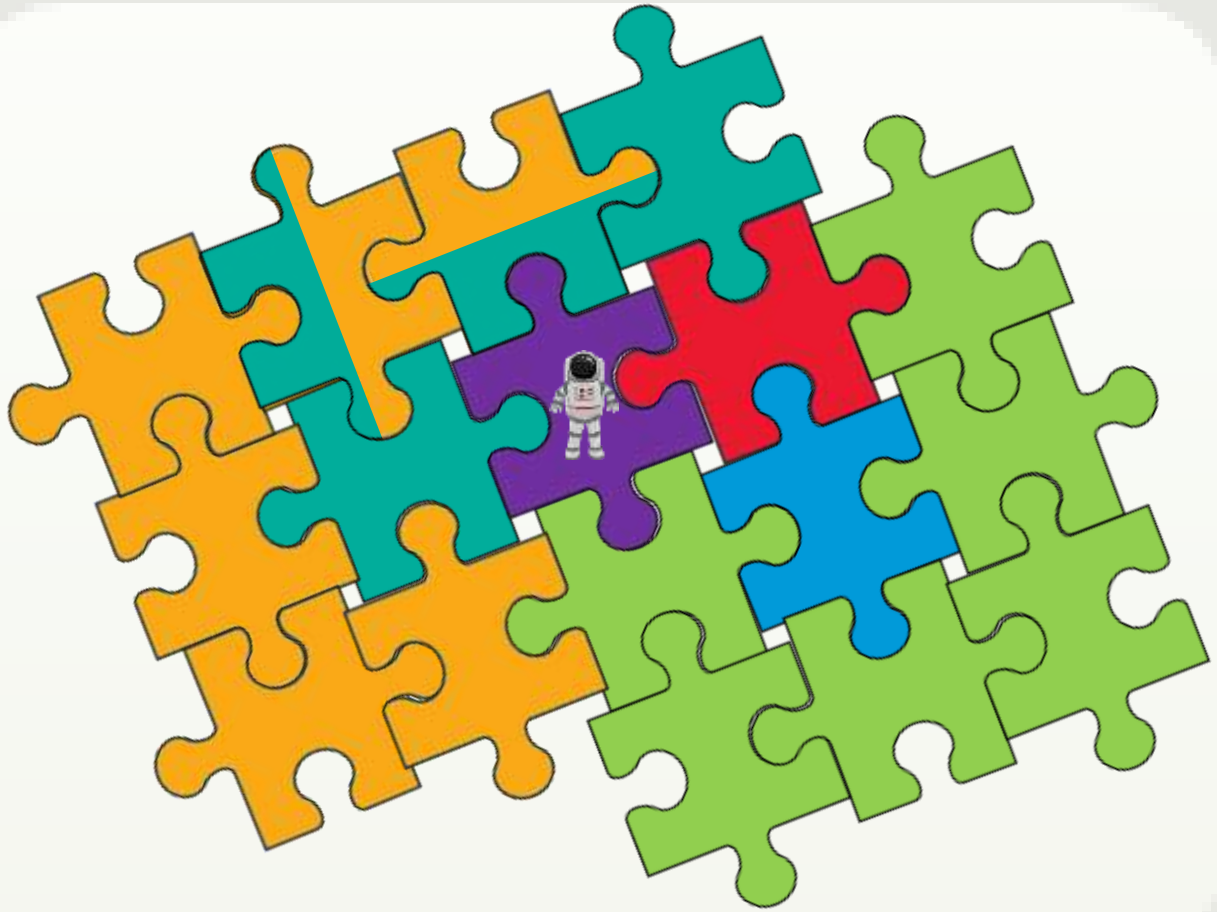
Transformation de l'azote

L'Analogie du Puzzle

Imagine que les différents compartiments sont comme les pièces d'un puzzle que l'on cherche à assembler pour former un système de recyclage optimal.



L'Analogie du Puzzle



It becomes complex…

L'Analogie du Puzzle

It becomes really complex…

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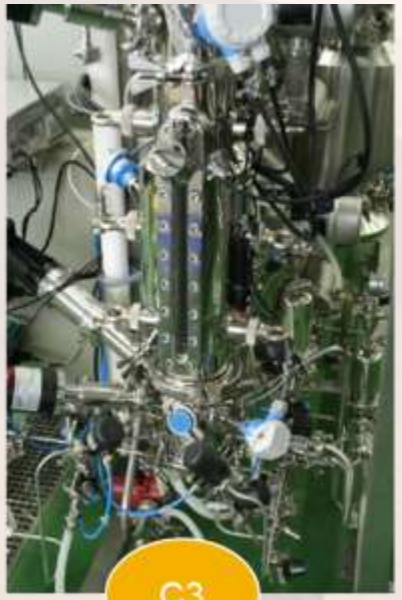
MELiSSA PILOT PLANT (BARCELONE)



Credits: ESA and The Martian

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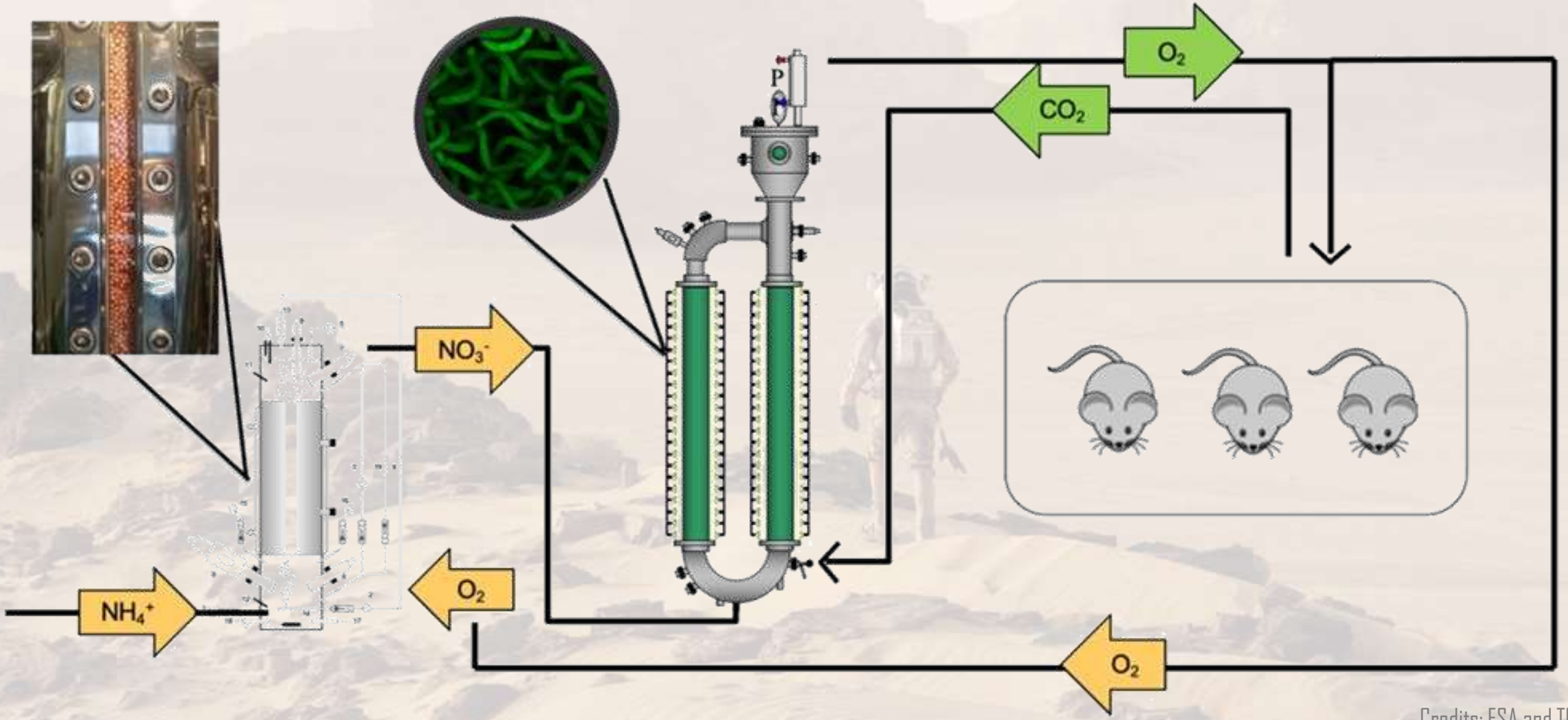

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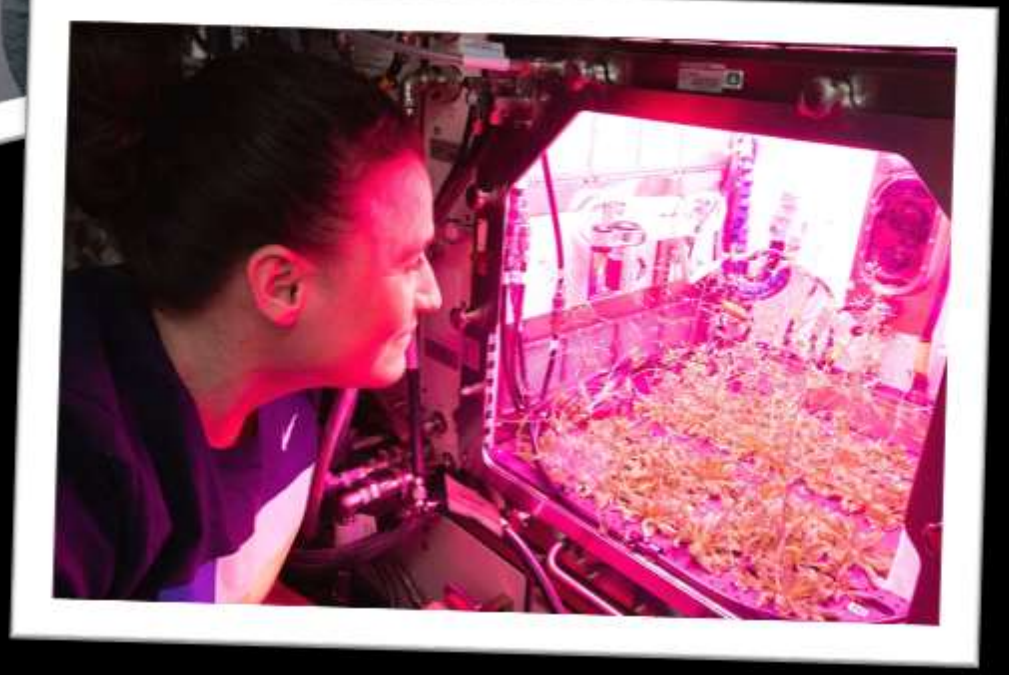
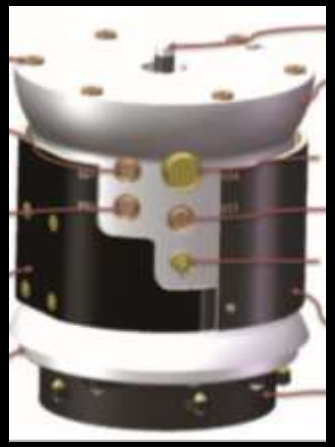


Credits: NASA

Credits: NASA

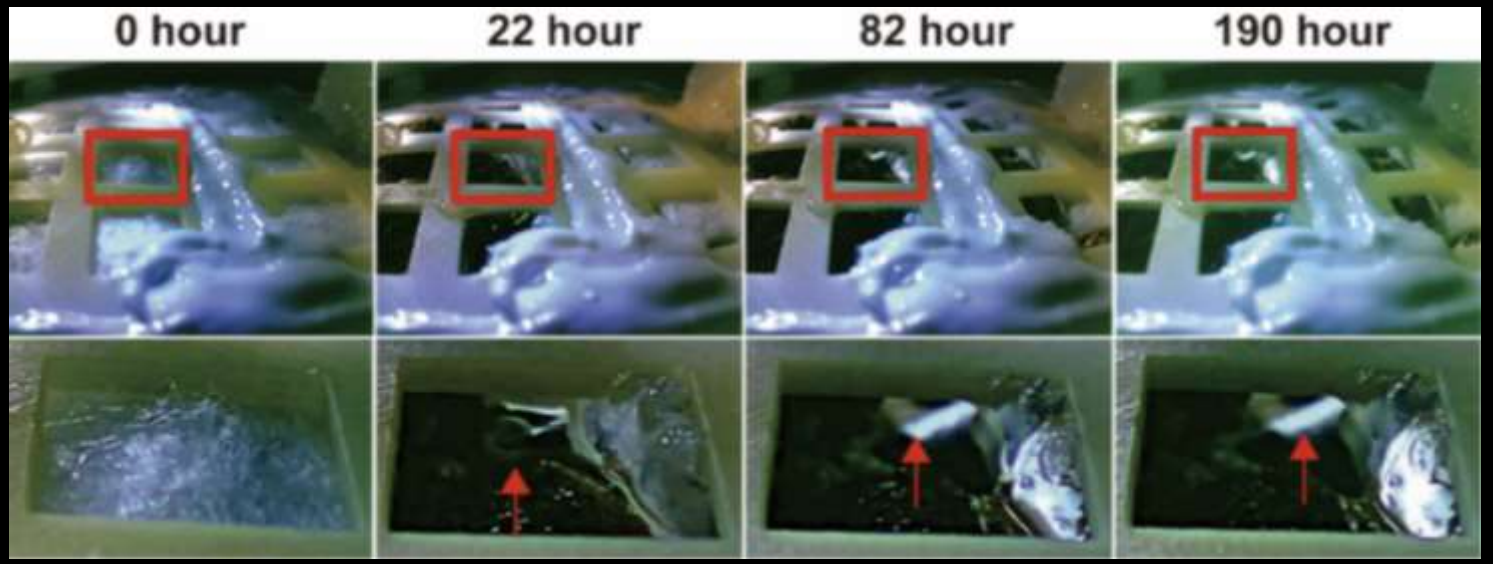
2019 : Premières plantes germées sur la Lune

CHANG'E 4

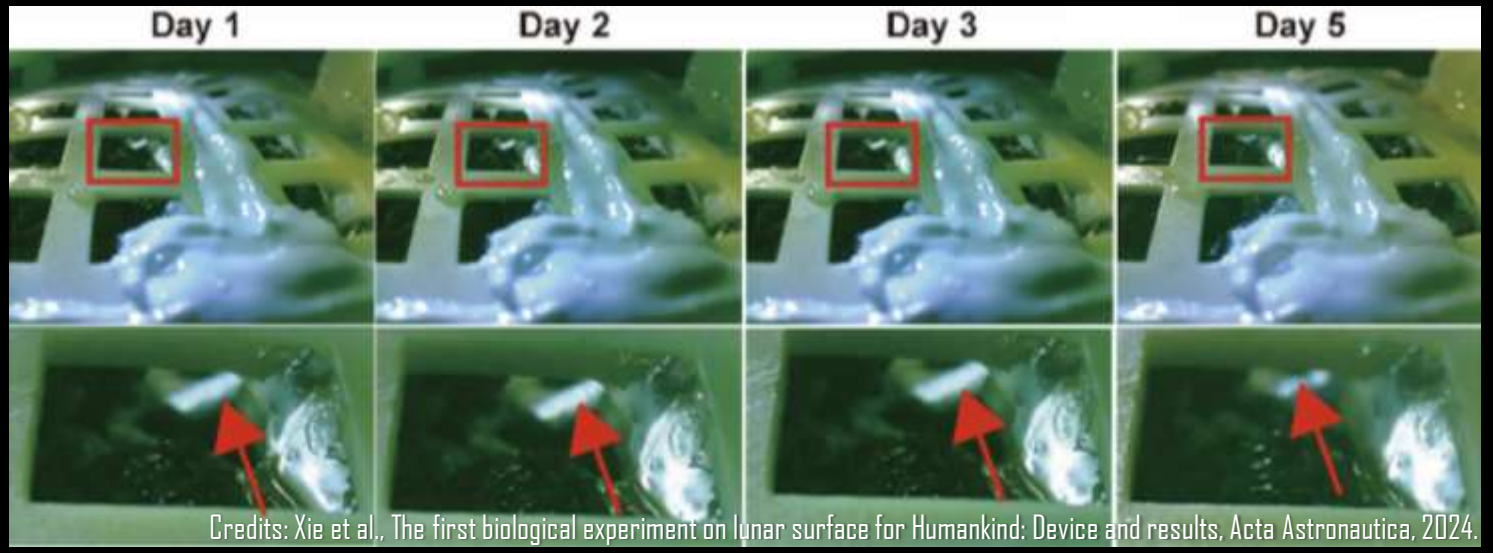


Biological Experiment Payload

Premier jour lunaire

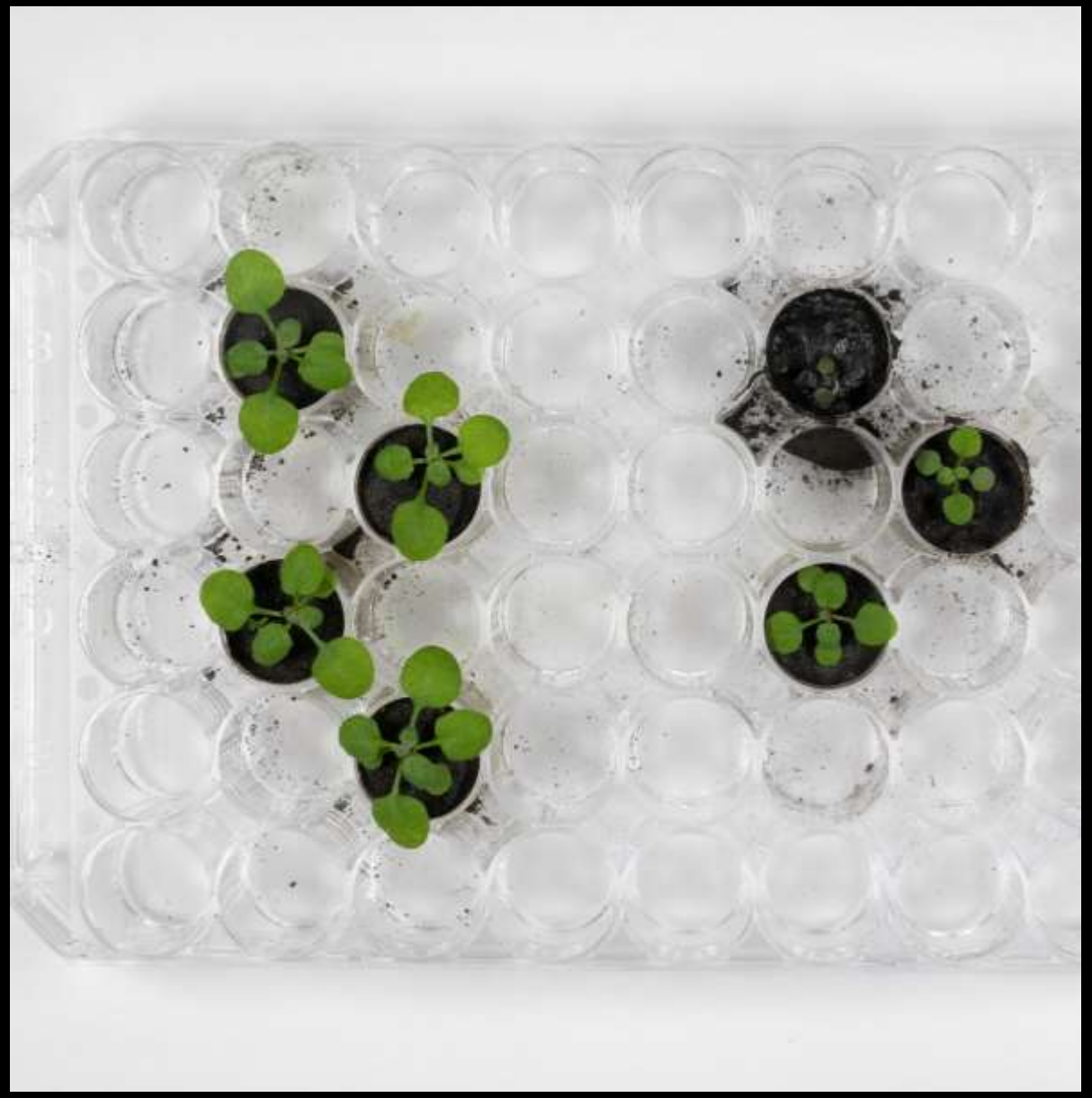


Deuxième jour lunaire



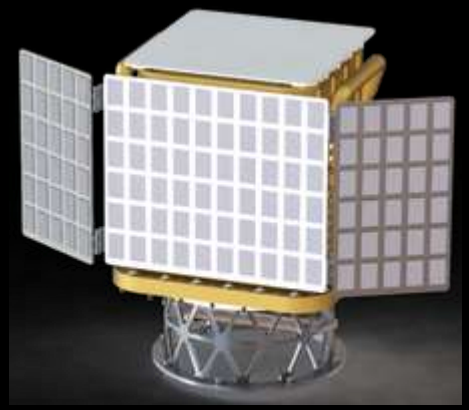
Credits: Xie et al., The first biological experiment on lunar surface for Humankind: Device and results, Acta Astronautica, 2024.

2022 : Premières plantes cultivées dans du régolithe lunaire



Credits: UF/IFAS photo by Tyler Jones

2026 ? : Premières plantes matures sur la Lune ?



ARTEMIS

Credits: Space Labs Technologies and NASA


Credits: NASA


Base Antarctique Concordia (IPEV - ENEA)
© G. Dargaud


NEEMO, Floride (NASA)
Credits: NASA


Credits: Mars Society
Mars Desert Research Station, Utah (Mars Society)


MARS500, IBMP, Moscow
(IBMP – ESA – Roscosmos)
Credits: ESA - S. Corvaja

HAWAII – HI-SEAS


Credits: A. Meier


HI-SEAS 2013
HAWAI'I SPACE EXPLORATION ANALOG AND SIMULATION


HI SEAS
LARK
RAMOS
BEVINGTON
PAYLER
EHRLICH
BARNARD


CARACCIO • LOCKWOOD • POULET • STEDMAN • SWARMER • WILLIAMS
HI-SEAS 2
HAWAII • 2014
SPACE EXPLORATION ANALOG & SIMULATION


LENTO
DUNN
HI-SEAS III
WILSON
KELLAR
SCHIEBELHUT
KLIKADYROV


HI-SEAS IV
A YEAR ON MARS
BASSINGTHWAIGHTE
HERNOKE
JOHNSTON
STEWART
VERSEUX
GIFFORD


© Sheyna Gifford 2013

MERCI ! QUESTIONS ?


0.8 kg O_2
3.2 kg Eau
0.6 kg Matière sèche
0.9 kg CO_2
3.6 kg Eau
0.1 kg Matière sèche
Credits: The Martian

Credits: Kenji Aito

Credits: NASA

UILA / HI-SEAS Systems Monitor (Aloha....) View: [dashboard] [sensors] [cam] 2014-04-26 @ 12:00:51

POWER

Battery A:	99 %	generating	3.09 kW
Battery B:	99 %		
H2 FC A:	50.00 psi	consuming	3.44 kW
H2 FC B:	Offline		

WATER

0.000 gallons -15.0 % full

WEATHER

RISE	05:57	SET	18:46	SOLAR	1014.10
TEMP	55.2°F	RAIN	0.00 in.	BAR	30.89
HUMID	84	DEW	50.7	WIND	NEbE 0.00

Habitat Interior

Electrical Rm	73.9 °F	CO2 Internal	1292.23 ppm	
Dining Rm	70.5 °F	RH internal	62.71 %	
Bedroom #3	63.9 °F	CO2 External	673.64 ppm	
Exterior 1	51.4 °F	RH External	78.18 %	
Exterior 2	54.7 °F	Hot Water	On	
		Hot H2O Flow	0.00 gal/sec	
		Hot H2O Total	219.09 gal	Reset
		Cold Water	Off	
		Cold H2O Flow	0.00 gal/sec	
		Cold H2O Total	102.62 gal	Reset

Current Time: Mon, 31 Mar 2014 09:25:40

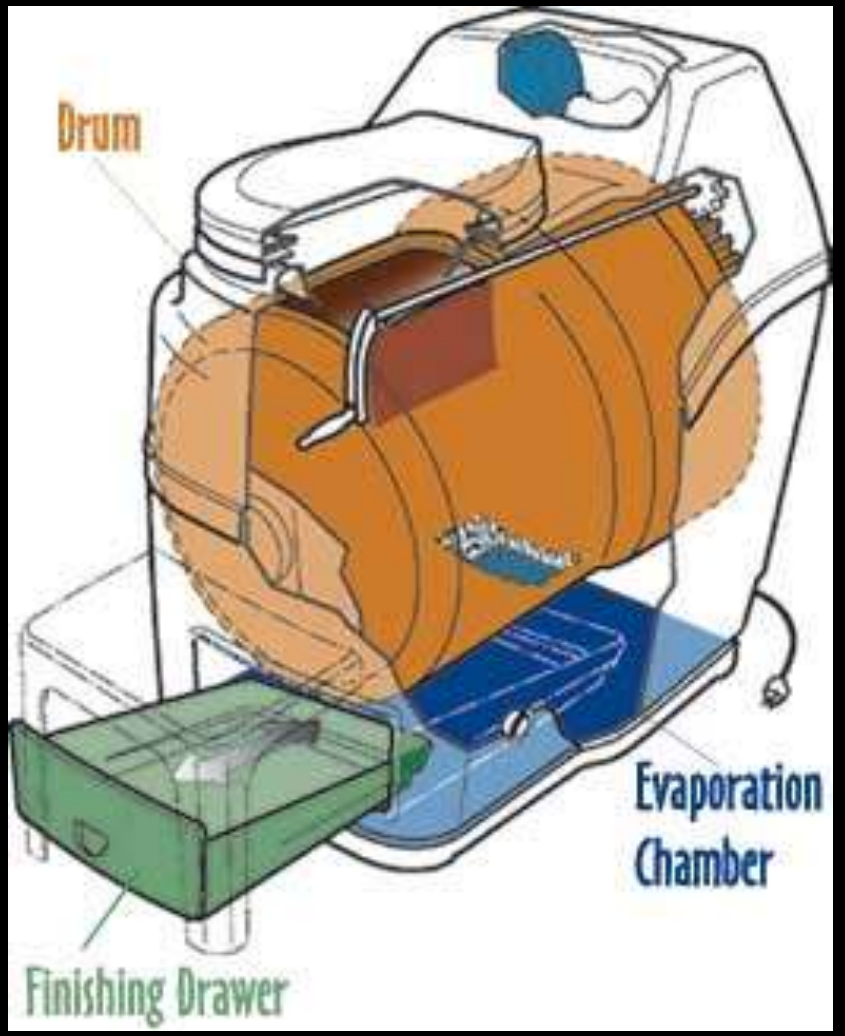
Mars Habitat / Mauna Loa
e Exploration Analog & Simulation


Credits: A. Meier

Credits: A. Meier


15ème TROPHÉE DE LA NEIGE

Credits: A. Meier



Credits: A. Meier

Credits: A. Meier

Credits: R. Lockwood