# NASA Mars XR 2 Challenge
Mars Camp 1

Mars Camp 1 simulates the first human camp on Mars at 38% gravity and is based on use of probable technologies and a site that possibly affords unique research on possible life and its evolution. All assets shown are VR models and most with animation operating in VR Unreal Engine 5.1.1.
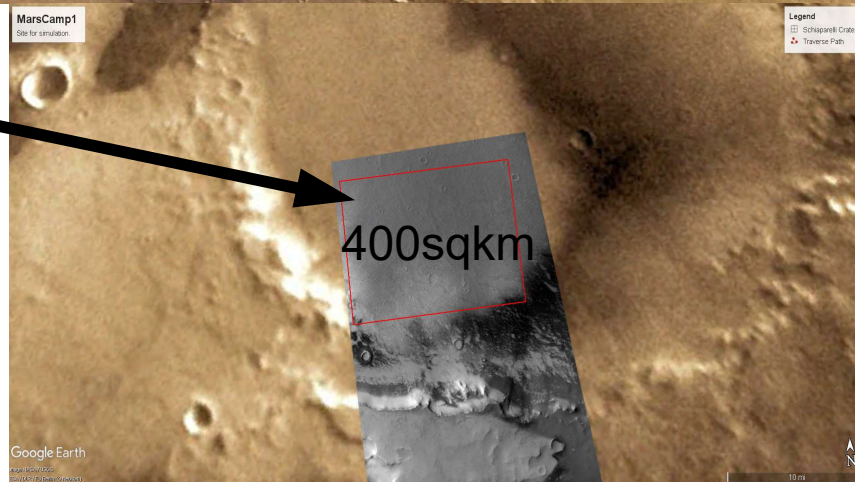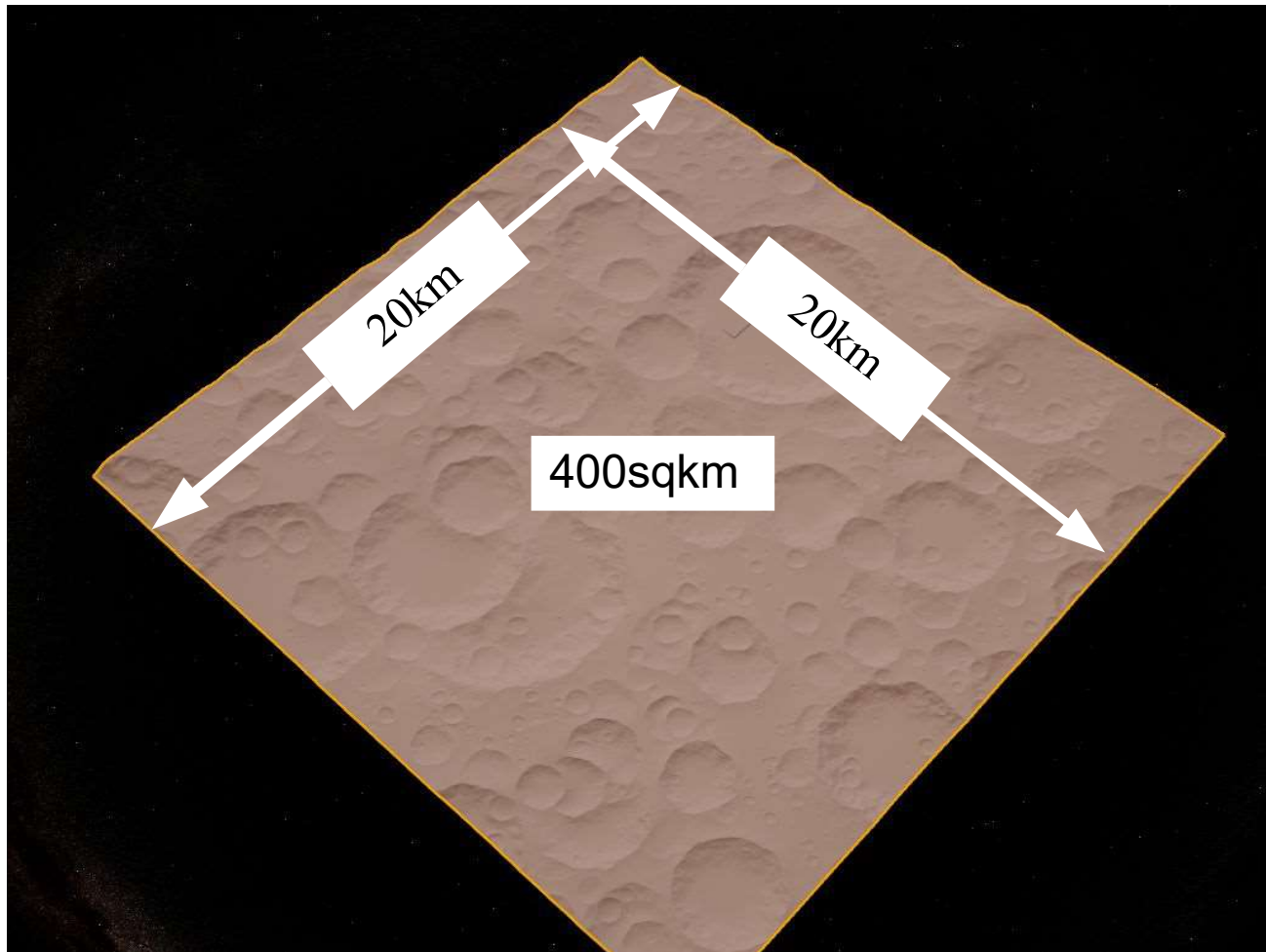

Simulation site

Sinus Sabaeus, MC-20
Mercator Projection
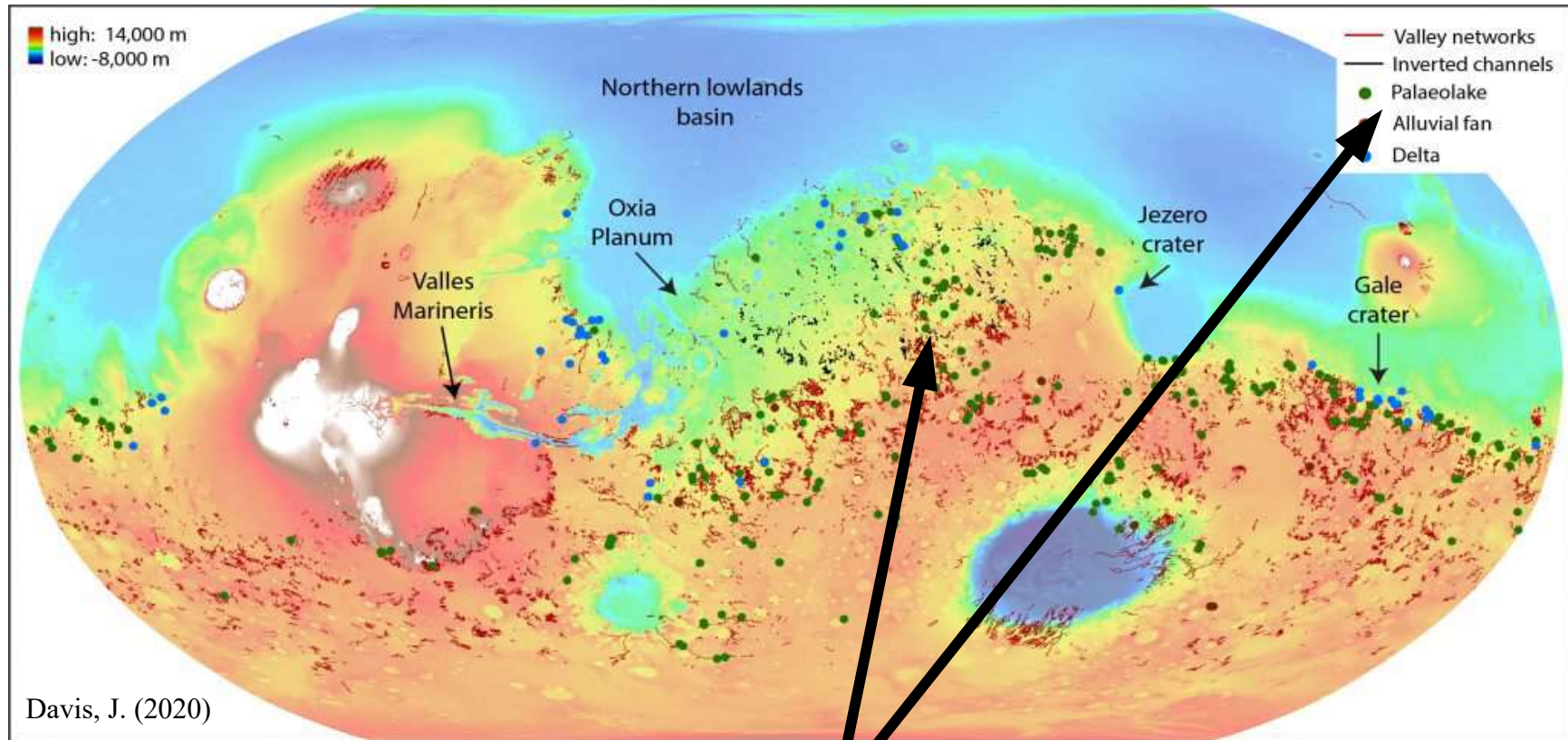
Site

SITE

400sqkm

Schiaparelli Crater
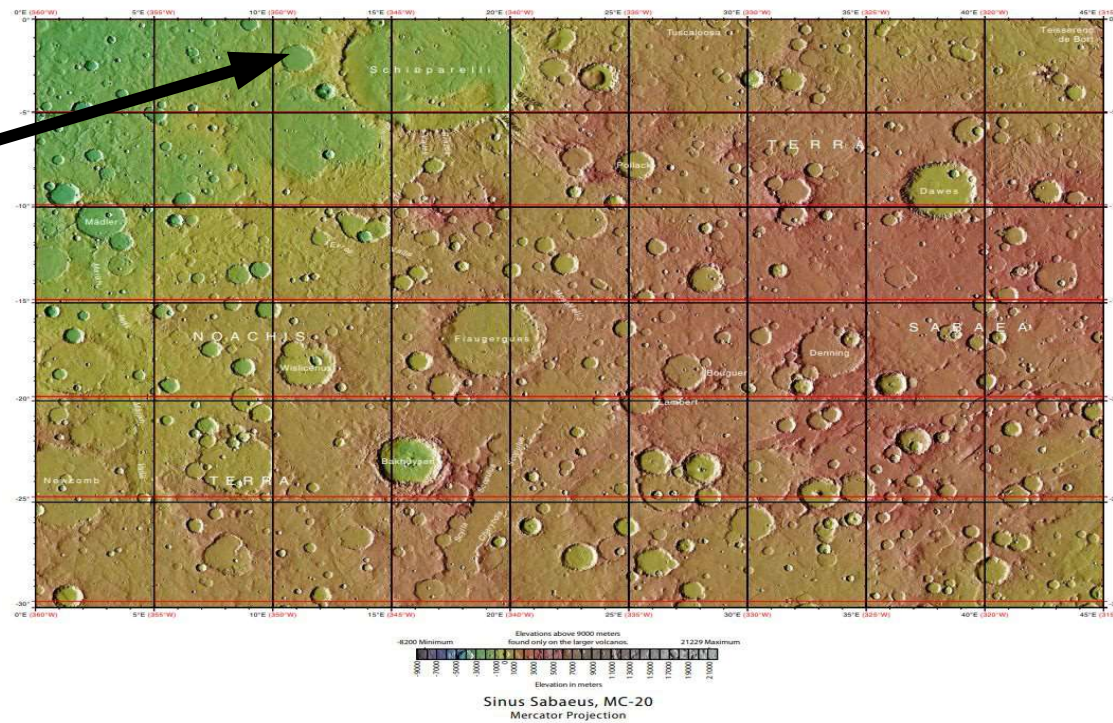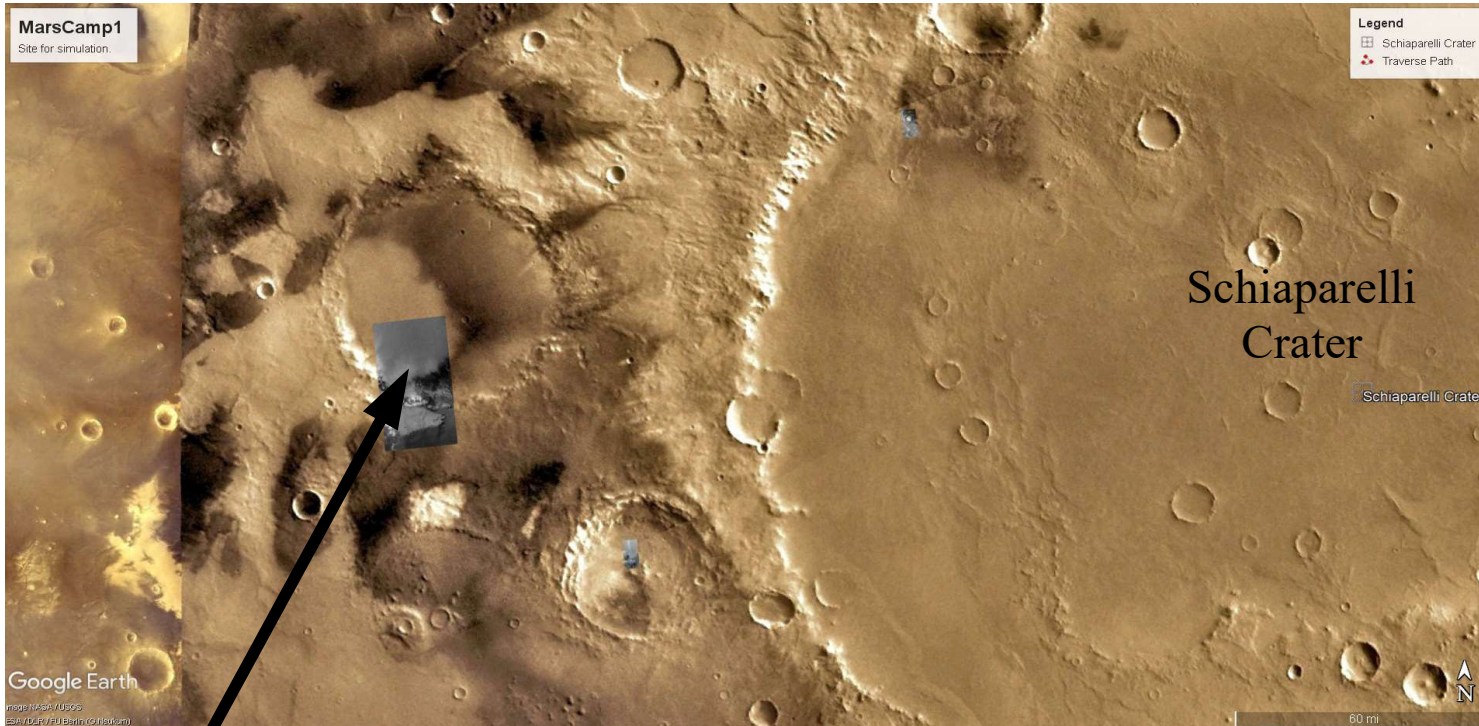
Site Size in Unreal Engine

20km

20km

400sqkm

Site Opportunity

Davis, J. (2020)

Mars Camp 1 site crater has geological layers to research for life fossils and by layers for evolution.

Arrival

NASA/SpaceX Star Ship initial landing and astronauts and equipment deploy
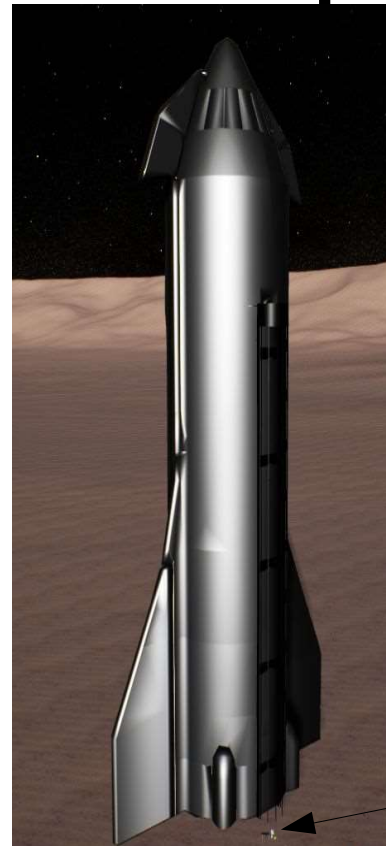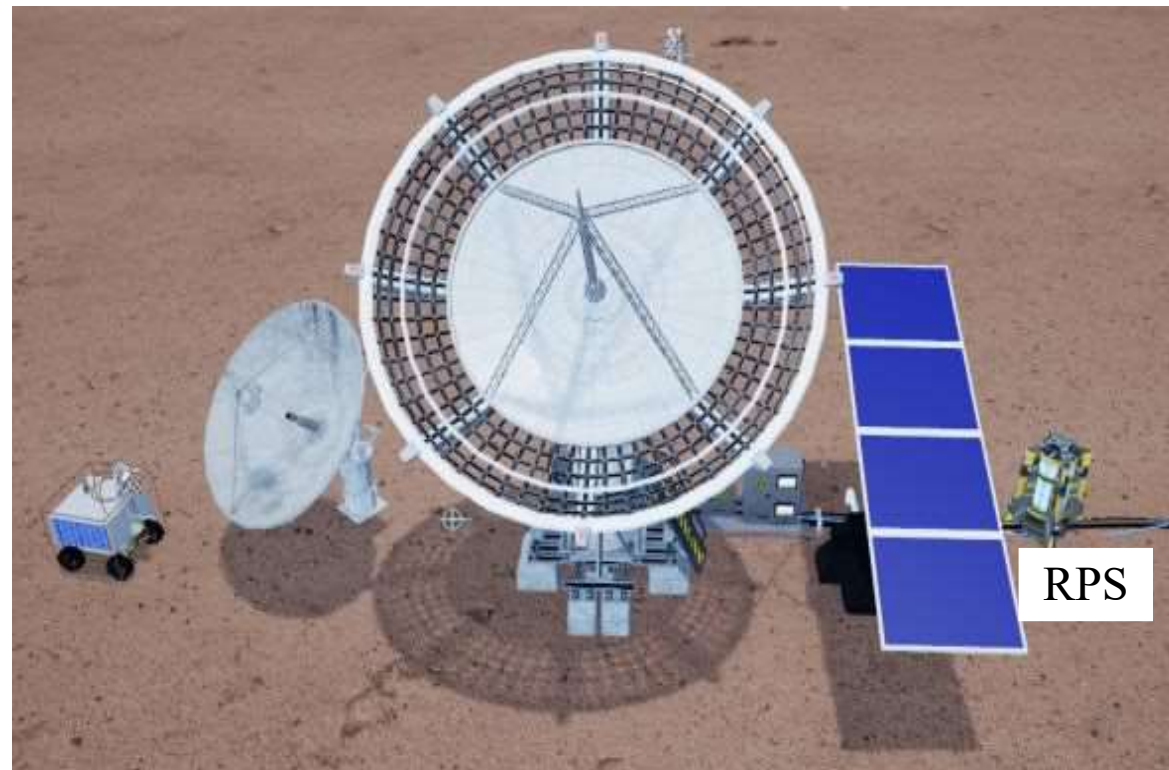

Astronaut

Equipment

Equipment deployed for search for water, communications dish, radio telescope, solar and radioisotope power system (RPS) power.

RPS

Mobility

Model courtesy of NASA

Team

VR Astronaut collects ice samples, uses tools to fix equipment, and Astronaut (NPC with artificial intelligence) walks to explore.

Select Tool As From A Tool Belt

In VR Use Hand To Fix Equipment With Tool. HUD Shows 02 & Tasks.

Helmet HUD O2 Depletion timed to 2 hours EVA

Oxygen

Ice Samples to Collect 35
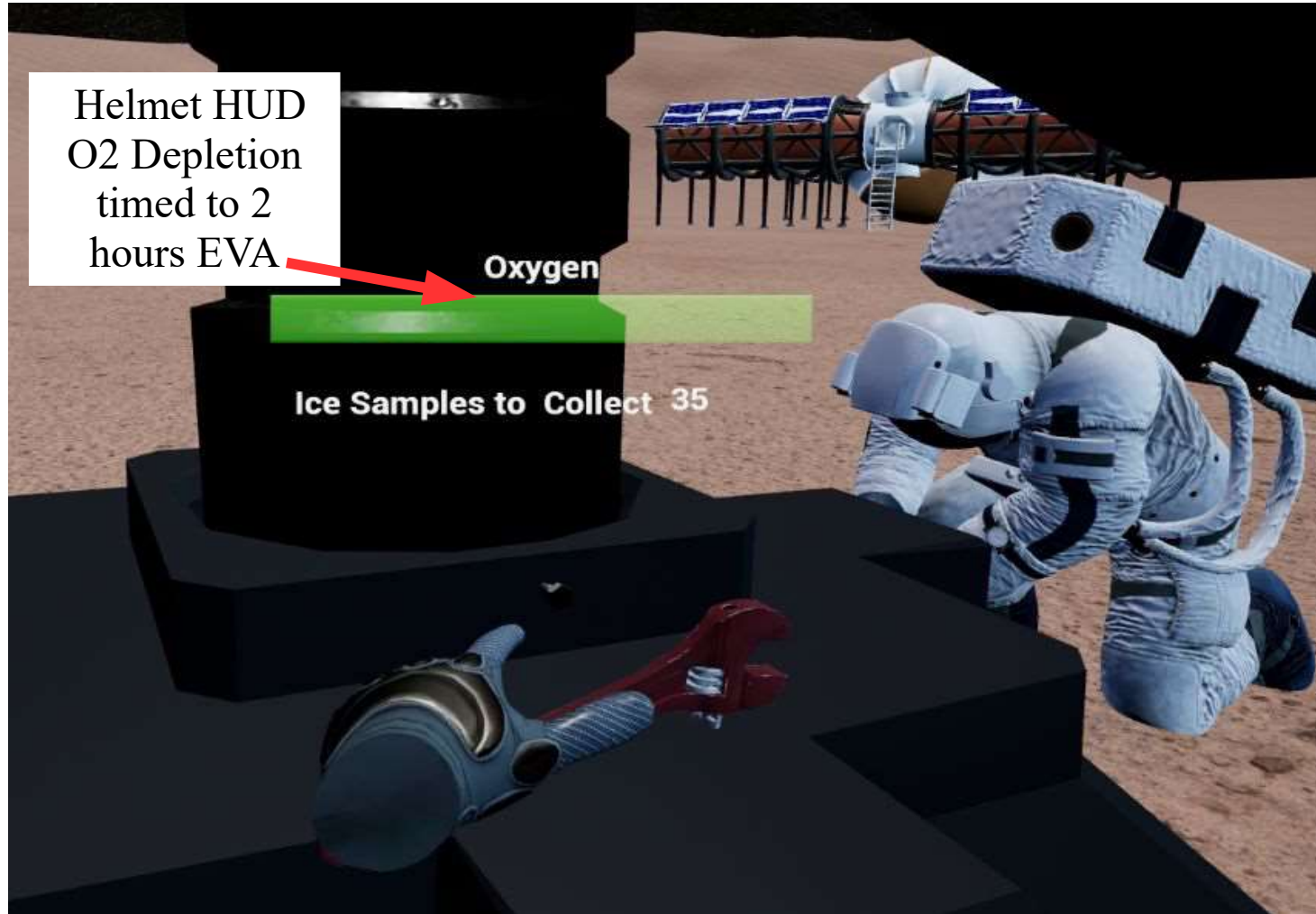
Inflatible Habitat
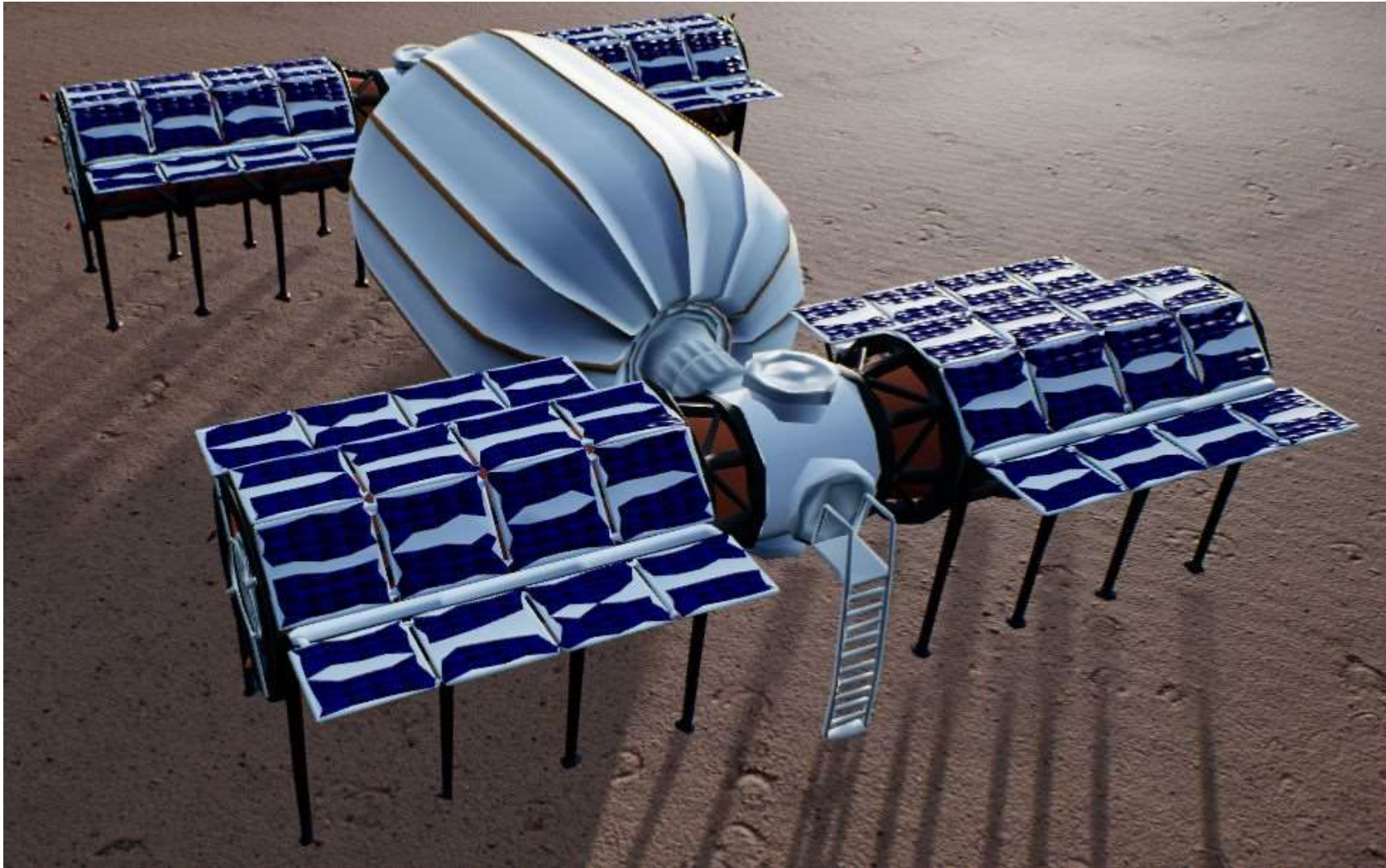
Habitat Interior

Sleep area top level 1

Work/Eat area level 2

Storage, shower & toilet area level 3
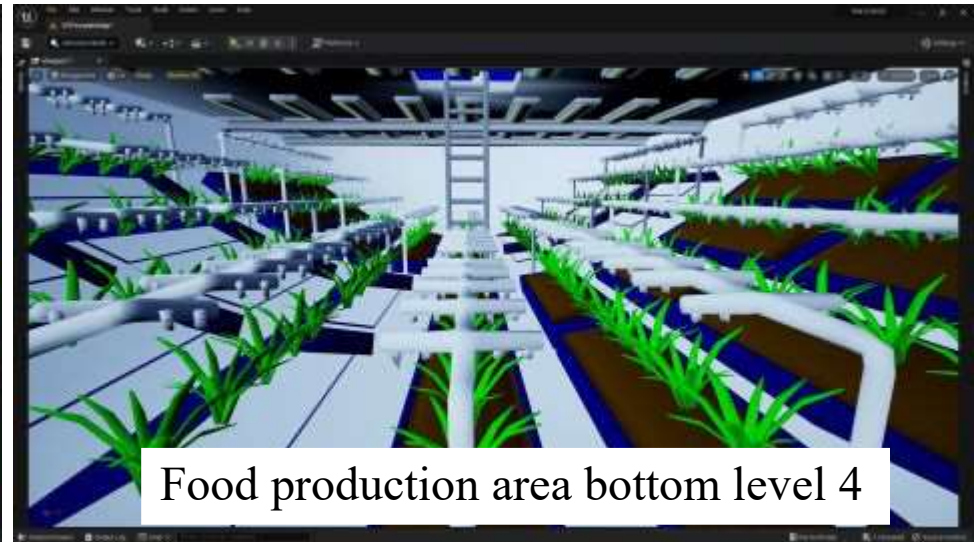
Food production area bottom level 4

Simulation Focus 1

Electrolysis Oxygen production from Mars rocks containing ice H2O & CO2

Scheller, E. (2022)

Debris removed by excavator

O2 & H2 Electrolysis Production Equipment

Excavator w/bucket dumping collected icy rocks on conveyor belt.

Microwave heat icy sand steaming out H2O & CO2

Rock Crusher

O2 Plant

RPS

Crusher Motor

Crusher

Electrolysis Unit

Micro wave

CAUTION

H2O Pump & Motor

FLAMMABLE

O2 Plant Control Box

CRUSHER   HEAT   O₂   H
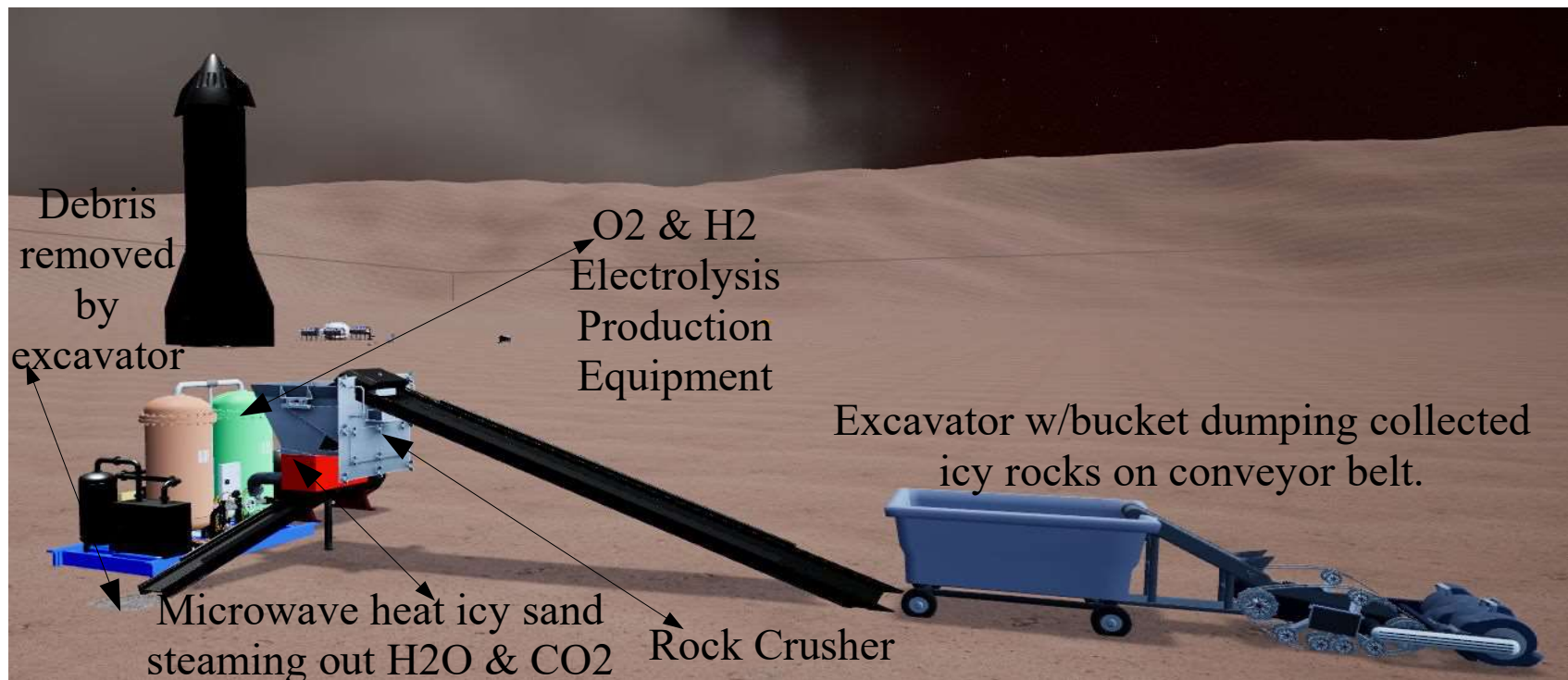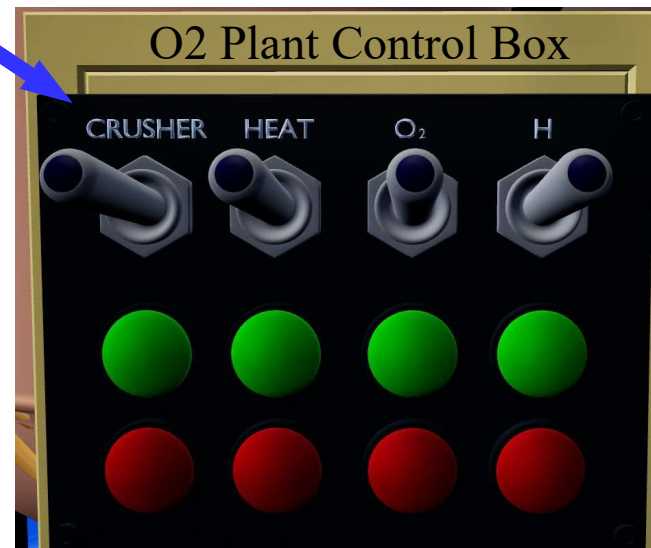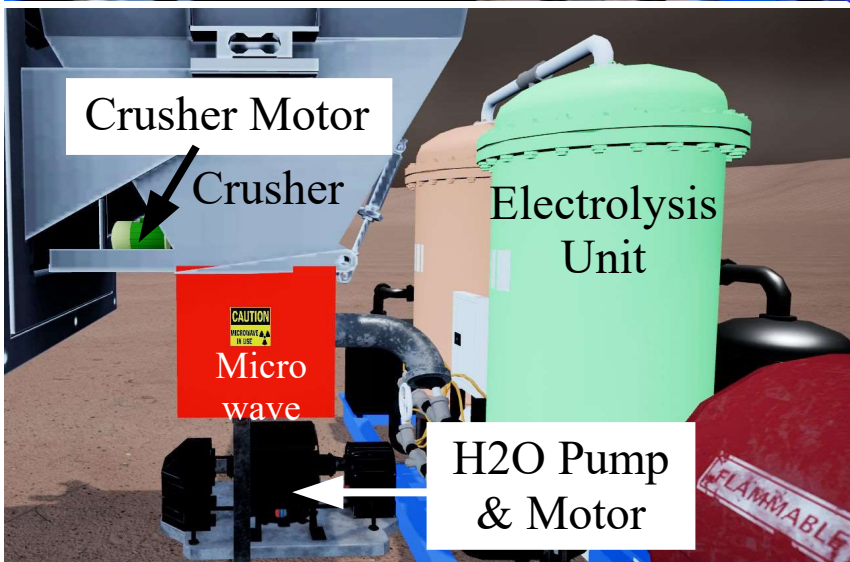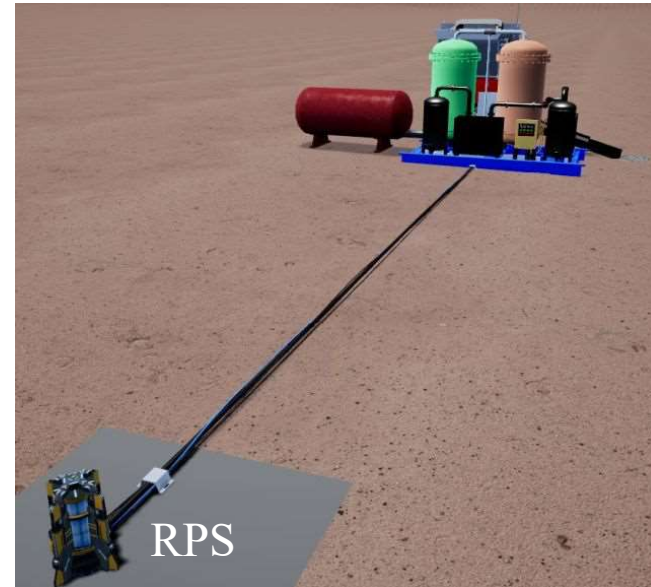
Simulation Focus 2

Bioreactor producing algae food & O2

Each year 1 ha feeds:
soy — seaweed — microalgae
= 100 people

Protein source

Microalgae consist mainly of protein.

	%
Microalgae	70 %
Chicken	25 %
Soy	18 %
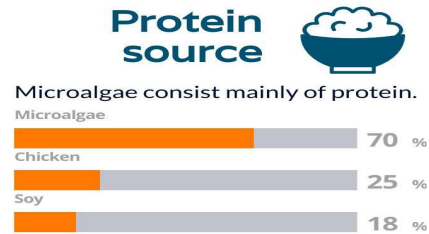
On a global scale microalgae produce more than 75% of the oxygen required for animals and humans.

Source: Wageningen University & Research Centre Netherlands

Photo ISS Bioreactor Algae Production Unit
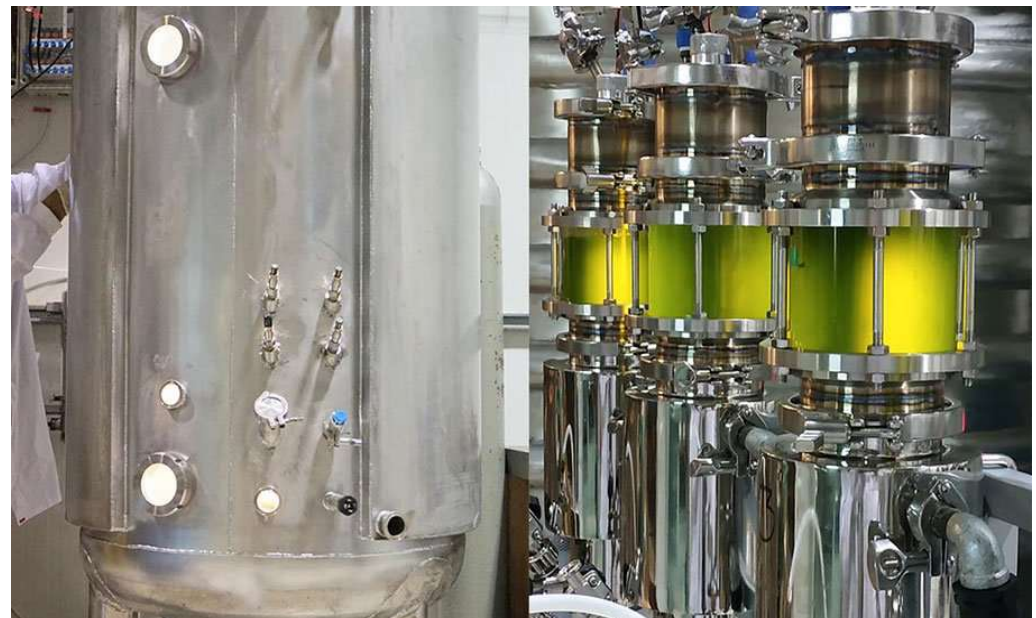
Photo Industrial Bioreactor Algae Production Brevel Inc. Israel

CHRISTOPHER SHOVE, Ph.D.

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VR Microalgae Bioreactor

- Mars microalgae bioreactor asset based on *AlgaePARC* vertical panel operation.
- VR player interactions will be included to produce algae for food and O2 using Mars ISRU CO2, human waste sanitized fertilizer and H2O liquid derived from Mars rocks and ice.

AlgaePARC Operations Netherlands

Algae Bioreactor 3D model in habitat 4th floor

XR IMPLEMENTATION

1) Images of assets and scenarios presented in this storyboard exist and operate in UE5.1.1VR including blue prints (BP).
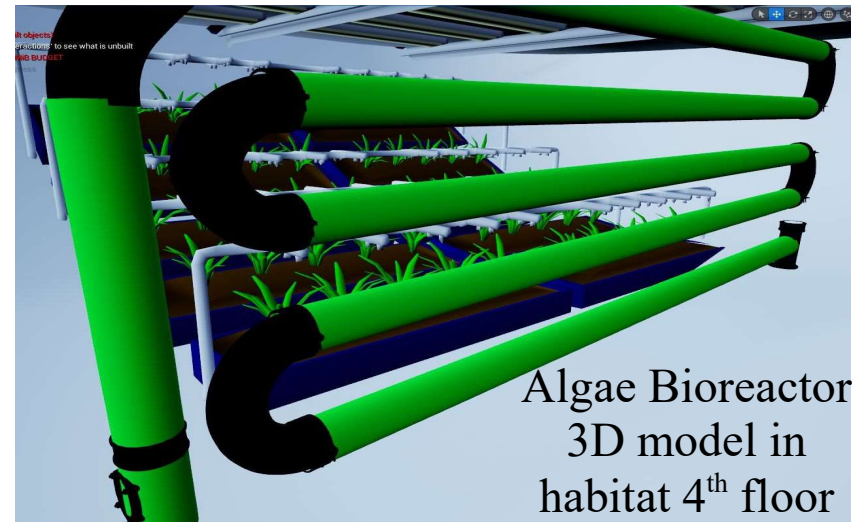2) Next steps include improving realism of some models including site, expanding *foci scenarios* of O2 and food production from Mars ISRU and via BP, implementing player interactions to fix different equipment.
3) Upon further research, more assets may be added.

Credits

- Producer & Unreal Engine Integrator and most Blue Prints Dr. Christopher Shove (U.S. Citizen)
- 3D models Andre Vaitsekhovich (Belarus) & Christopher Shove; "Algae Bioreactor" James Speight (USA); "Gas Tank" 3D model by Agustín Hönnun (Chile) is licensed under Creative Commons Attribution; "Scale Hopper" by seeriouslee is licensed under Creative Commons Attribution; "Industrial Grade Electric Motor" by Harri Snellman (Finland) is licensed under Creative Commons Attribution; & Epic Games Market Place
- Mars images courtesy of NASA, USGS & Google Earth/Mars
- Graphic Art Liubov Artemenko (Ukraine)
- Epic Unreal Engine 5.1.1 Virtual Reality used to make and operate VR simulation.

References:

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- Wageningen University (2023) "What can algae do for us?", https://www.wur.nl/en/value-creation-cooperation/algaeparc/show-3/what-can-algae-do-for-us.htm
- Davis, Joel, "From wet planet to red planet" Geoscientist December 2020
- Hecht, M., (2020) "MOXIE" https://mars.nasa.gov/mars2020/spacecraft/instruments/moxie/
- NASA, (2019) "Building Better Life Support Systems for Future Space Travel". Bioreactor Algae Food ISS: https://www.nasa.gov/mission_pages/station/research/news/photobioreactor-better-life-support
- Scheller, Eva (2022) H2O & CO2 ice in Mars rocks. https://www.nasa.gov/feature/is-there-water-on-mars-we-asked-a-nasa-scientist-episode-18.