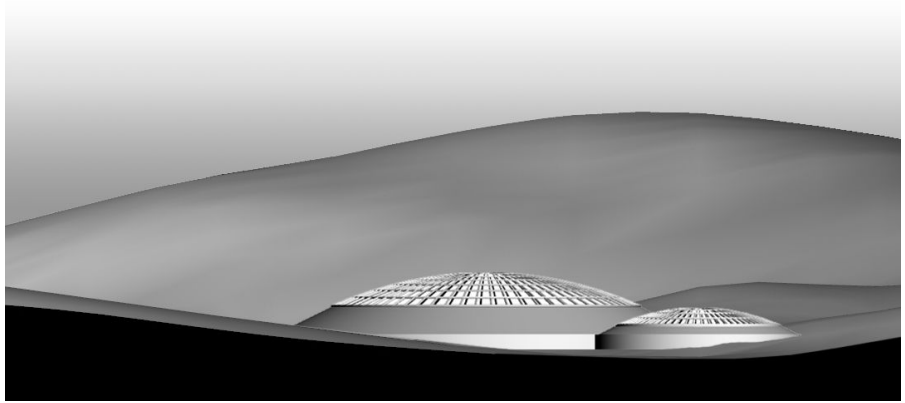


INTERPLANETARY HABITATION

DESIGNING FOR LIFE ON MARS

Landon Schoeneck

Abstract:

How can architecture adapt the complex engineering systems of a Mars colony to sustainable human life?

Migration and travel has evolved from the dawn of humanity to the automotive and flight industries of current times. Now interplanetary travel is on the forefront of technological innovation.

Innovation is created by those who dream farther forward than current society can understand, and it is necessary to push the boundaries of technology to make the impossible practical. thinking ahead to design for future interplanetary migration is a needed step to compel the world forward, as well as architecture and it's boundaries therein.

Building Title: Mars Station 1
Typology: Planetary Colonization
Site: Home Plate, Gusev Crater, Mars

The Primary goal of this Thesis is to practically design a Martian colony in which a building can combine the following requirements for sustainable life on the Martian surface.

Efficiency in Construction, Materiality, Transportation, Storage, & Functionality Systems

Aesthetics in Historical Connection, Design Hierarchy

Immediate Life Support in Radiation & Environmental Protection

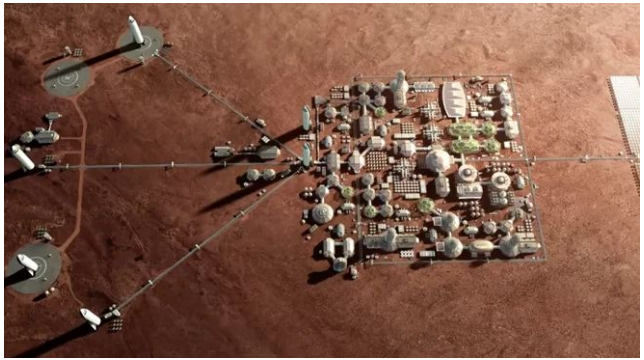
Life Longevity in Medical, Physical, & Psychosomatic Health Systems

Comfortability in Residency, & Workspace

Migration

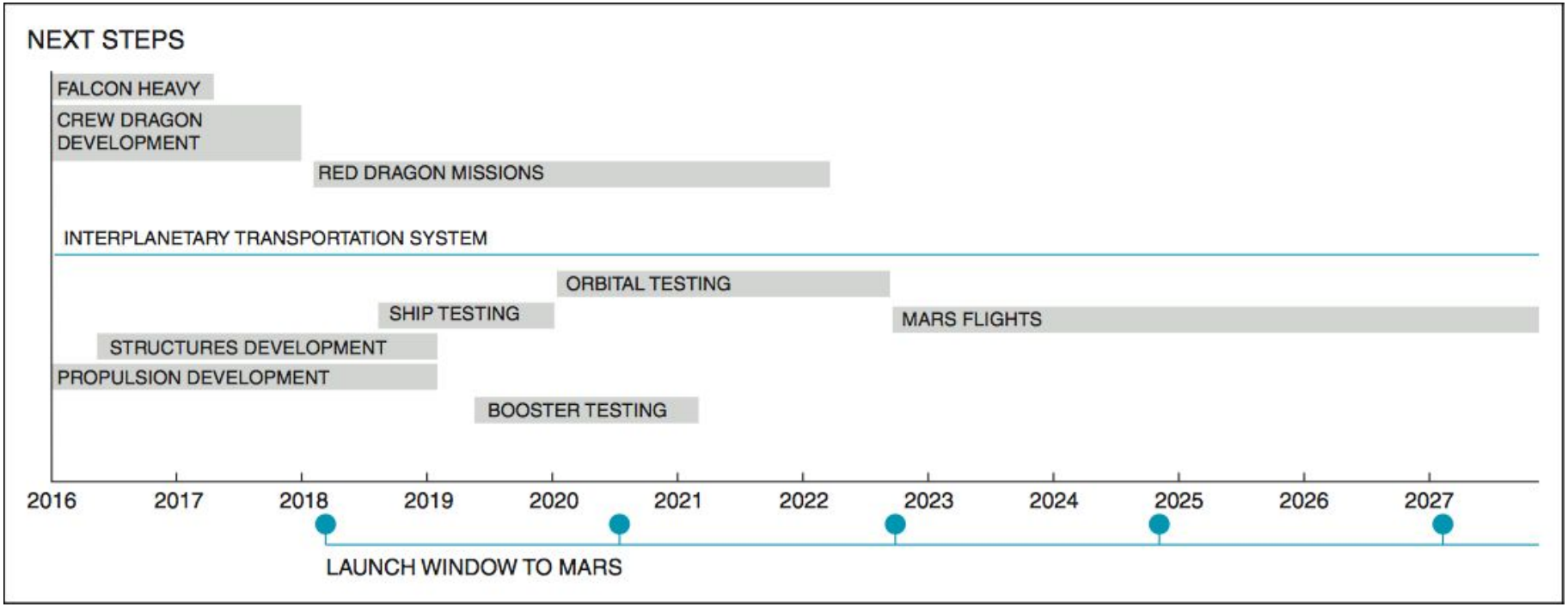
Trajectory

Elon Musk & SpaceX



“We are building the first ship, the first Mars or interplanetary ship (BFR Rocket), right now. I think we’ll be able to do short flights, short up and down flights, sometime in the first half of next year (2019).” - Elon Musk

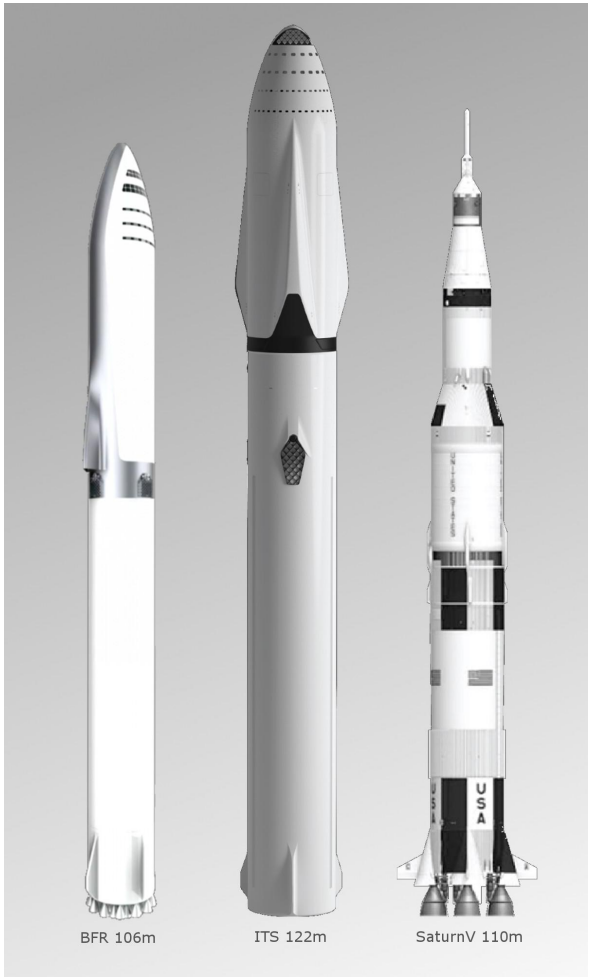
Current SpaceX Timeline



Interplanetary Rockets

Current & Past Mars Mission Compatible:
- NASA Saturn V at $1.16 Billion per launch
- SpaceX Falcon Heavy at $90 Million per launch

Promising Future Mars Mission Compatible
- SpaceX BFR at $34 Million per launch
- SpaceX ITS at $43 Million per launch
- Blue Origin New Glenn (pricing uncertain)

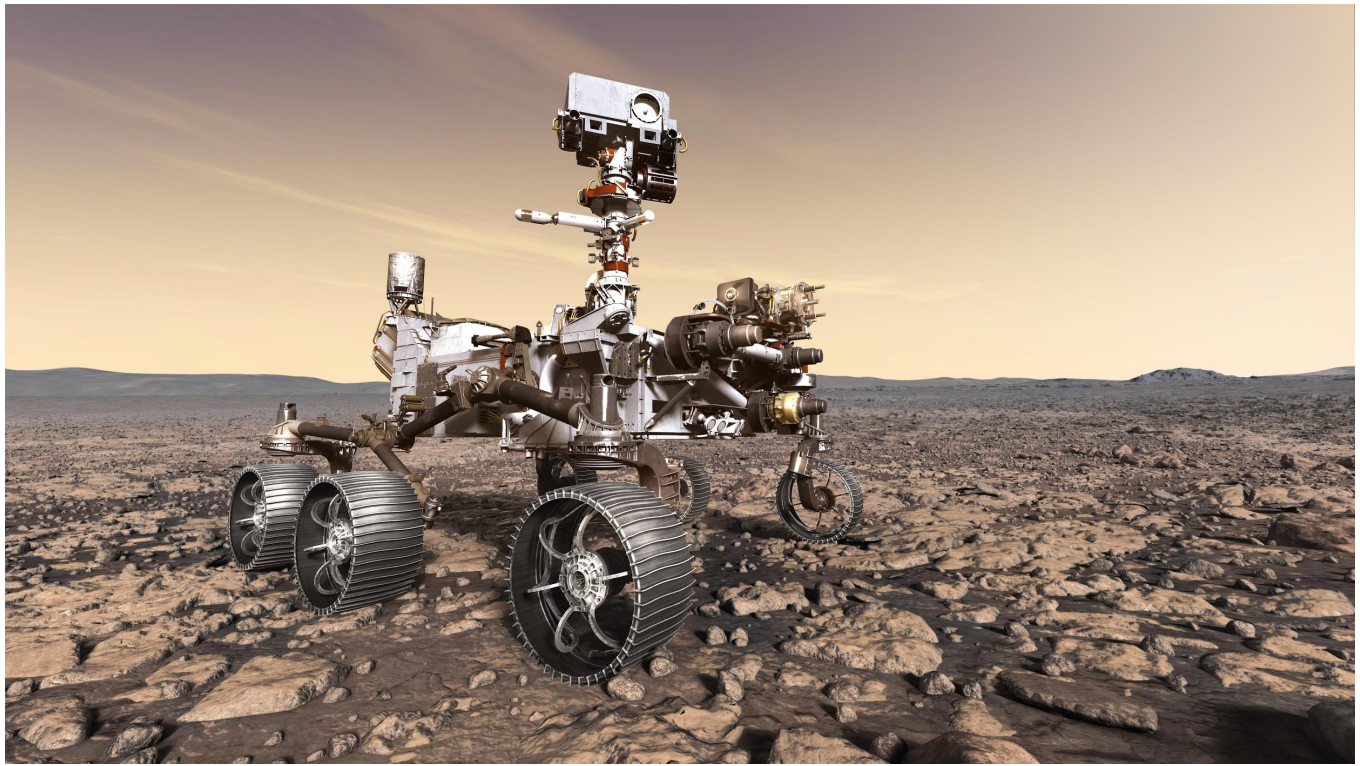


Mars One

Is a company looking to use current technology to stage privatized missions to Mars.

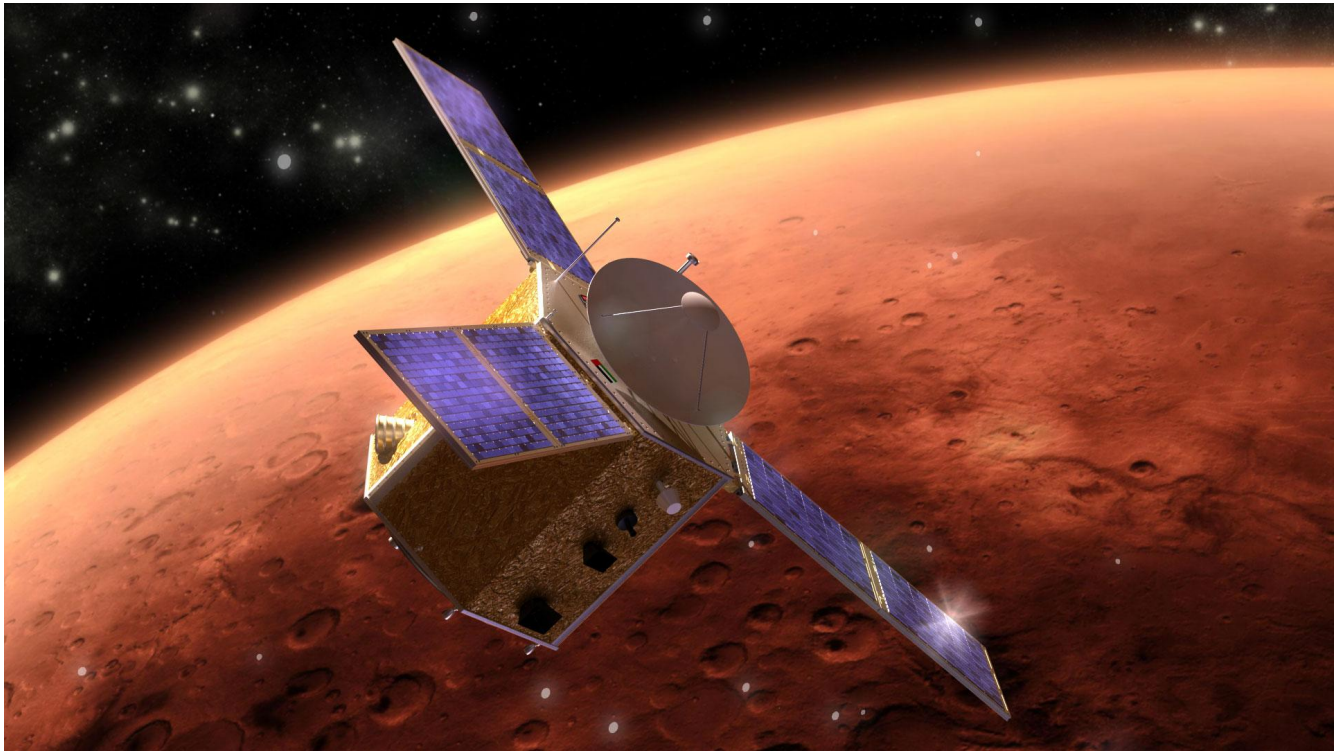
NASA

Is primarily working to further research into Mars & deep space for discovery and technological development.



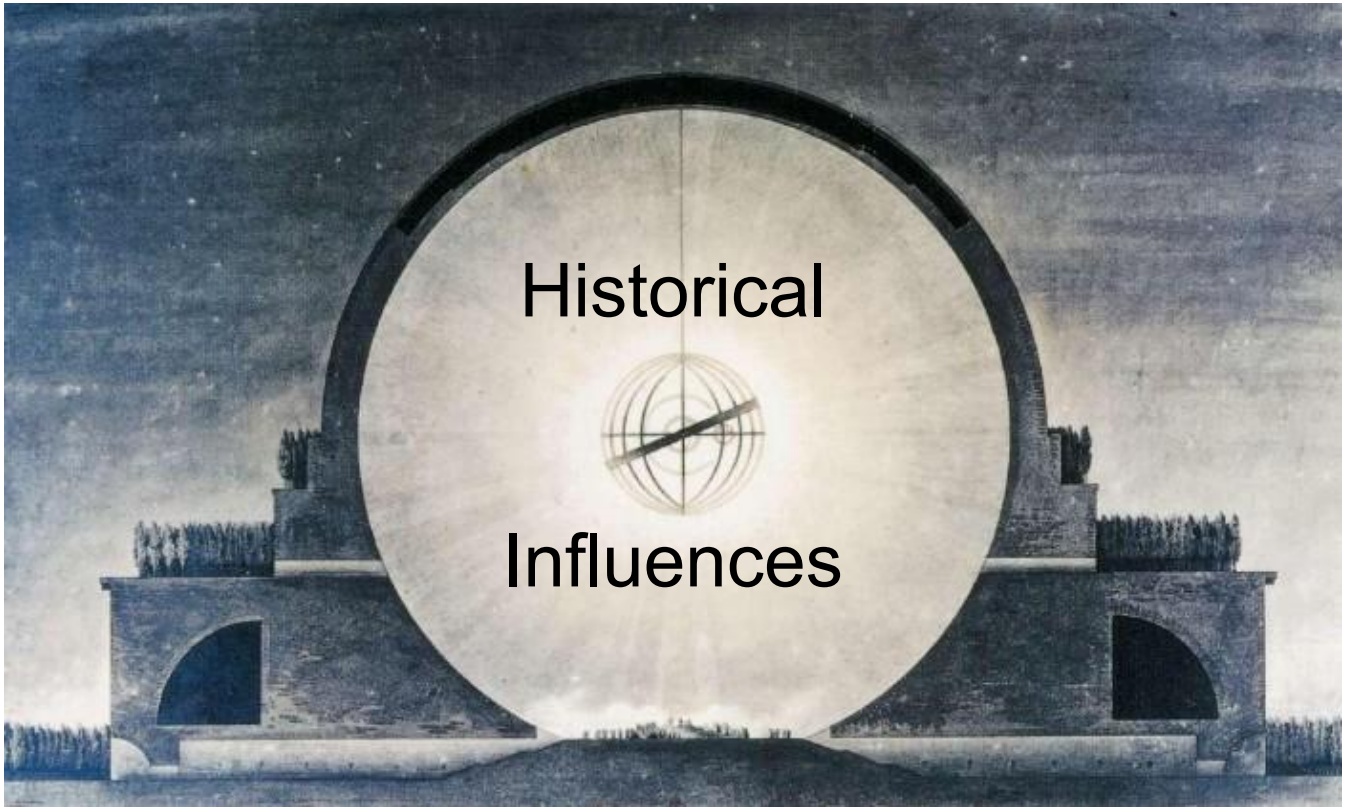
UAE

The United Arab Emirates, is currently working on a 100 year migration plan & simulations, with a leisurely timeline

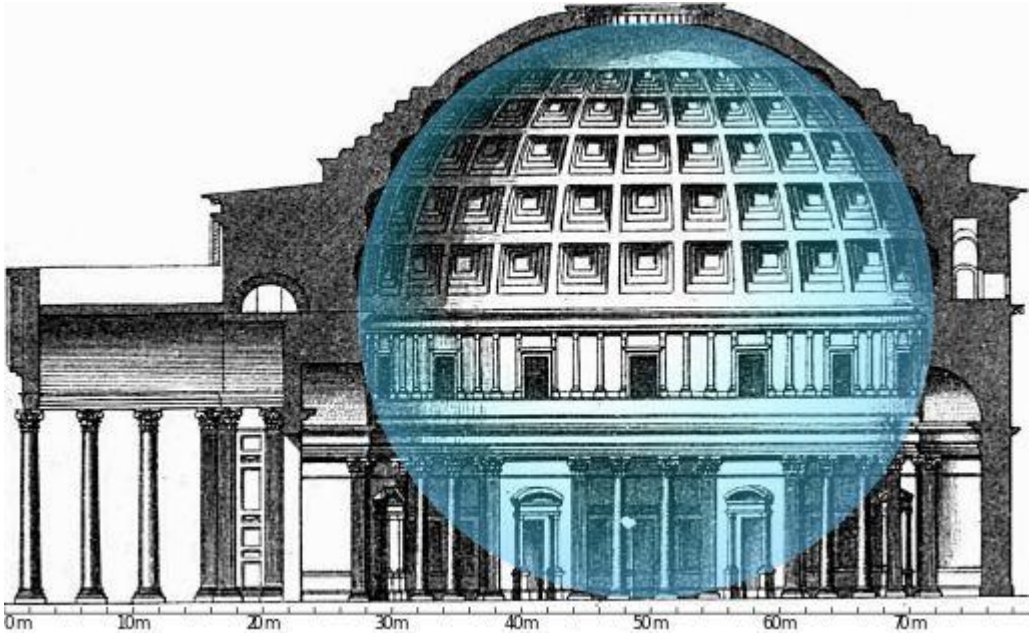


Relativity

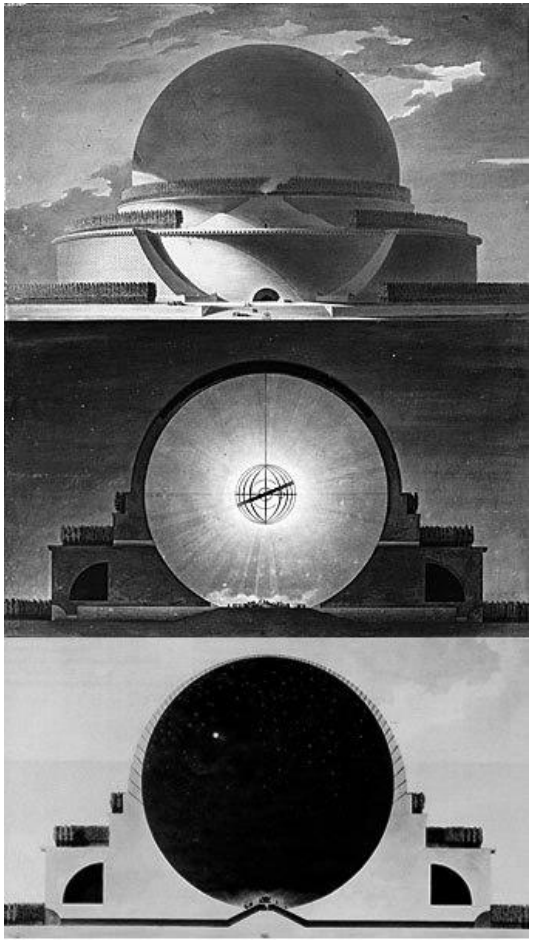
Relativity Space is an innovative startup working to develop factories to entirely 3D print Rockets for various companies


Historical
Influences

Cosmology & The Sphere

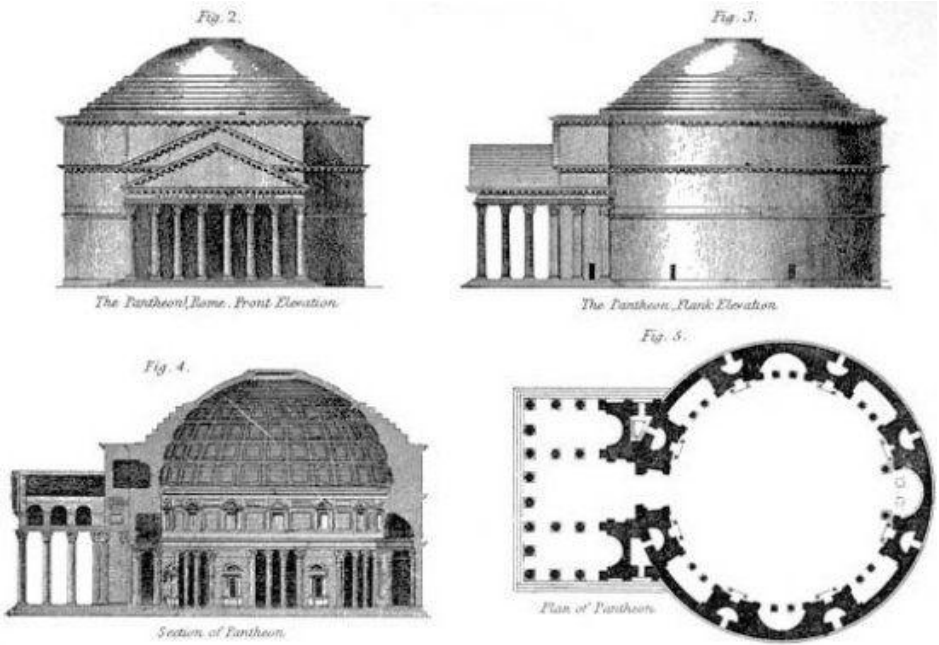


Pantheon of ancient Rome.

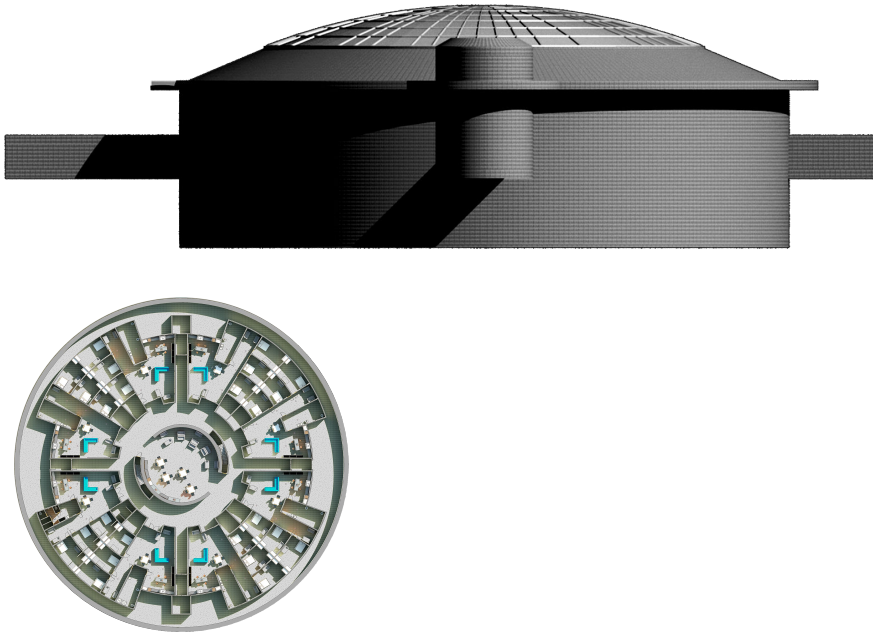


Cénotaphe à Newton Design By Étienne-Louis Boullée

Comparison to Pantheon aesthetic



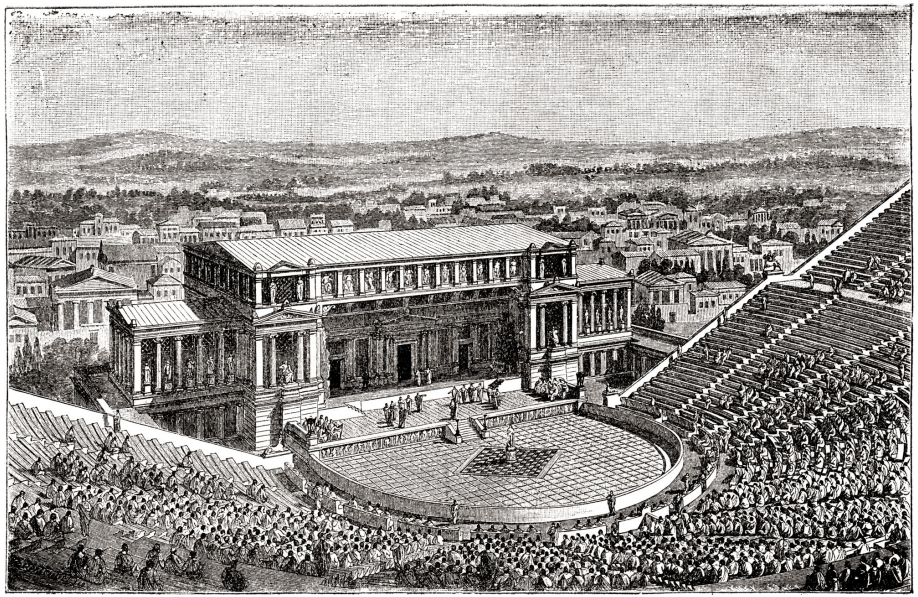
Pantheon Plan, Section, & Elevations



Mars Design Plan & Elevation

Amphitheater Design Influence

Theatre of Dionysus in Athens

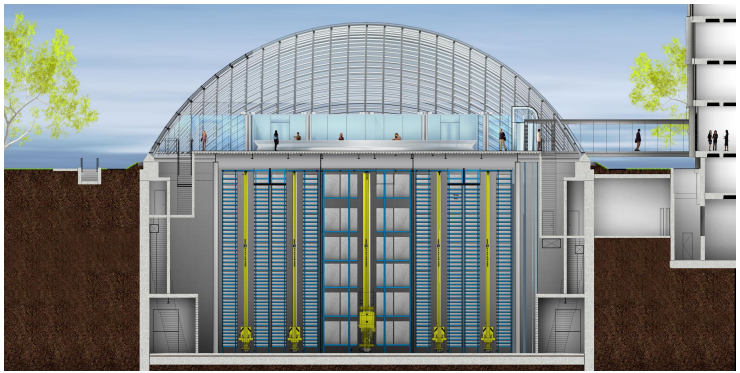


Conrad Prebys Amphitheater at Indiana University

Dome Design Influence

Reichstag, Berlin

Pantheon, Rome

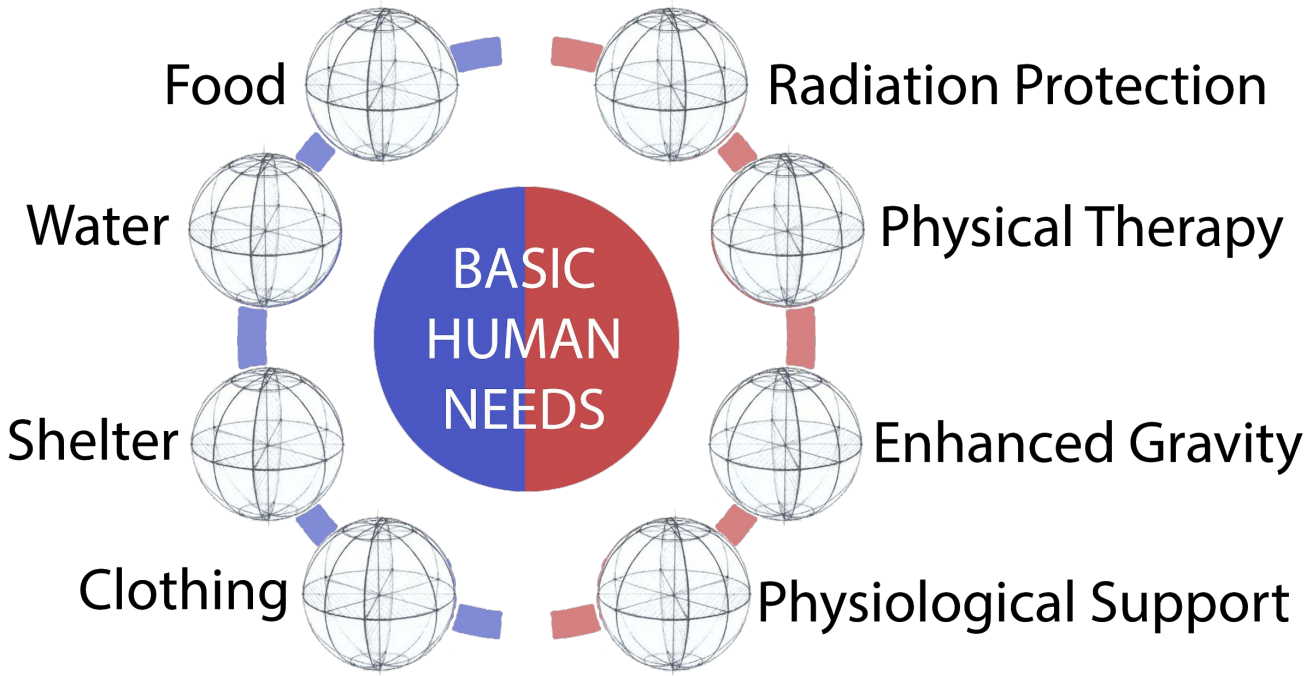


Library, University of Chicago

1781, Project Design for The Paris Opera

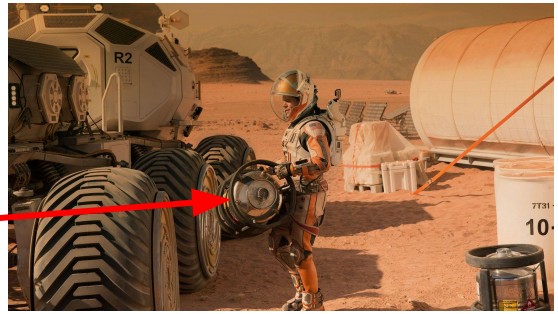
Necessities for Life on Mars

Necessities for longevity on Earth

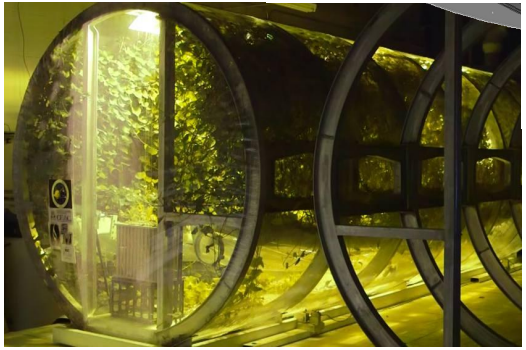


Total necessities for longevity on Mars

Oxygen, Food, & Water



Electrolysis Oxygen Production



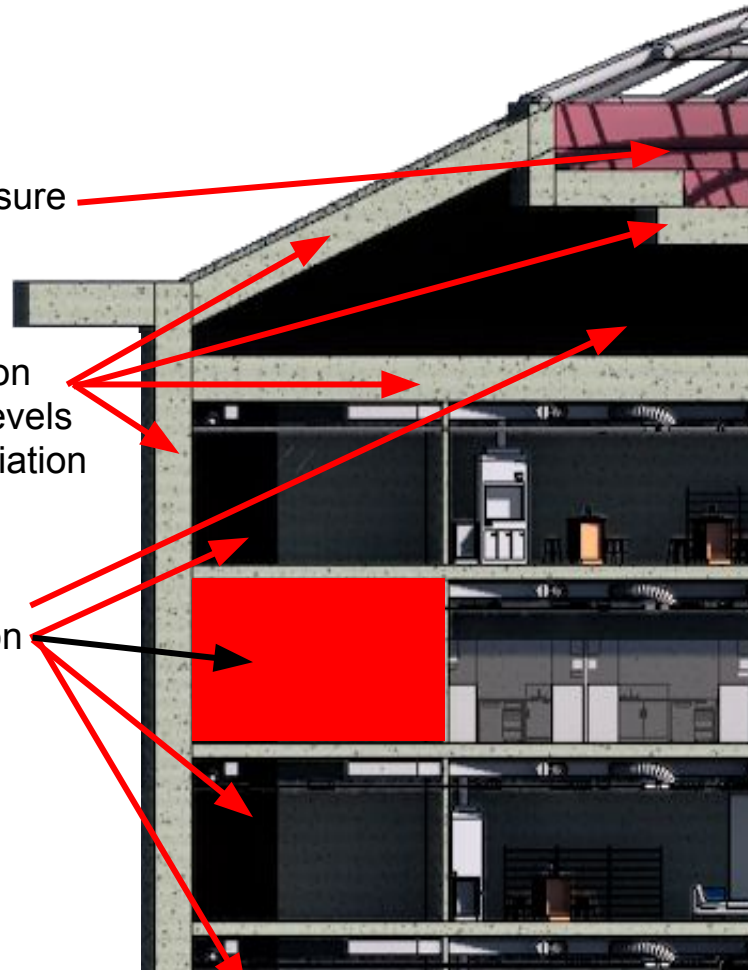
Water Purification

Food Production

Environmental Shelter & Radiation Protection

Earth’s atmosphere protects life here organically, but on Mars we need to build protection.

Humans can allow for a maximum of 2 hours of exterior daylight radiation exposure, per day on Mars surface.



Gravity & Pressurization

Gravity: 100%

1 Moon, & Many Satellites

Substantial Atmosphere

Mostly Oceanic Surface

Gravity: 38%

2 Moons, & 2 NASA Satellites

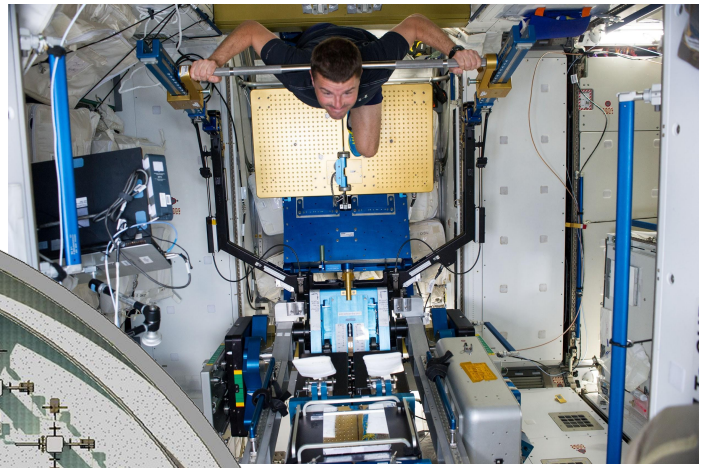
Weak Atmosphere

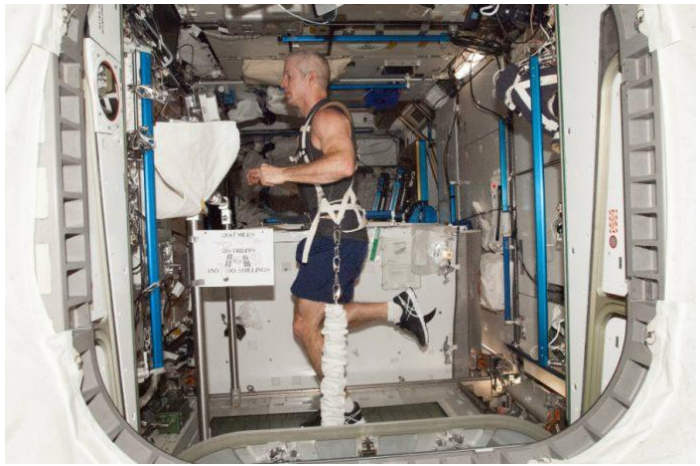
Little Flowing Water & Ice

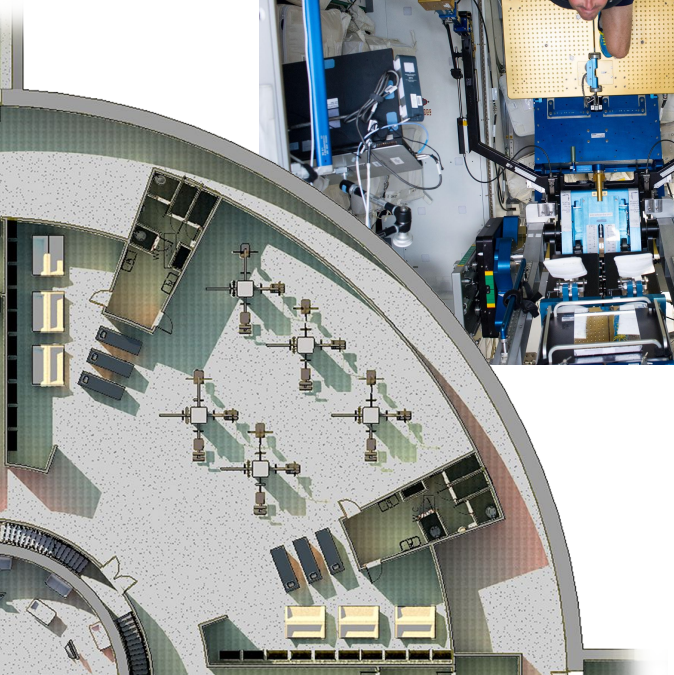
Avg Temp: -67 F

Temp High: 68 F

Physical Therapy & Tissue Regeneration





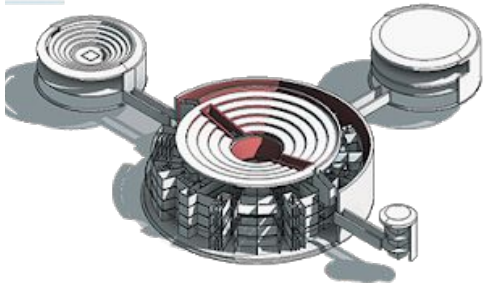


Physical Therapy Plan

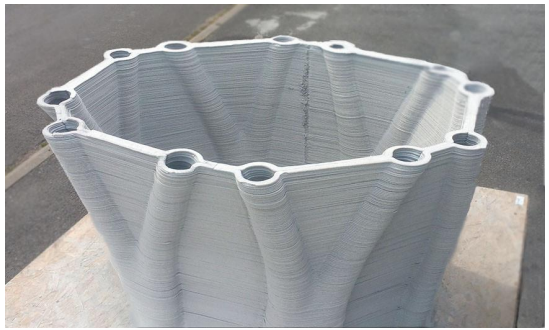
Physiological & Psychological Support

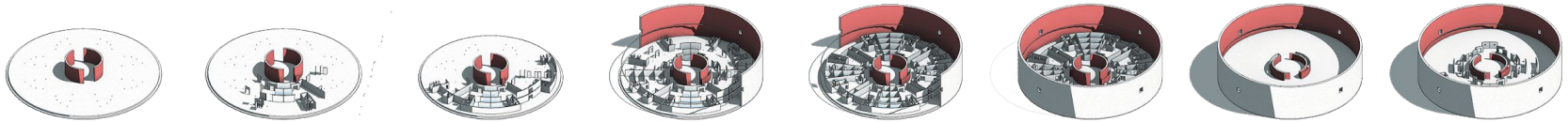
Medical Facility Plan

Construction Process



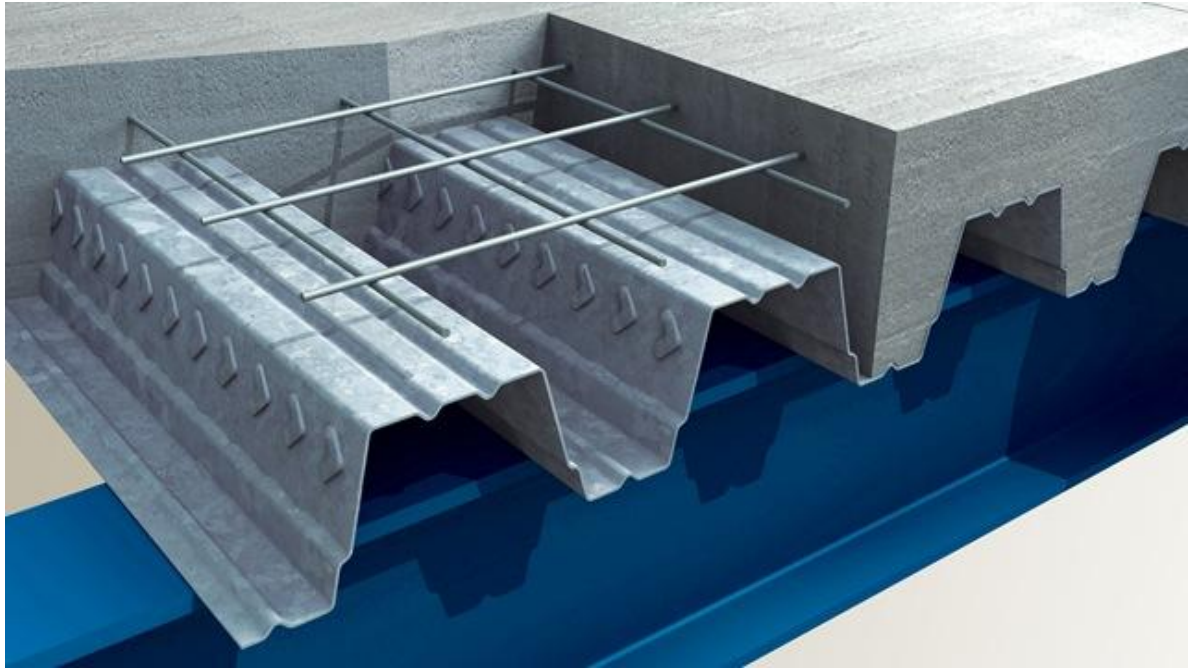
3D Printed Concrete Construction



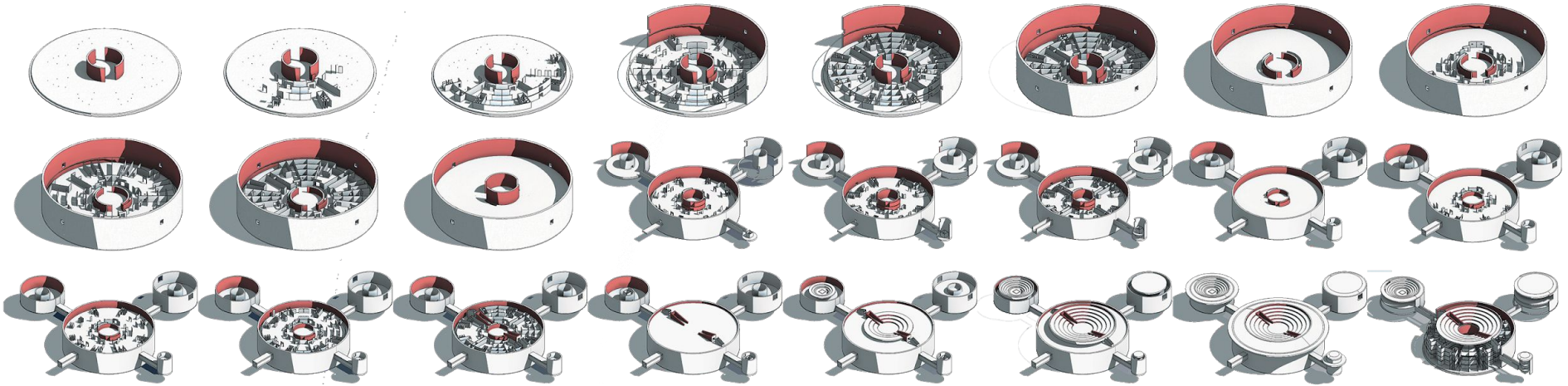


Steel Alloys & Minimal Material Design

Steel Decking / Concrete Composite Flooring (3D Printed Concrete)

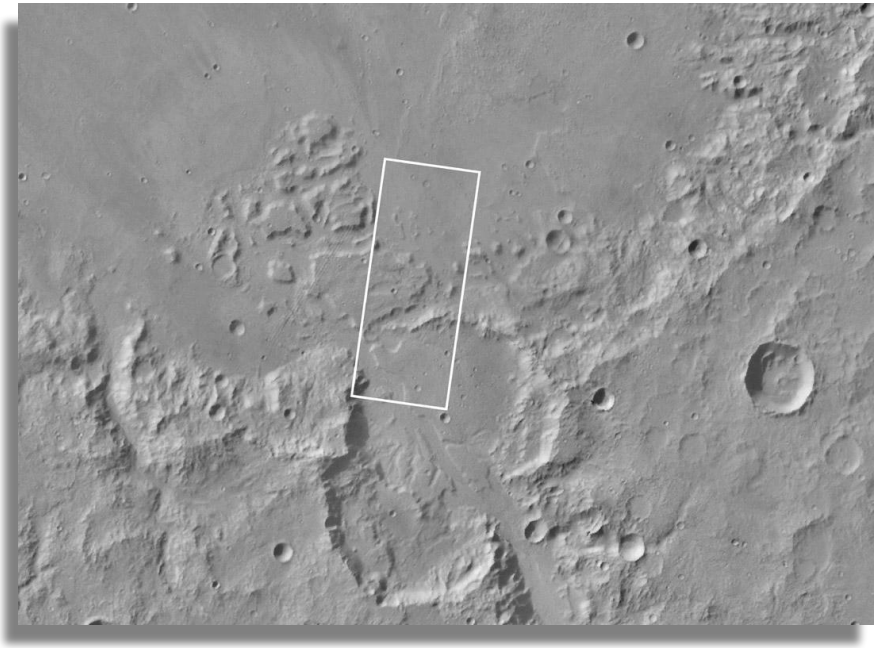


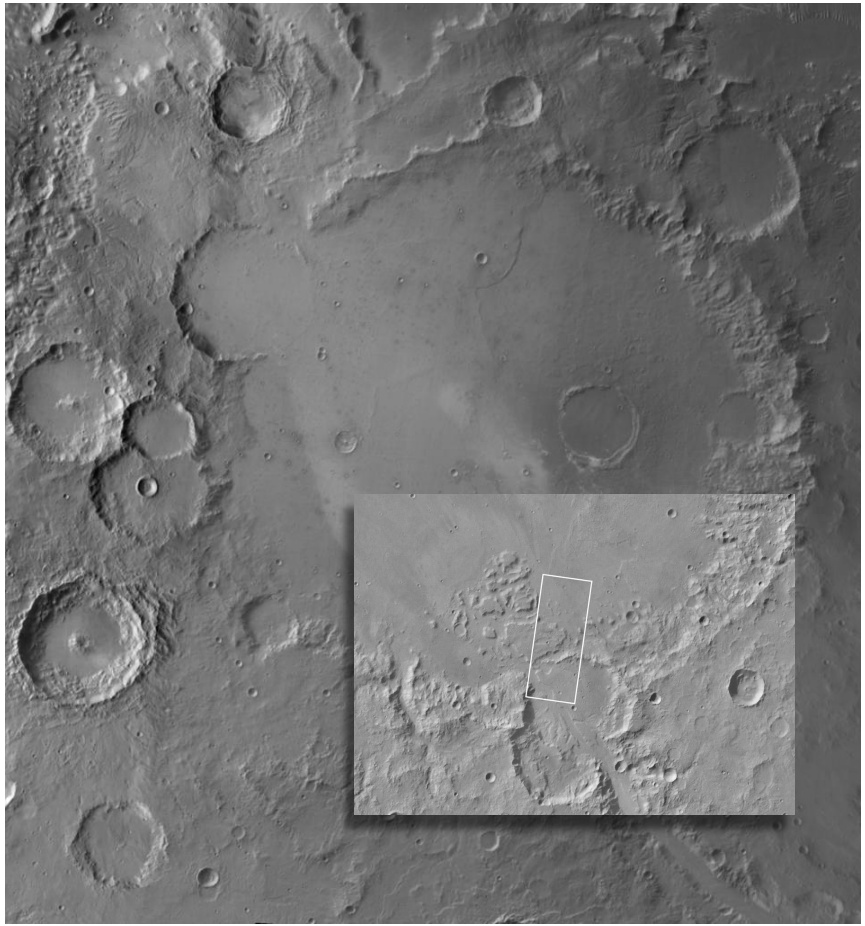
Construction Diagraming



Site: Gusev Crater

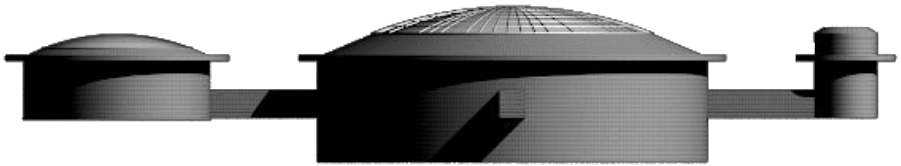
Site is replicable at any point along the Martian equatorial surface.



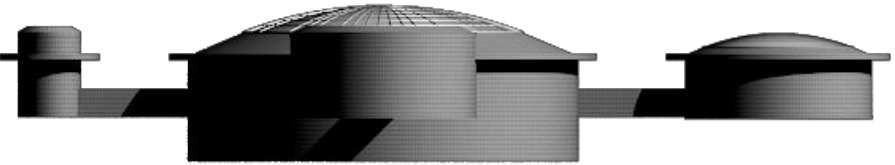


Building Design

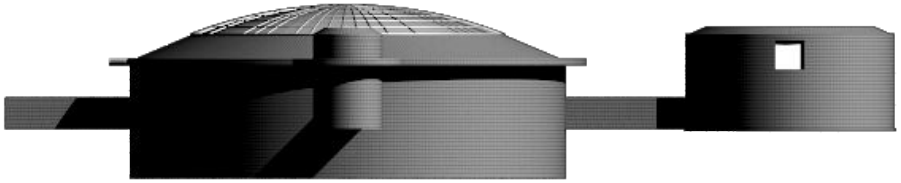
Southern Elevation



Western Elevation

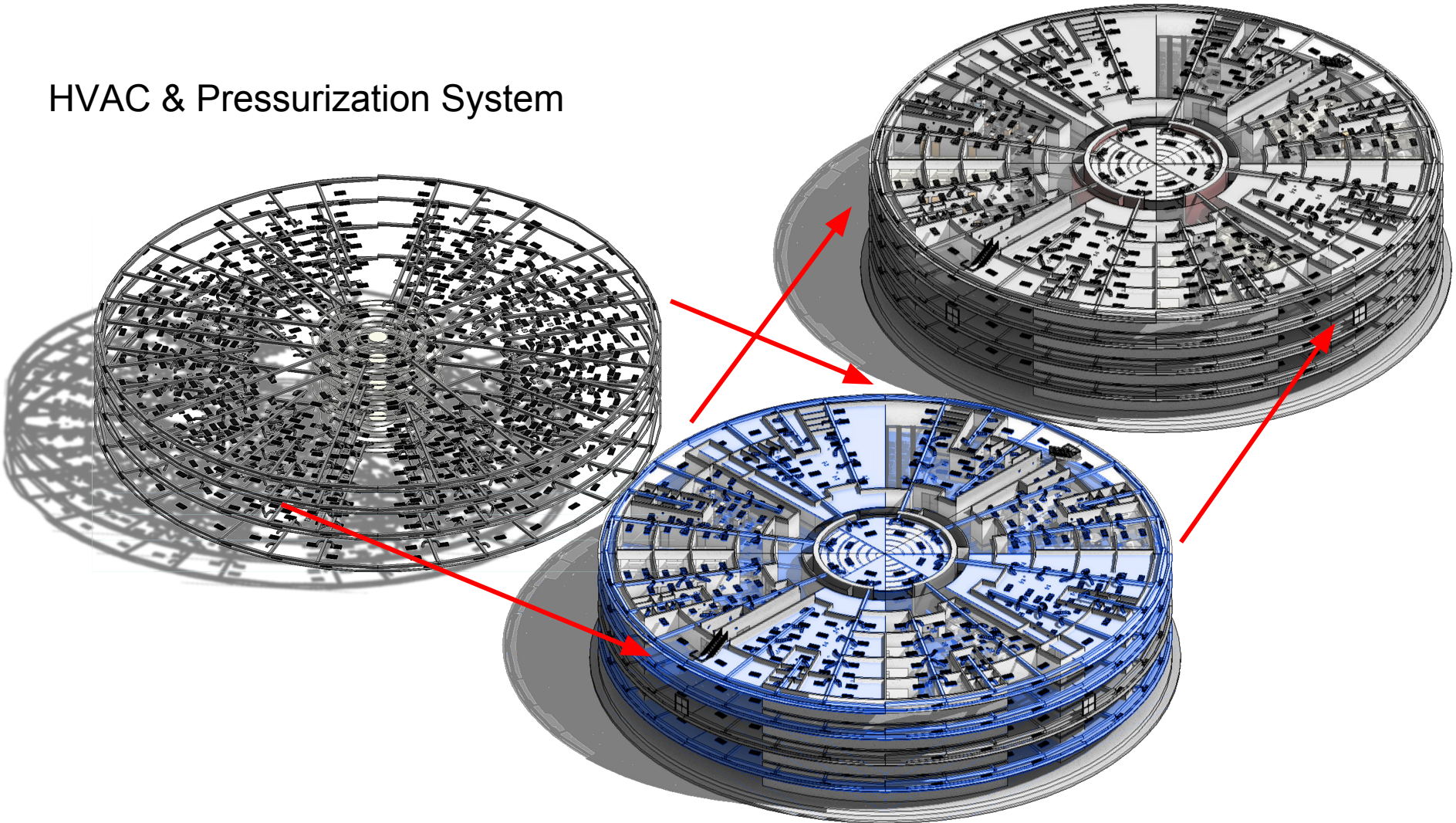


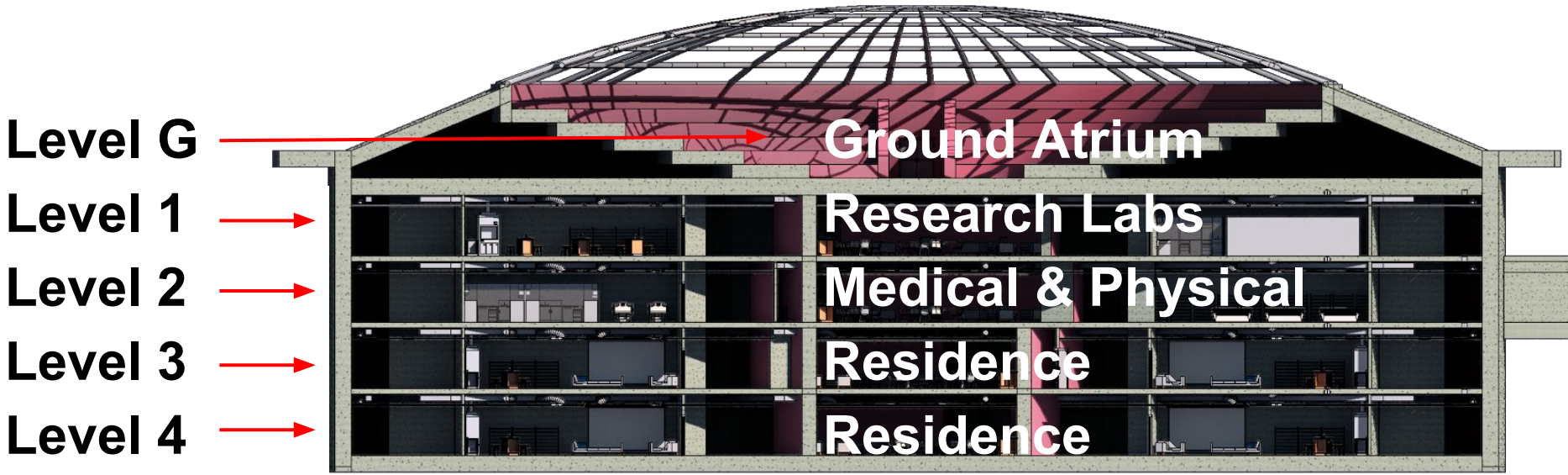
Northern Elevation



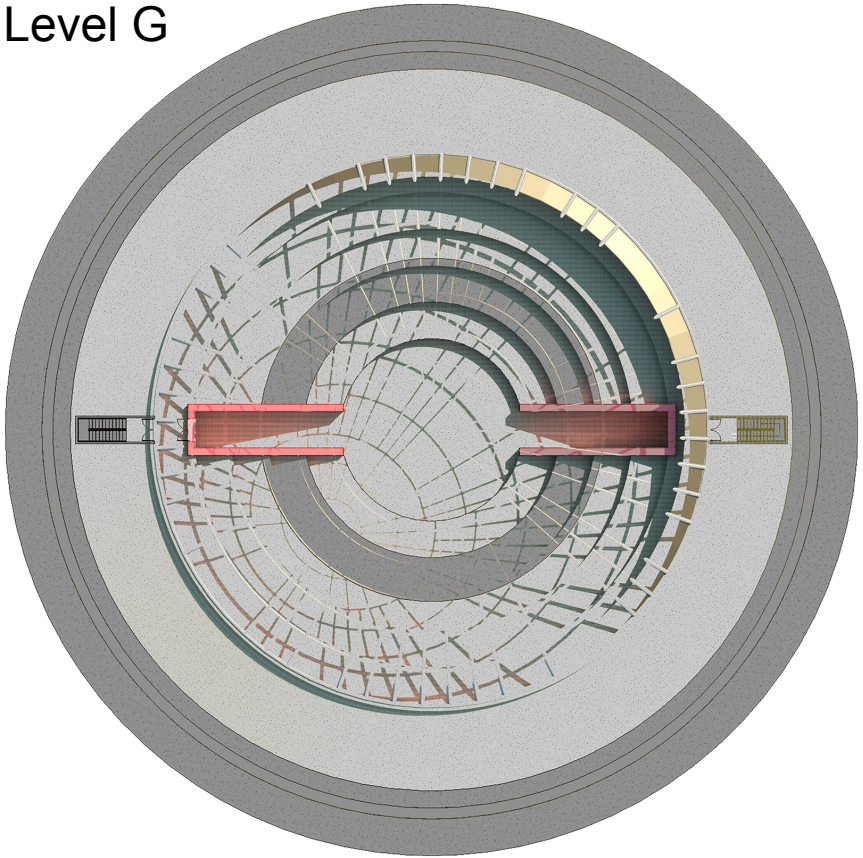
Eastern Elevation

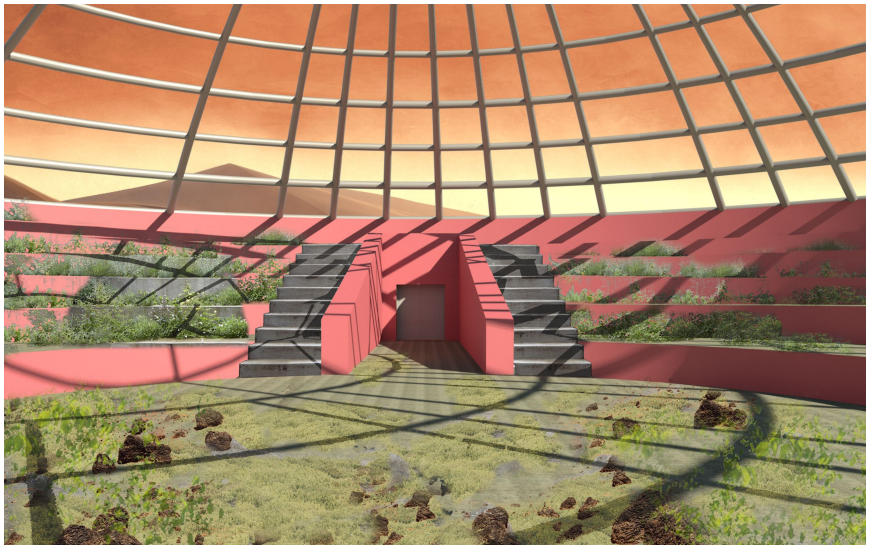
HVAC & Pressurization System




Level G
Level 1
Level 2
Level 3
Level 4
Ground Atrium
Research Labs
Medical & Physical
Residence
Residence

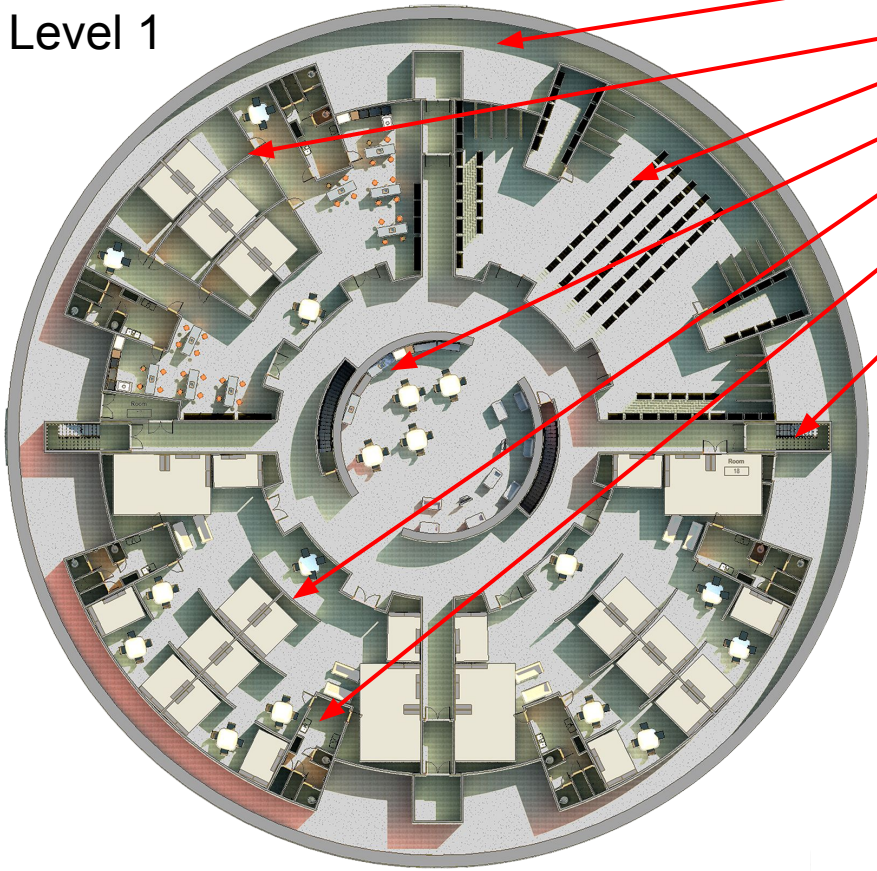
Level G



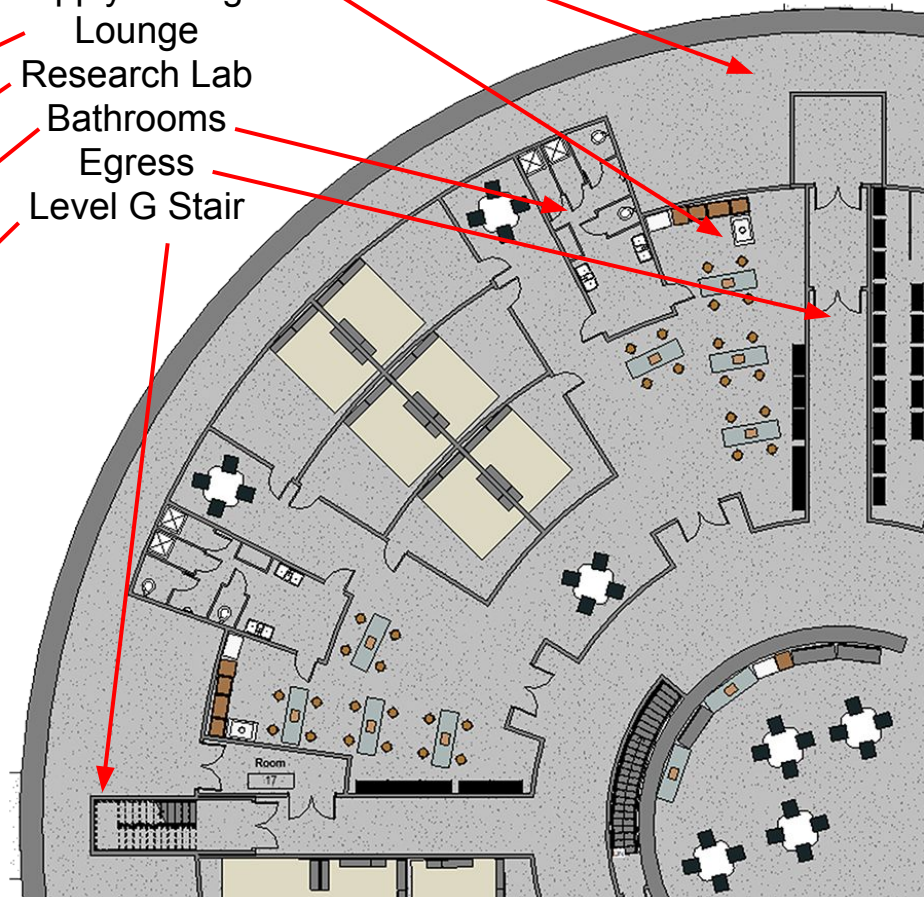


Ground Floor Atrium Space

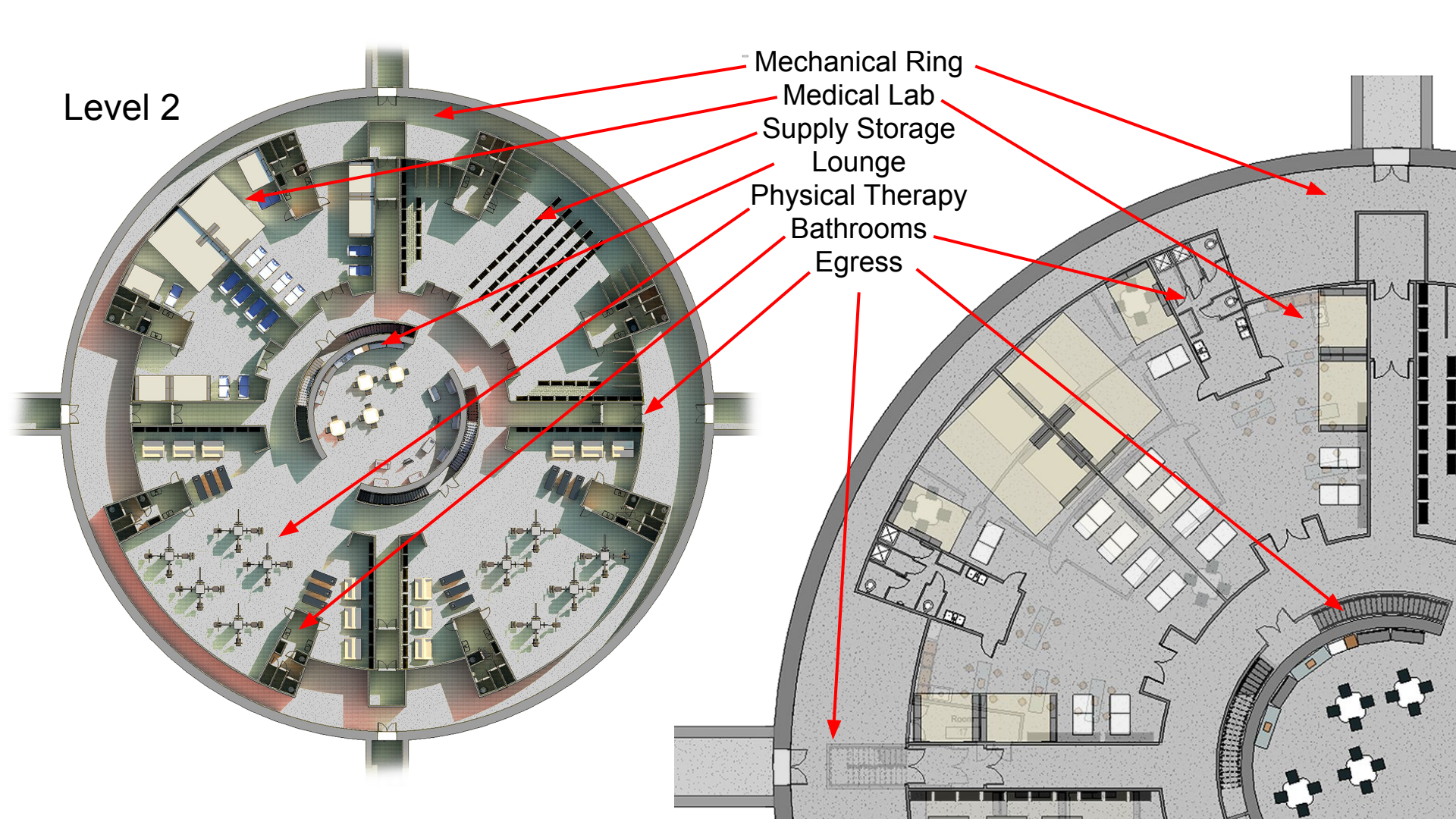
Level 1



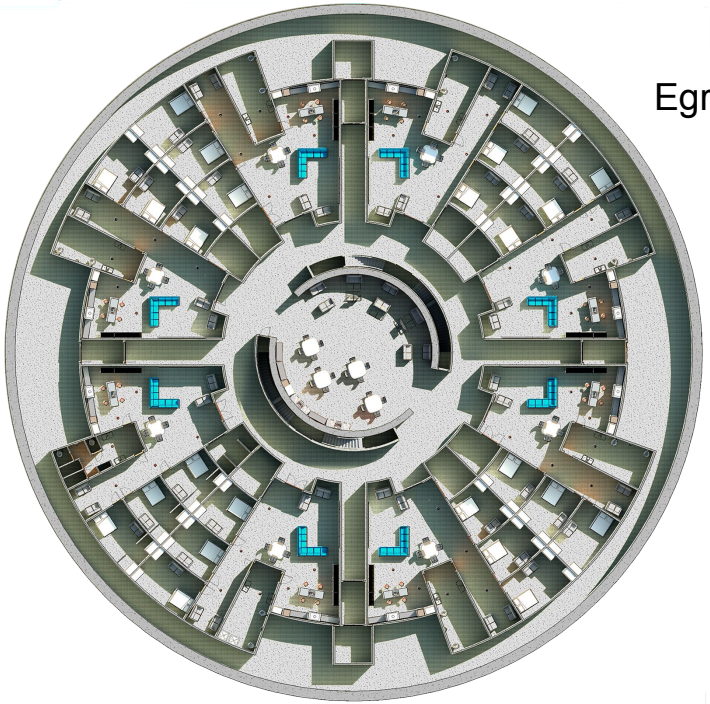
Mechanical Ring
Research Lab
Supply Storage
Lounge
Research Lab
Bathrooms
Egress
Level G Stair



Level 2


Mechanical Ring
Medical Lab
Supply Storage
Lounge
Physical Therapy
Bathrooms
Egress

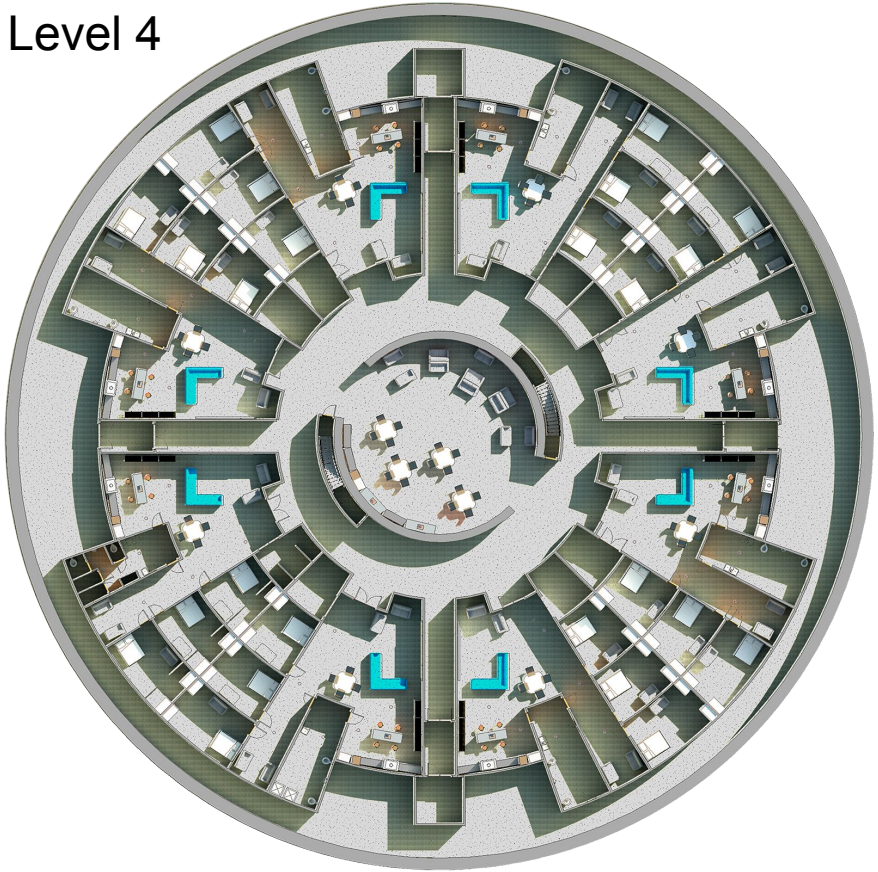
Level 3

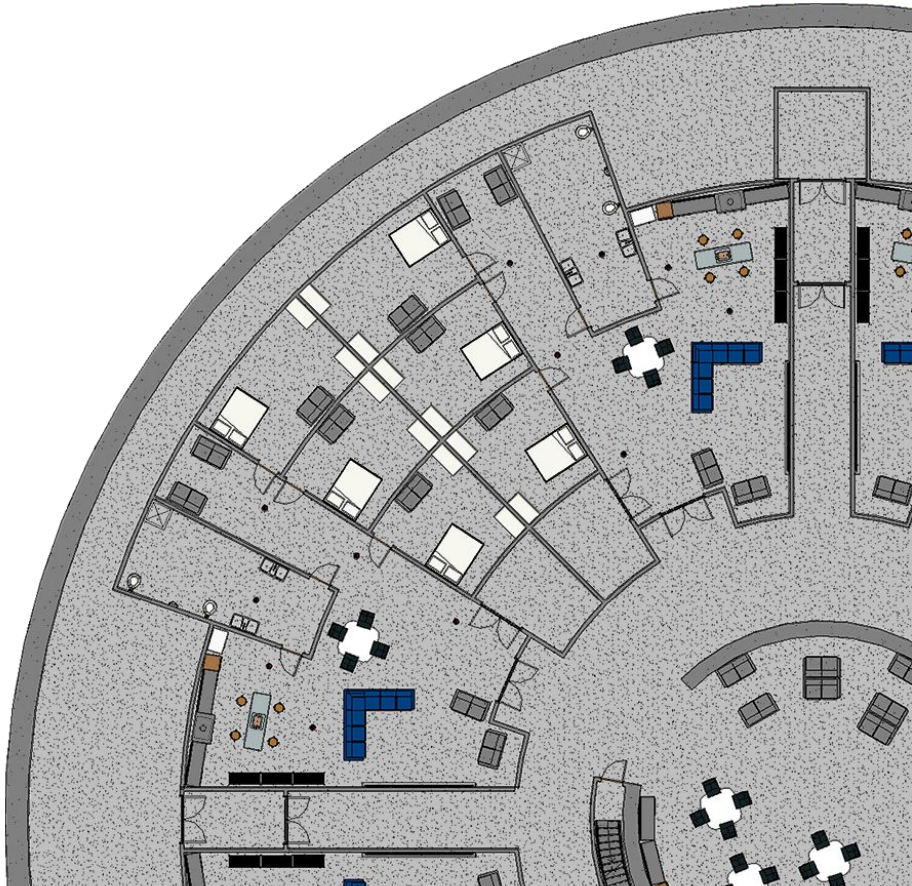


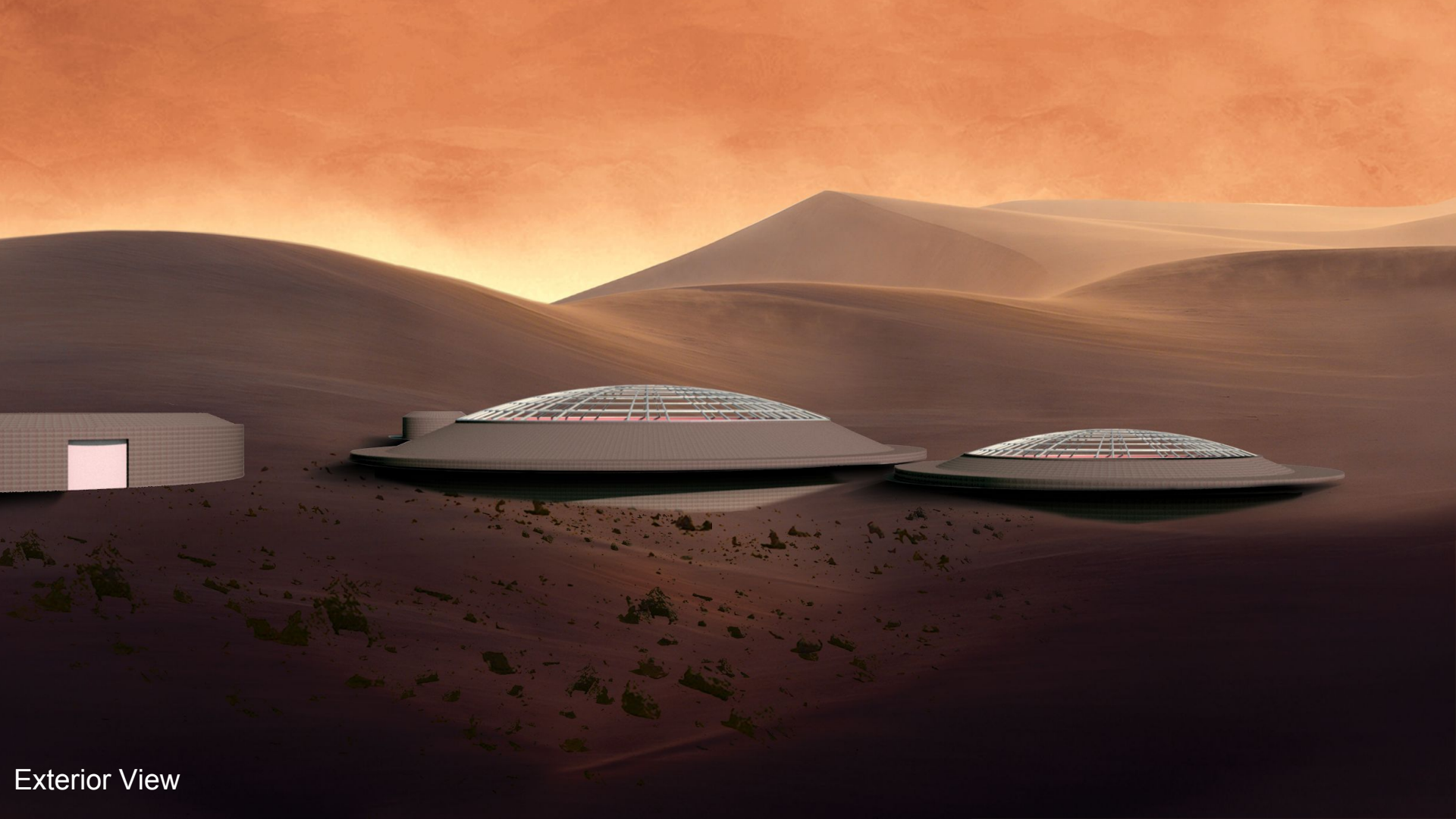
Mechanical Ring
Egress
Lounge
Residence
- Kitchen
- Living
- Bath
- Storage
- Rooms

Egress

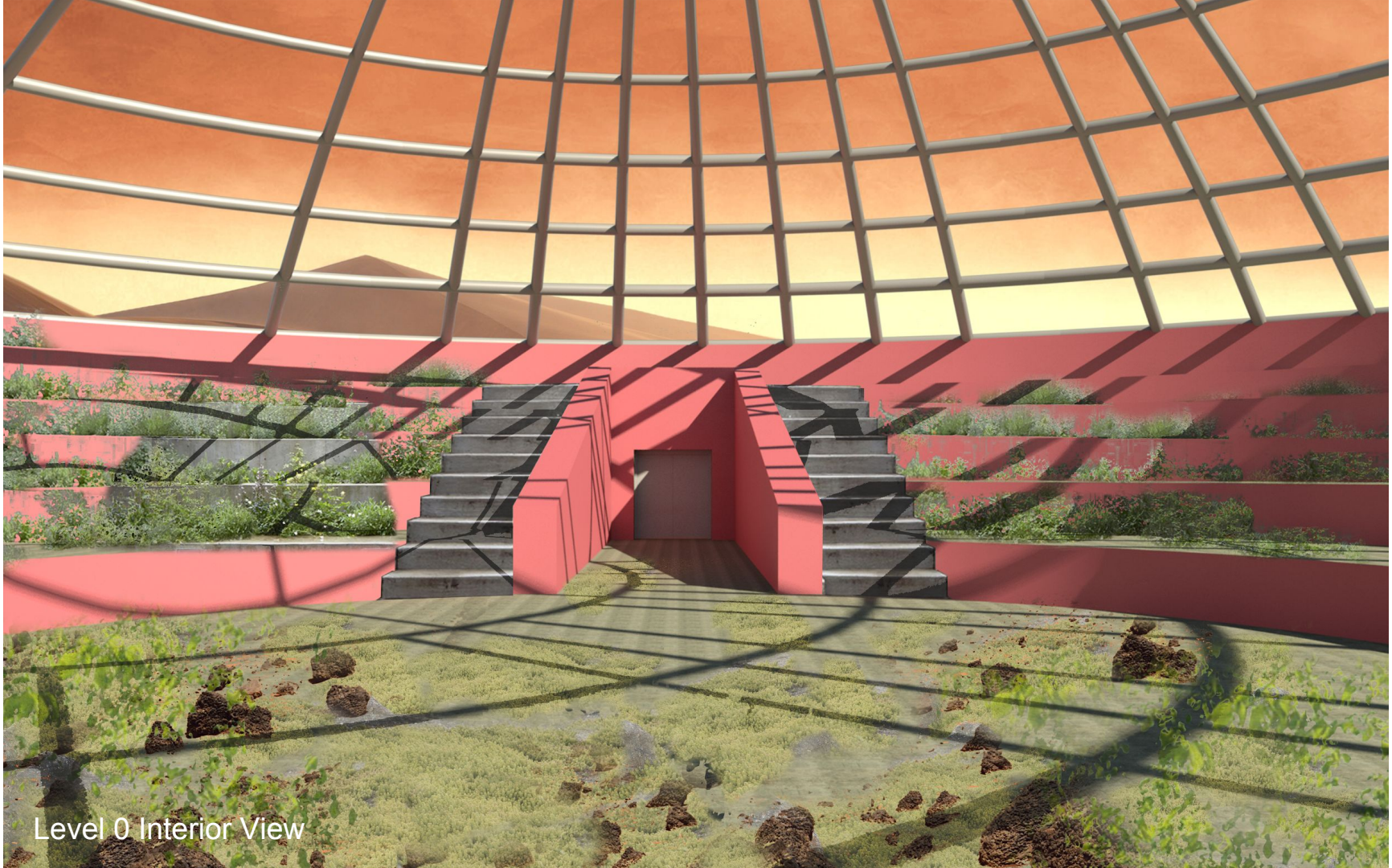
Level 4







Exterior View


Level 0 Interior View

Levels 3 & 4 Interior Residence

Levels 1-4 Interior Lounge