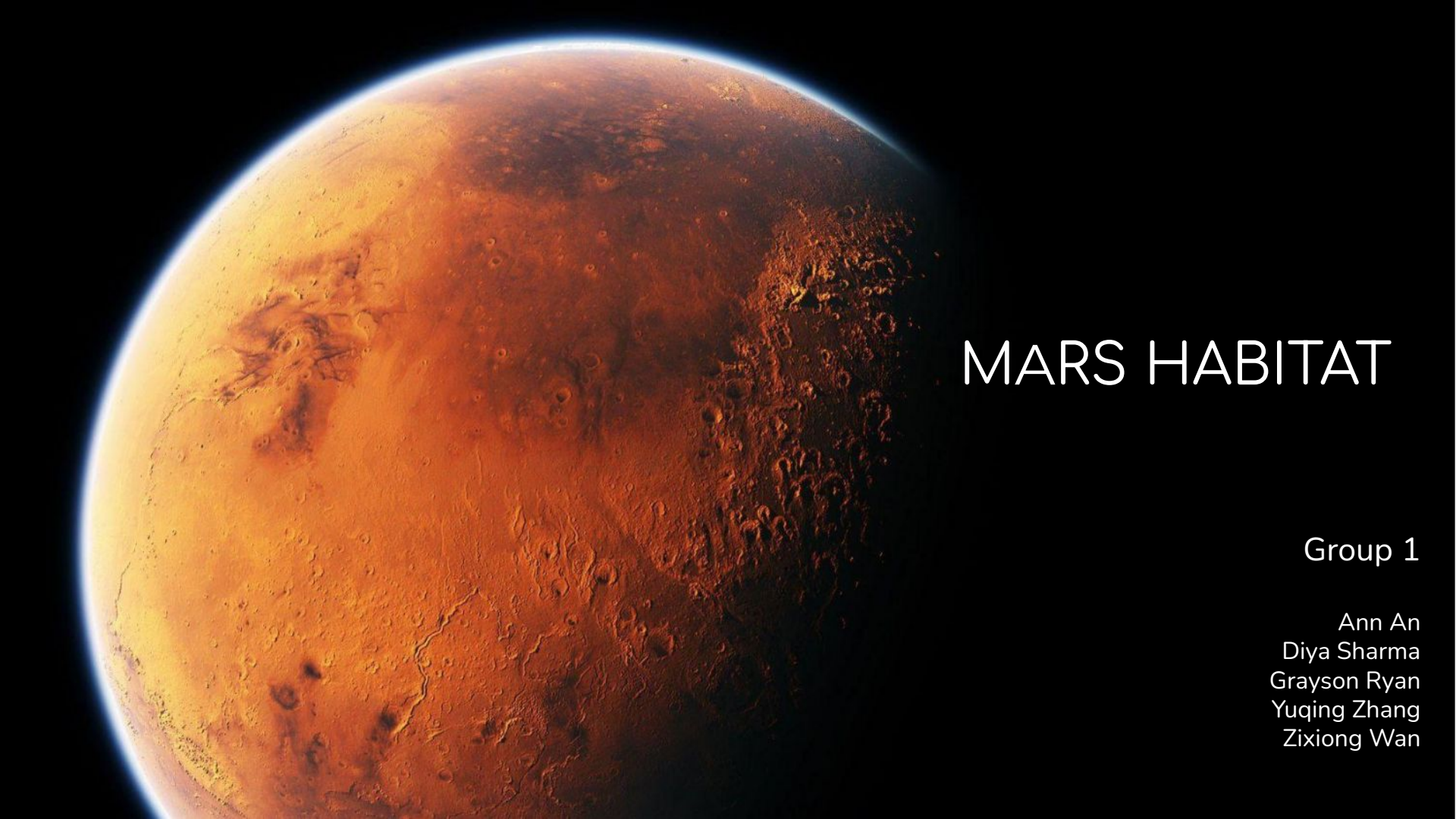


MARS HABITAT

Group 1

Ann An
Diya Sharma
Grayson Ryan
Yuqing Zhang
Zixiong Wan

LIVING CONDITIONS

Living Conditions on Mars

Gravity: 38% the Earth's

Temperature: -140~20°C

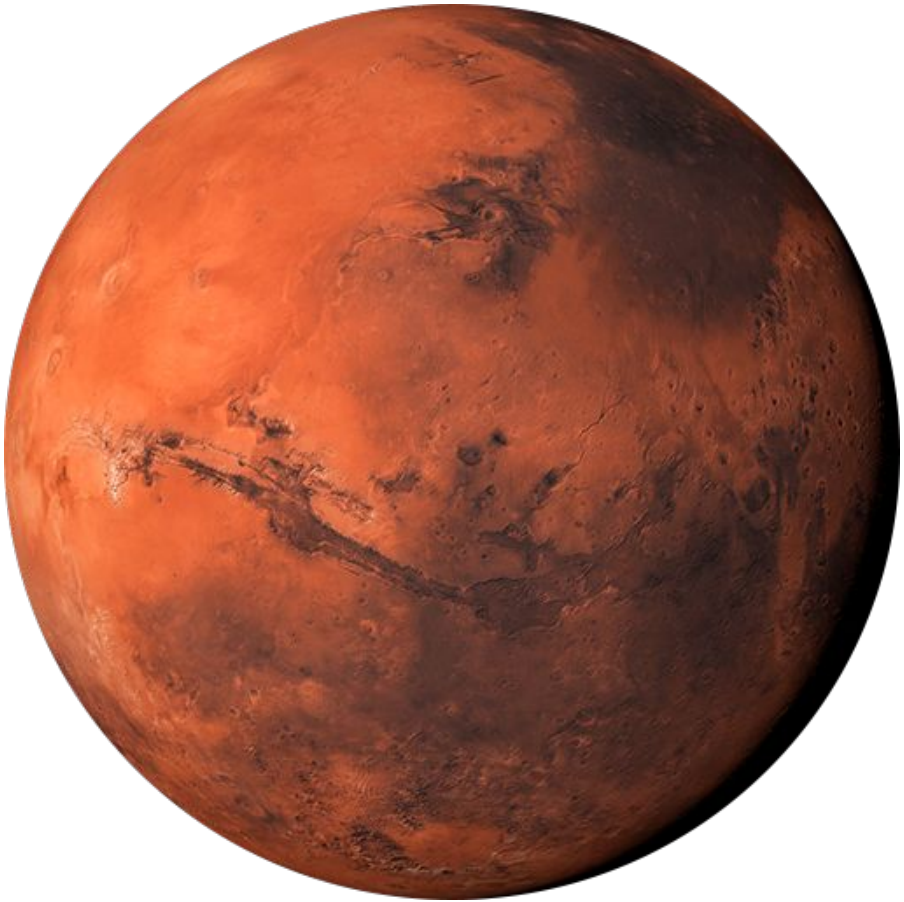
Sunlight: ~50% the Earth's

Pressure: 600 Pa, 0.6% the Earth's

Atmosphere: 95% CO_2

Winds: >110km/h

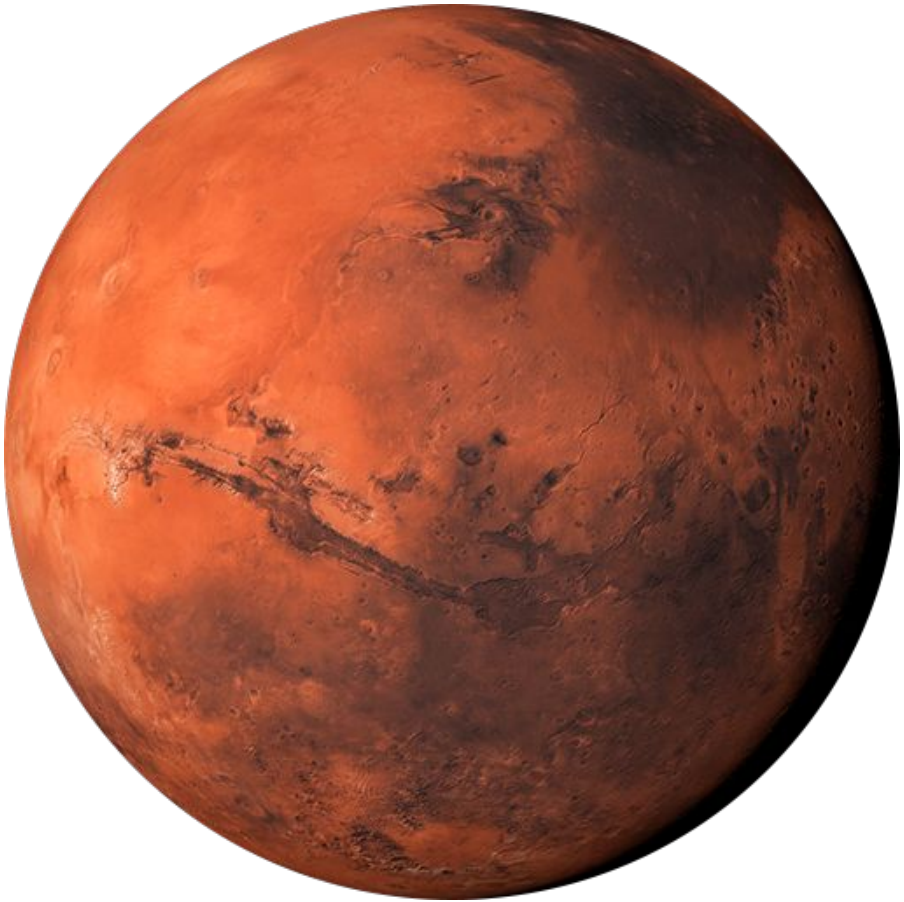
Geology: Silicon, oxygen, metals ...



Mars surface temperatures vary from lows of about −143 °C (at the winter polar caps) to highs of up to 35 °C (in equatorial summer).
We considered designing the habitat to the equatorial zone.

As the lower gravity on Mars allows larger differences in elevation than on Earth, the pressure can be quite different in lower and higher areas.

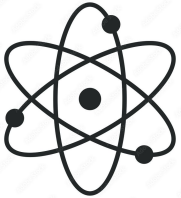
Mars also lacks the magnetosphere that protects Earth. The average natural radiation level on Mars is about 40-50 times the average on Earth.
Habitats are to be equipped with radiation shielding, therefore best protection may be achieved with shelter built in natural caves or set into cliffs or hillsides.



CONCEPT

Energy Requirements

Solar energy



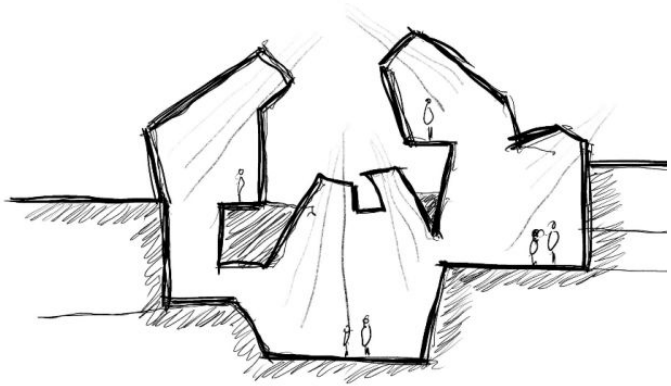
Nuclear energy

Wind energy

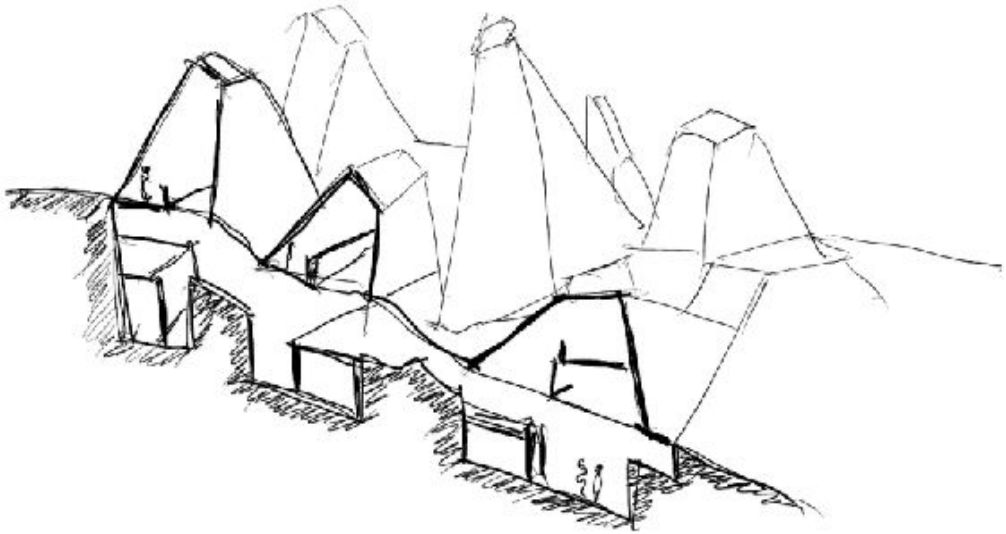
Geothermal energy

Our habitat will primarily use Solar energy and nuclear energy.

Initial concept



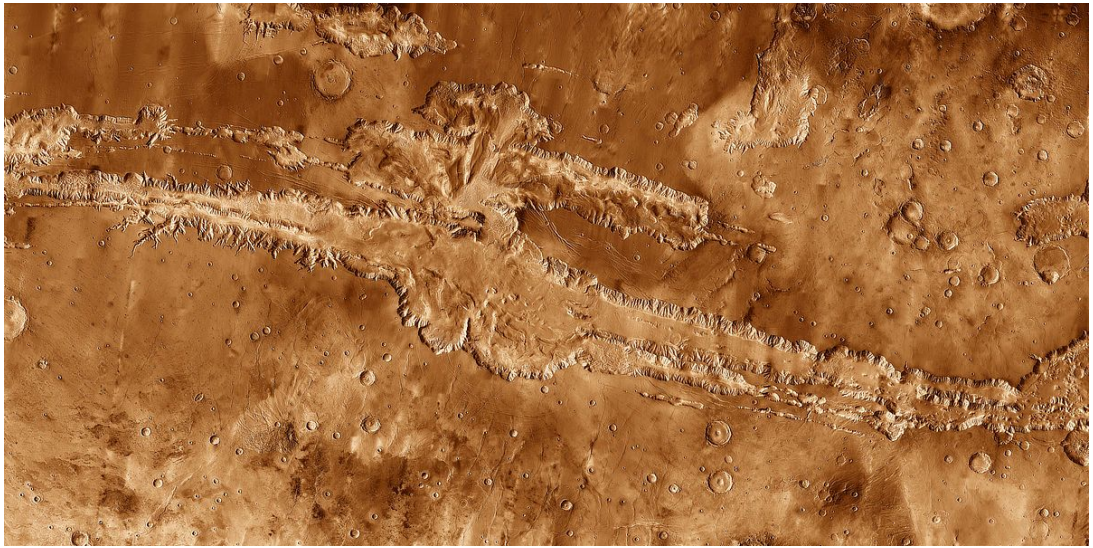
In initial design concept developed from connecting central common spaces with other units together.

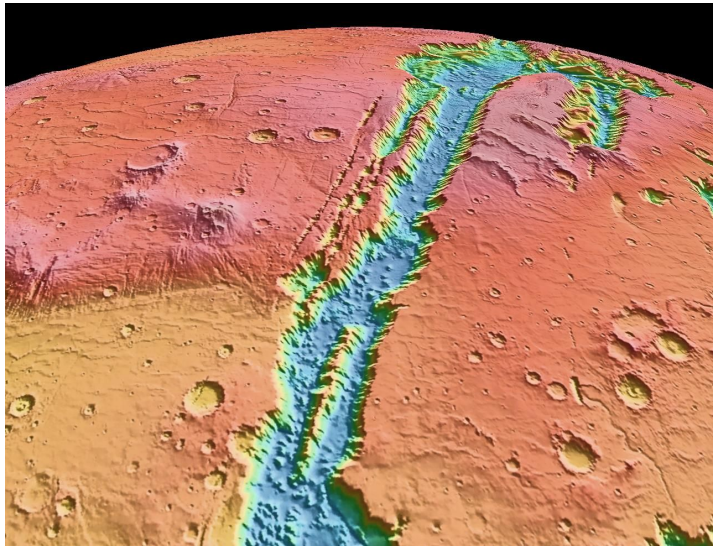


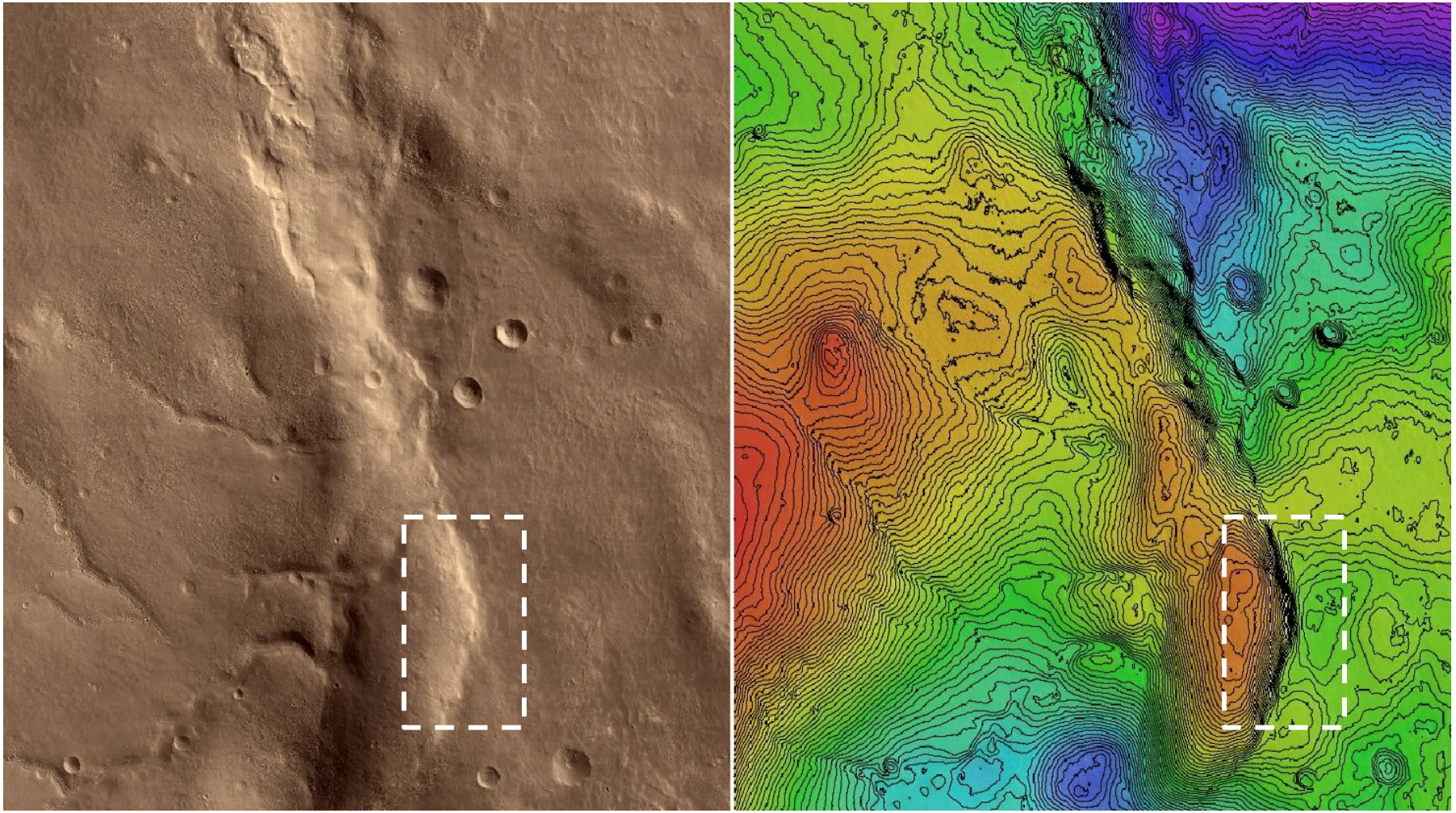
SITE ANALYSIS

Design in the Cracks

Valles Marineris stretches over 4,000 km (2,500 mi) across Mars, mostly east-west just below the equator, as seen in this Viking 1 orbiter image mosaic. The three Tharsis Montes are at left; towards the top, an ancient outflow channel stretches northward from Echus Chasma to Kasei Valles. Similar outflow channels extend from the east end of Valles Marineris towards Mars's northern lowlands.

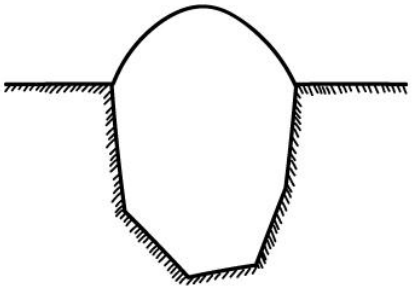




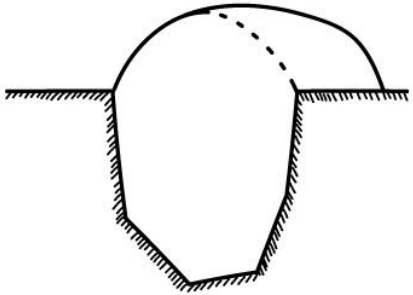


DESIGN DEVELOPMENT

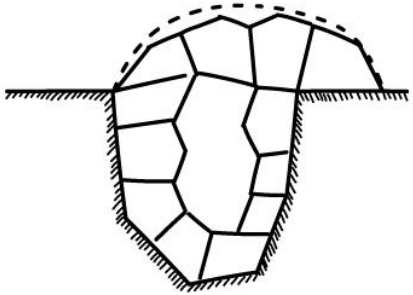
Composition of Blocks



We chose natural cracks as a site.

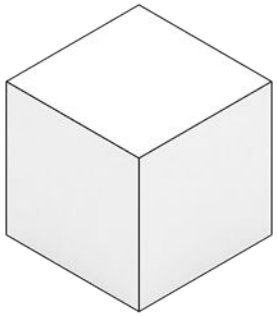


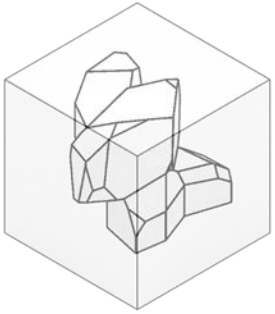
We placed the entrance at ground level.

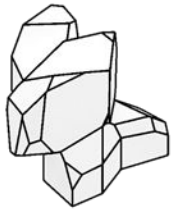


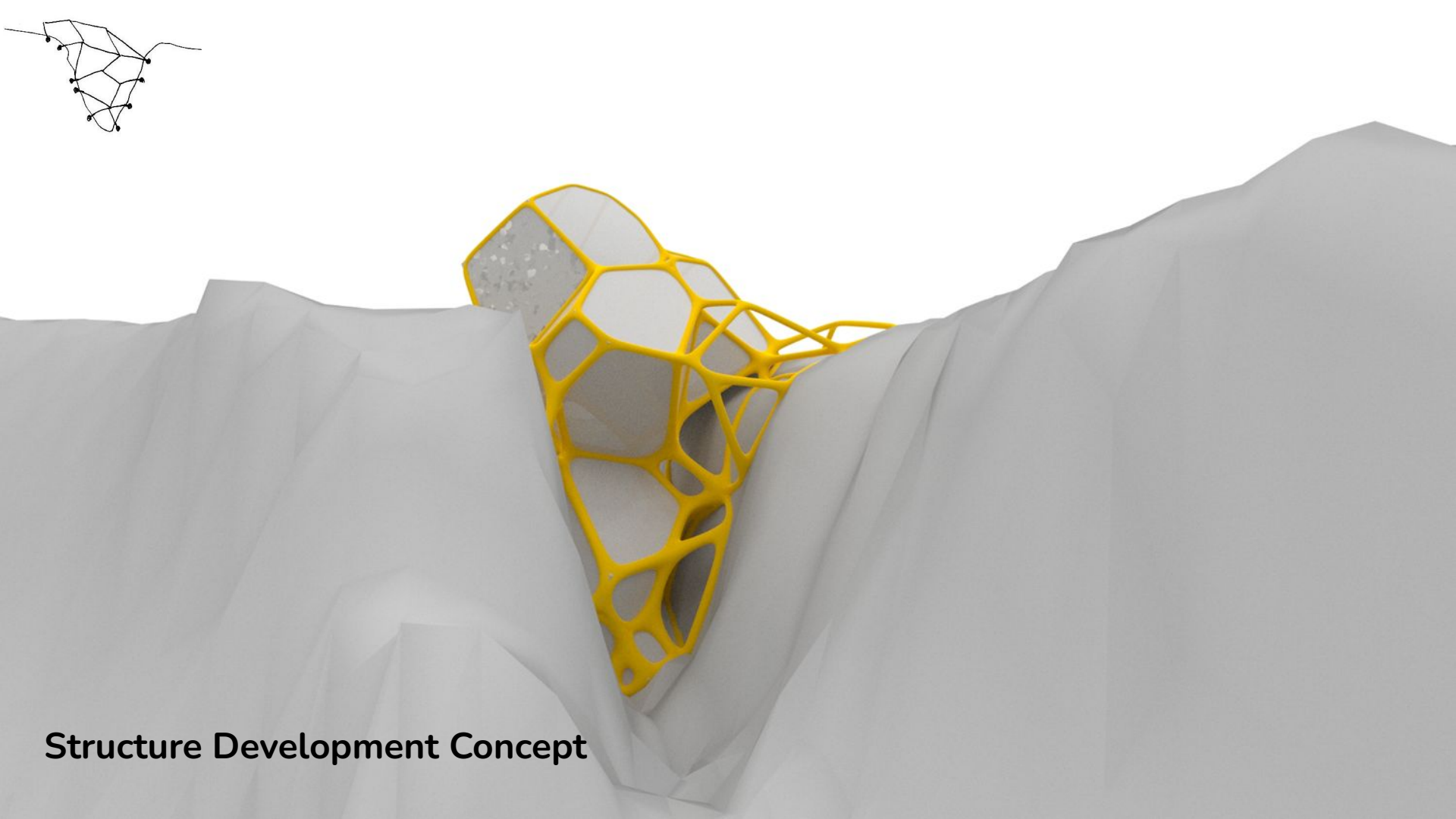
Generating Voronoi cells in cracks.

Design Development

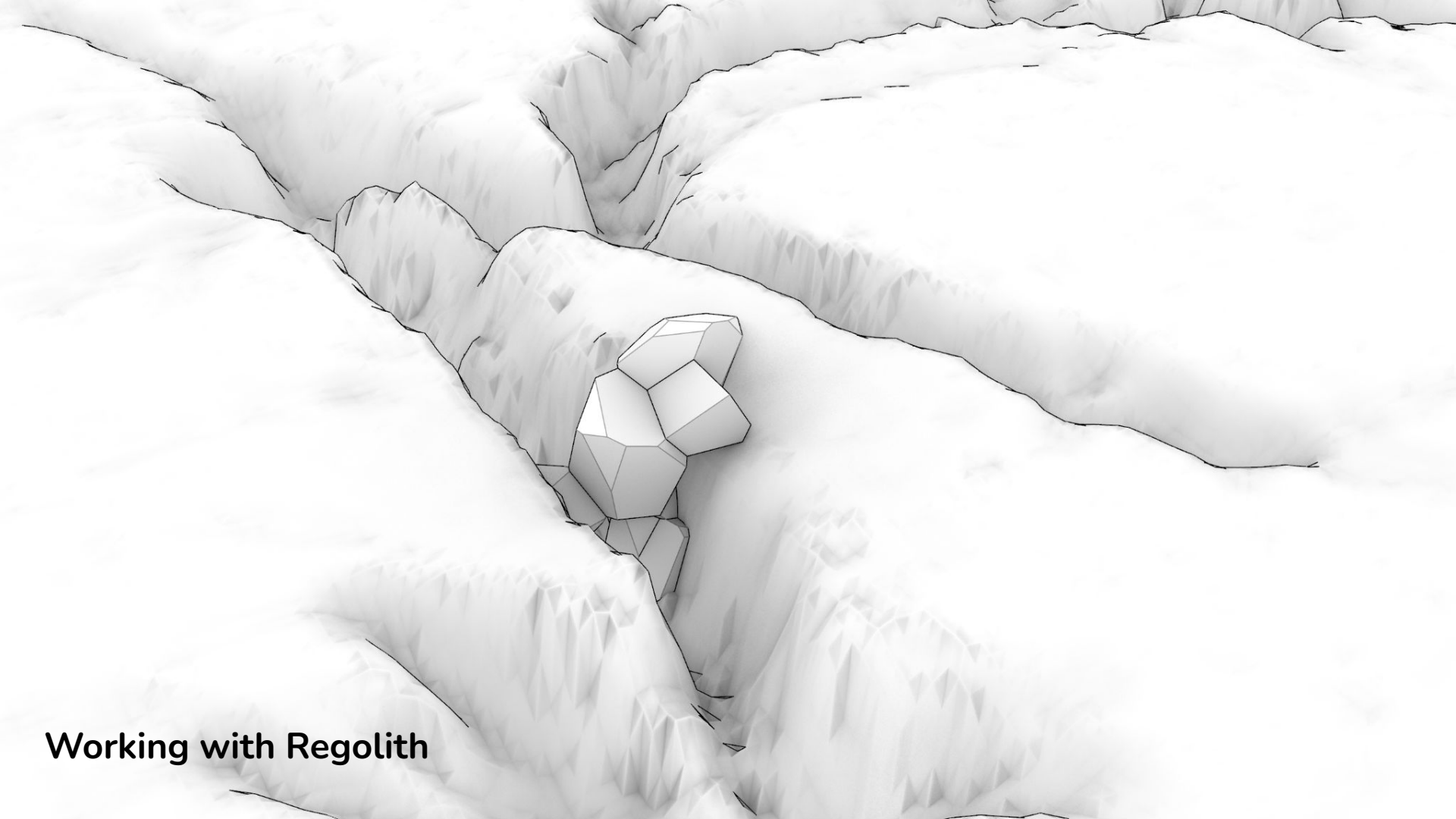




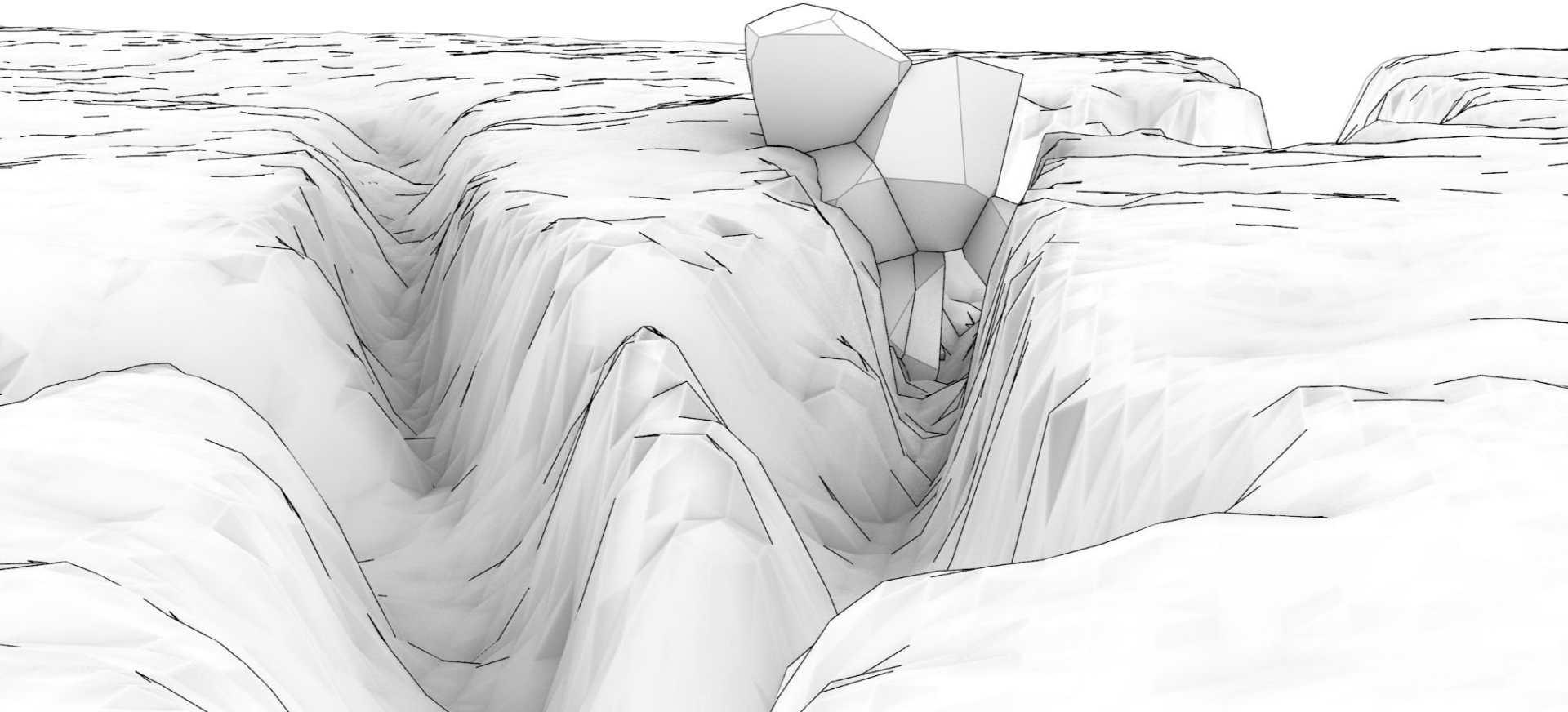




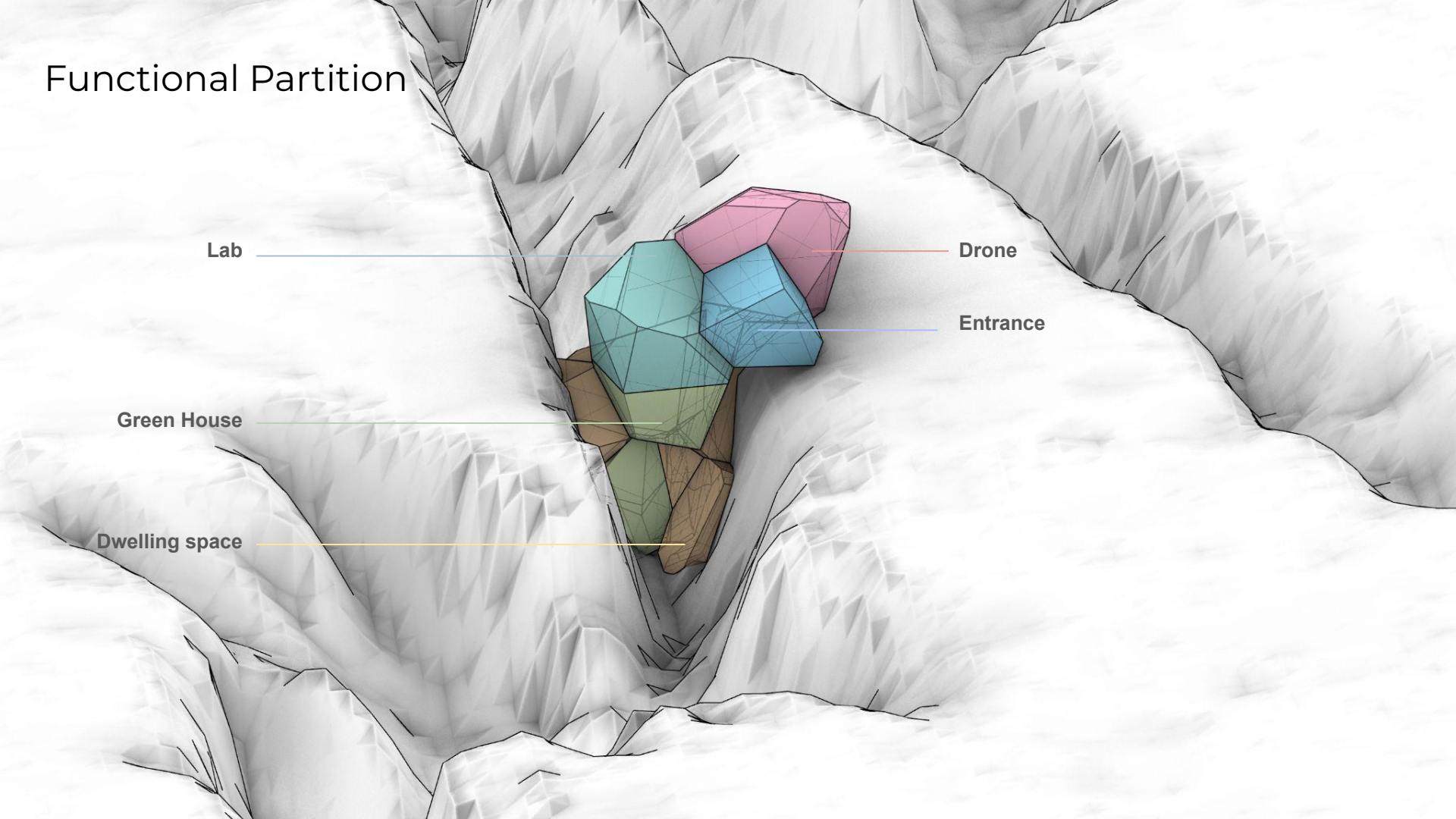
Structure Development Concept



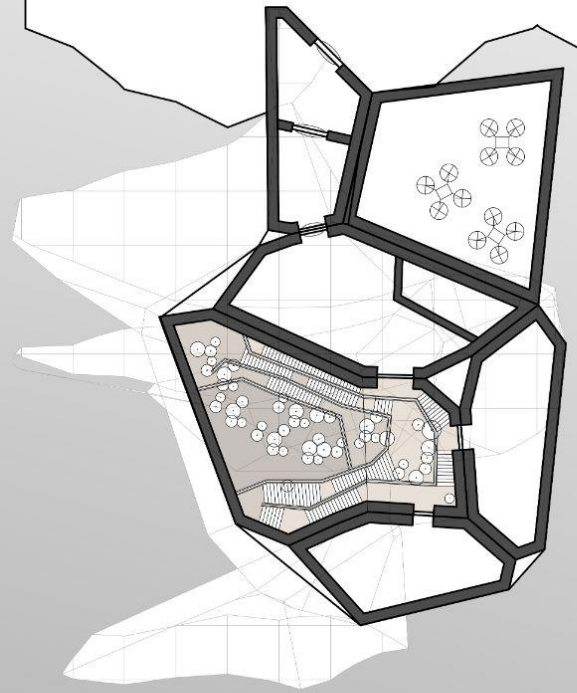
Working with Regolith



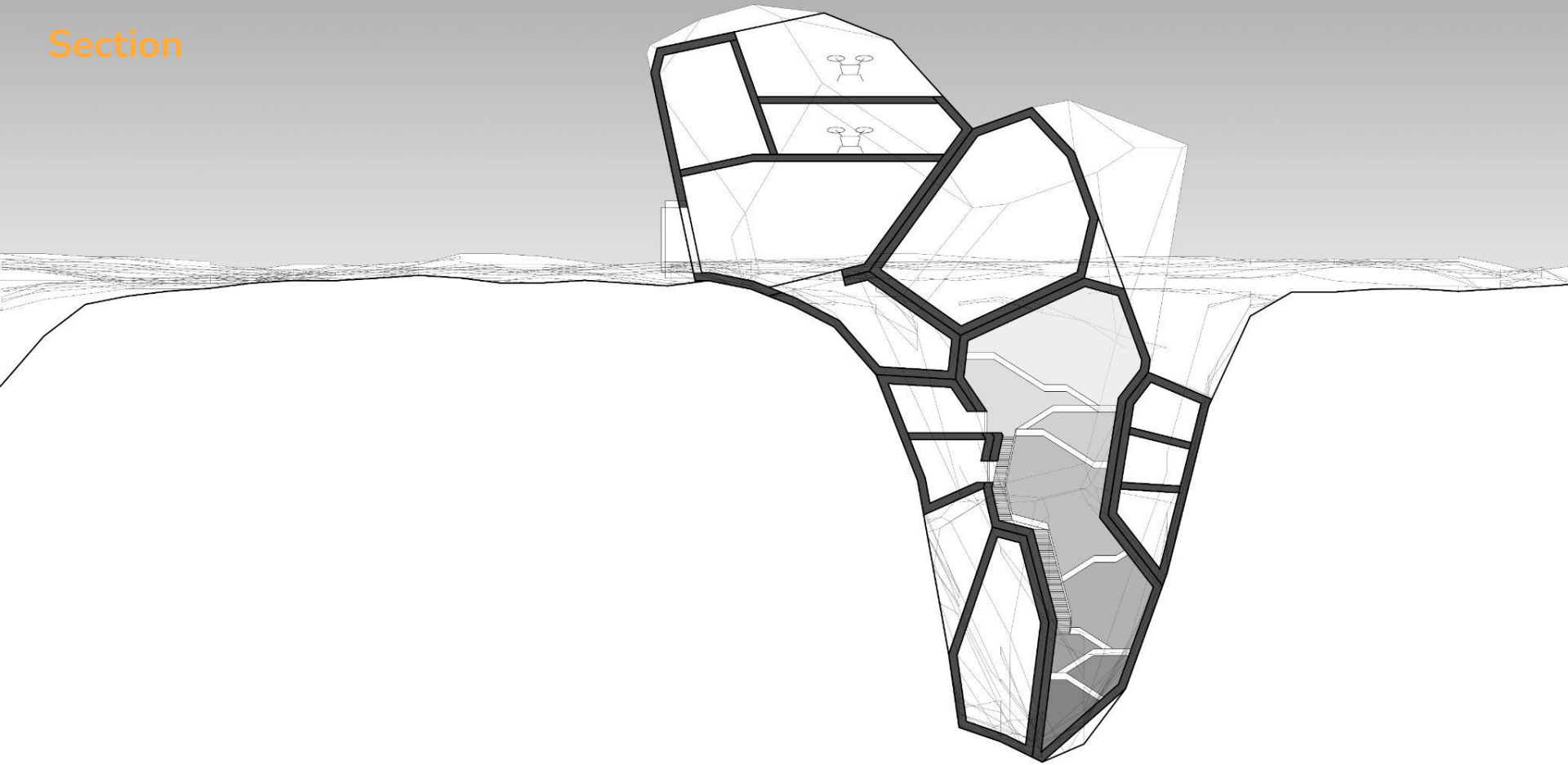
Functional Partition



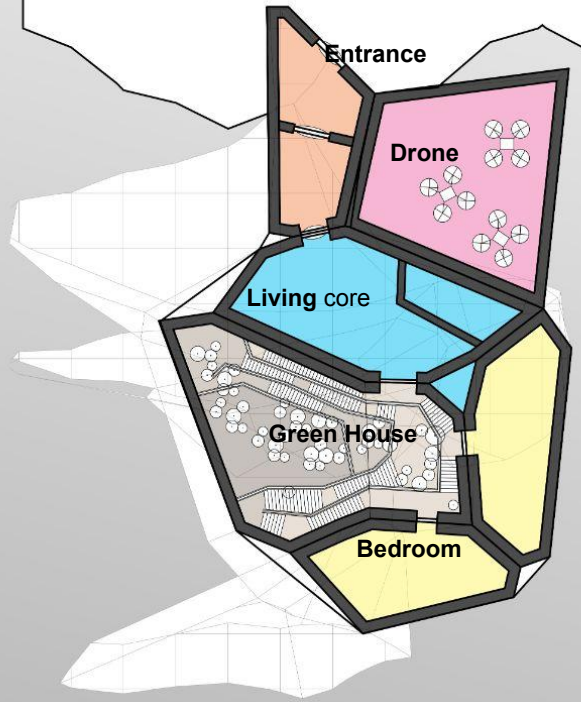
Plan



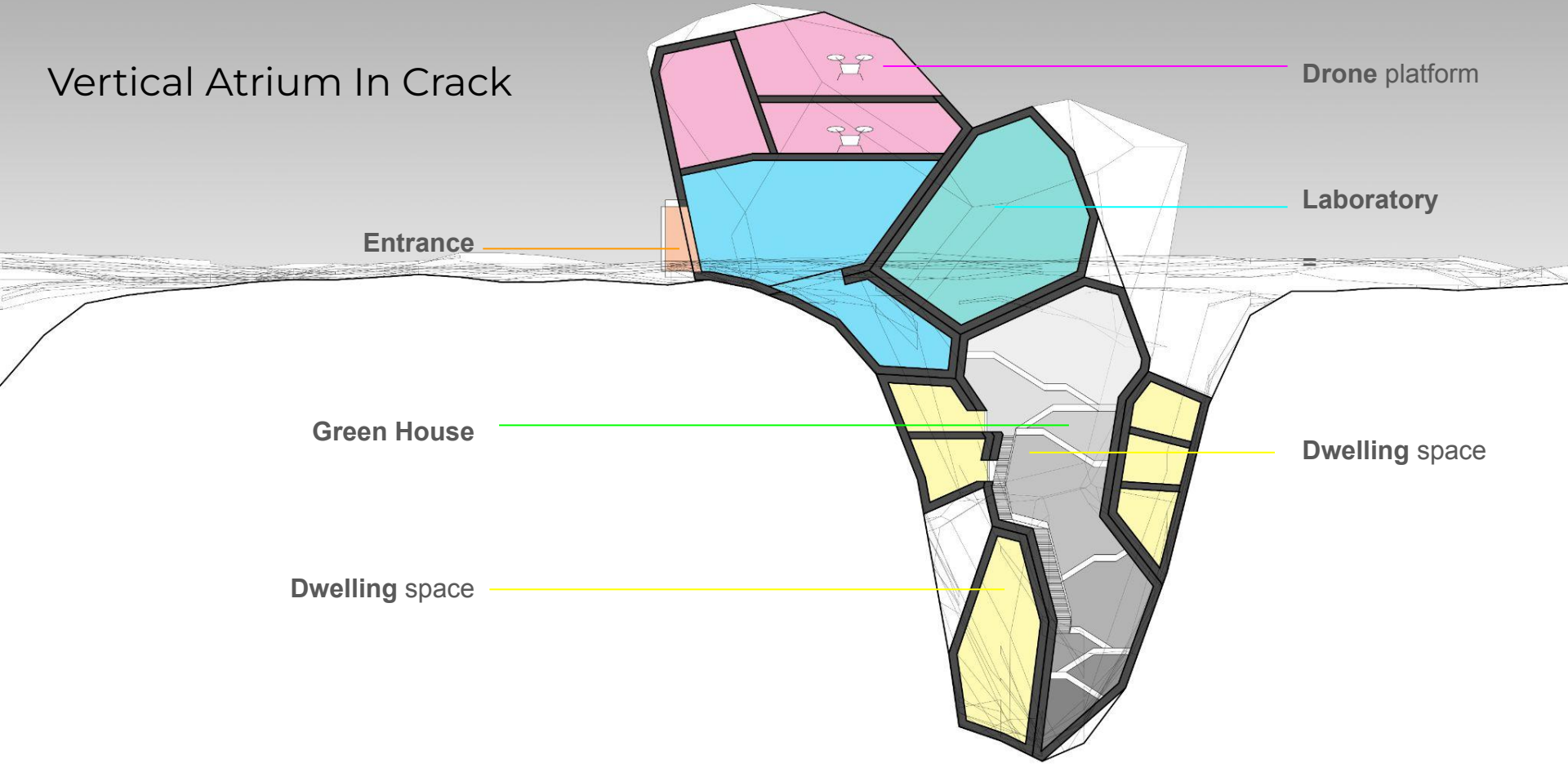
Section

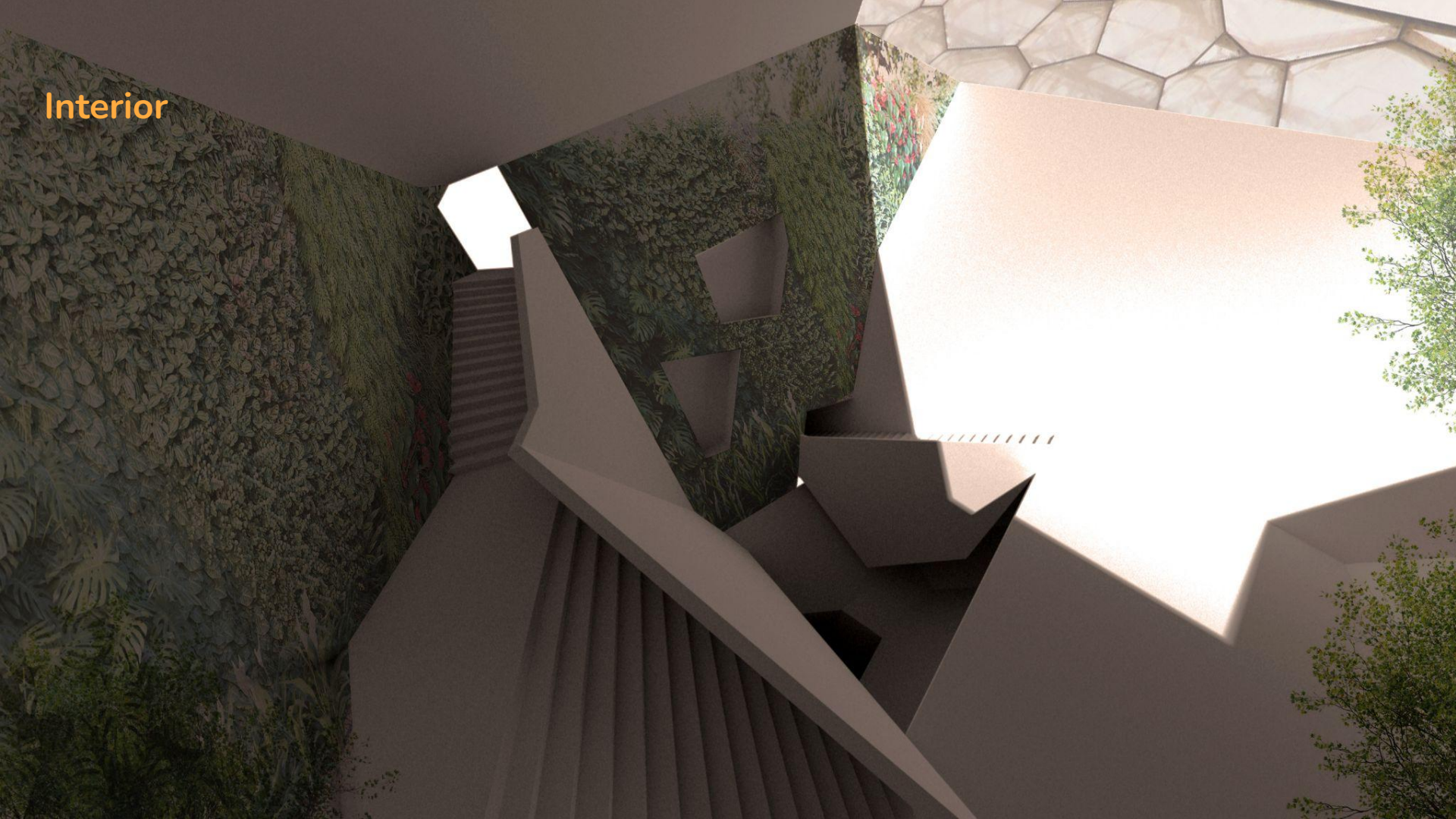


Function

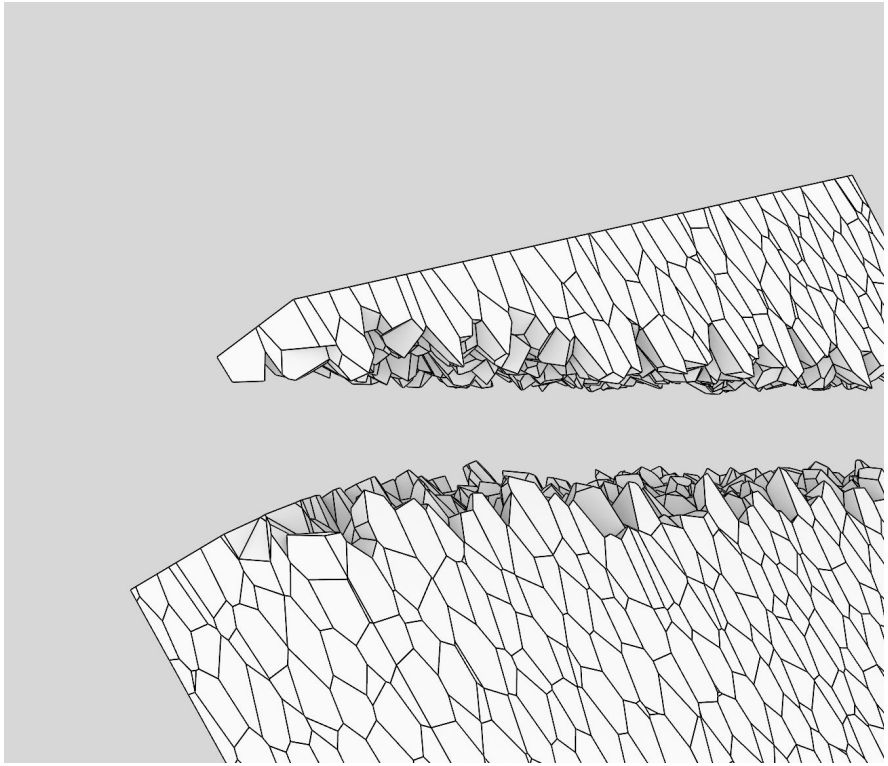


Vertical Atrium In Crack




Interior

FRAGMENTS



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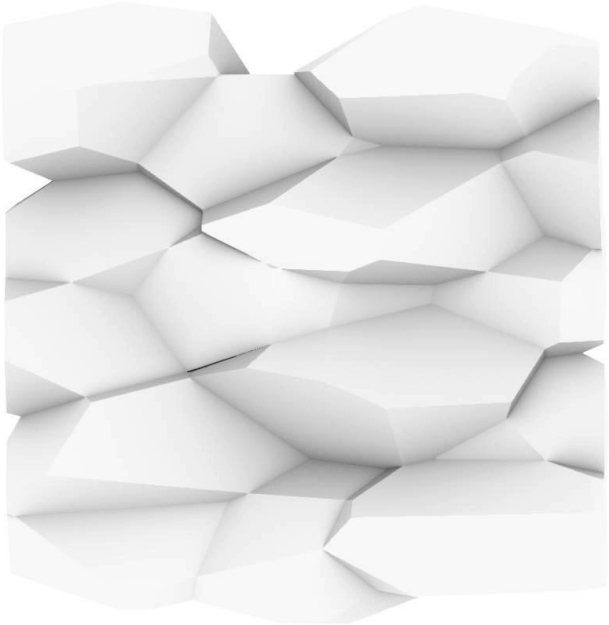
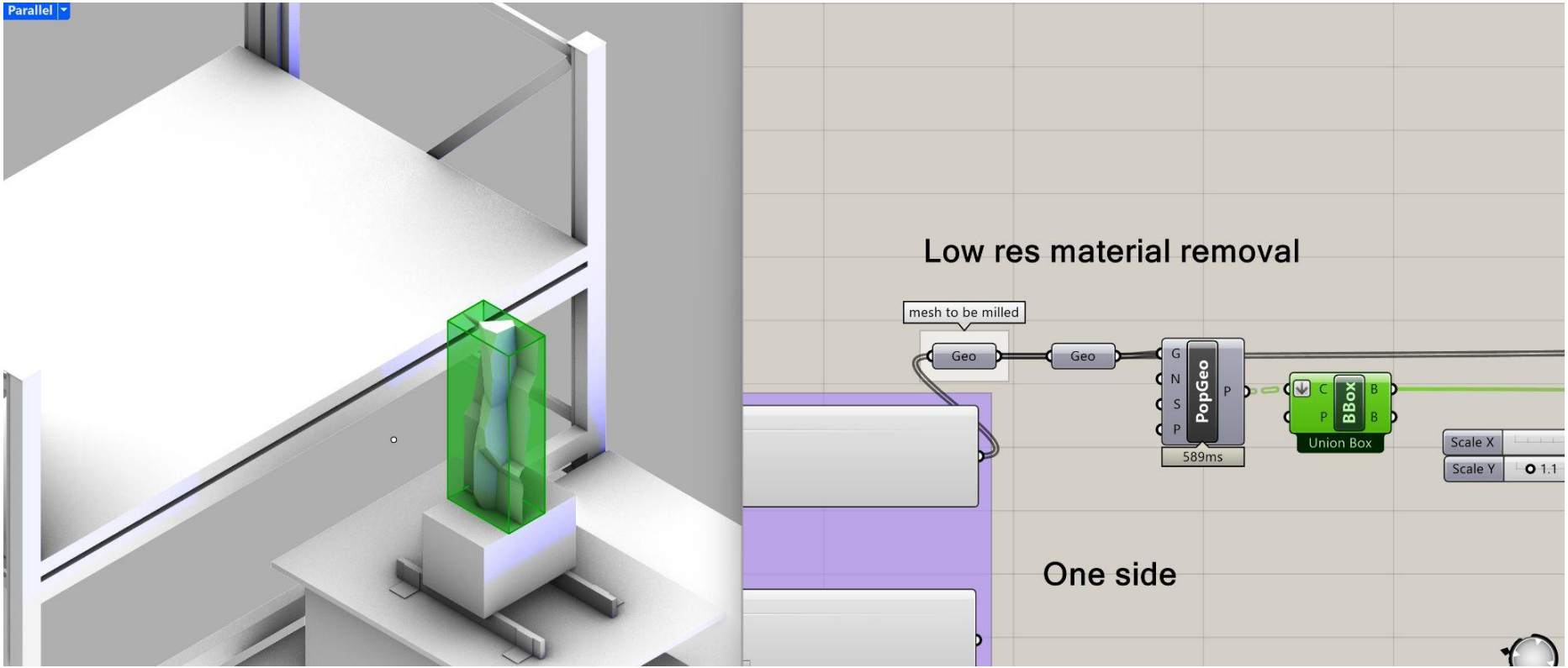
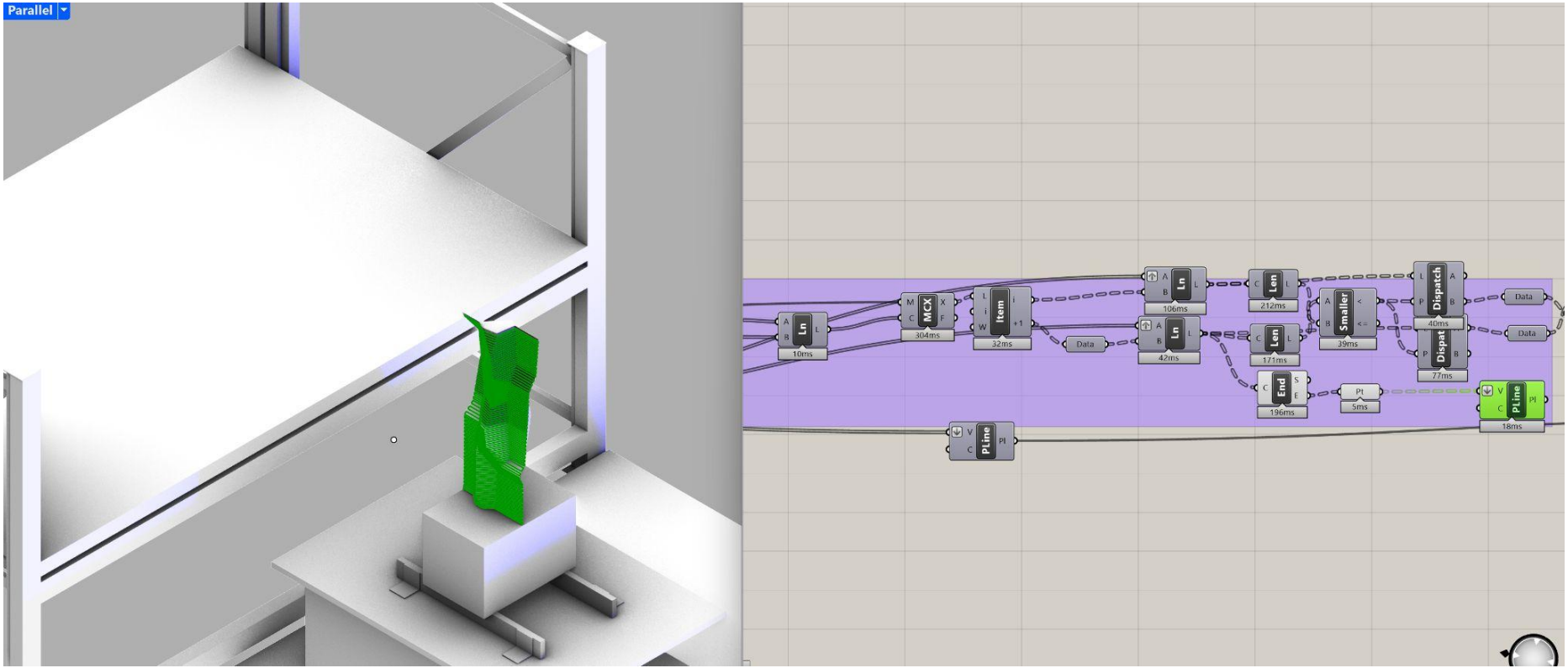
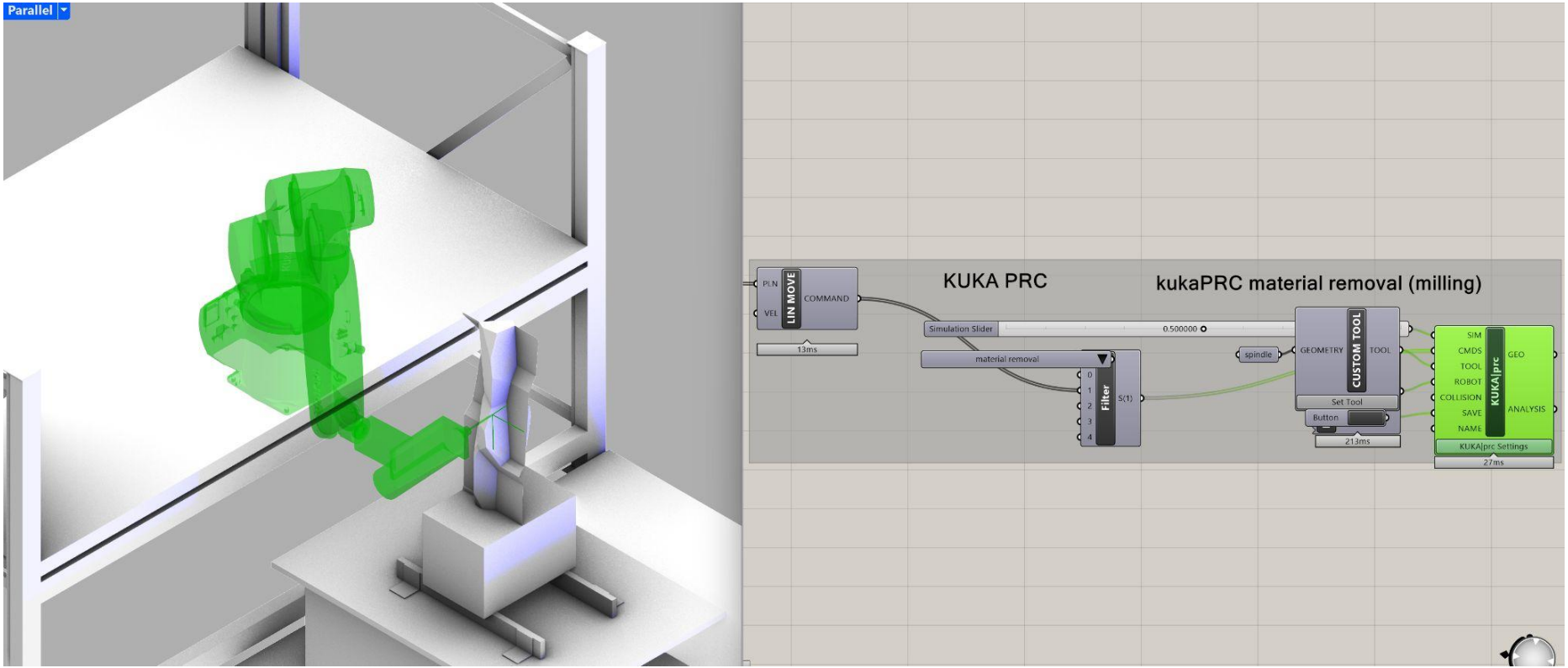
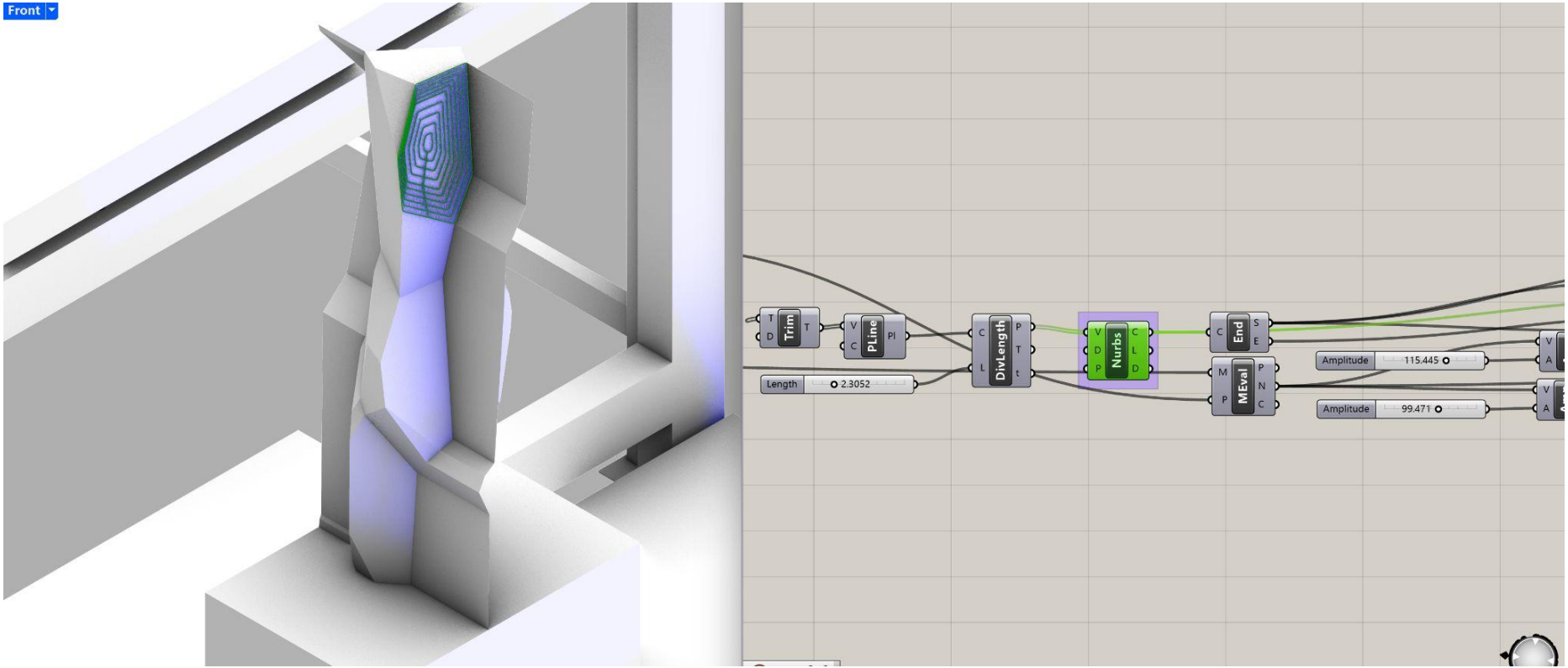


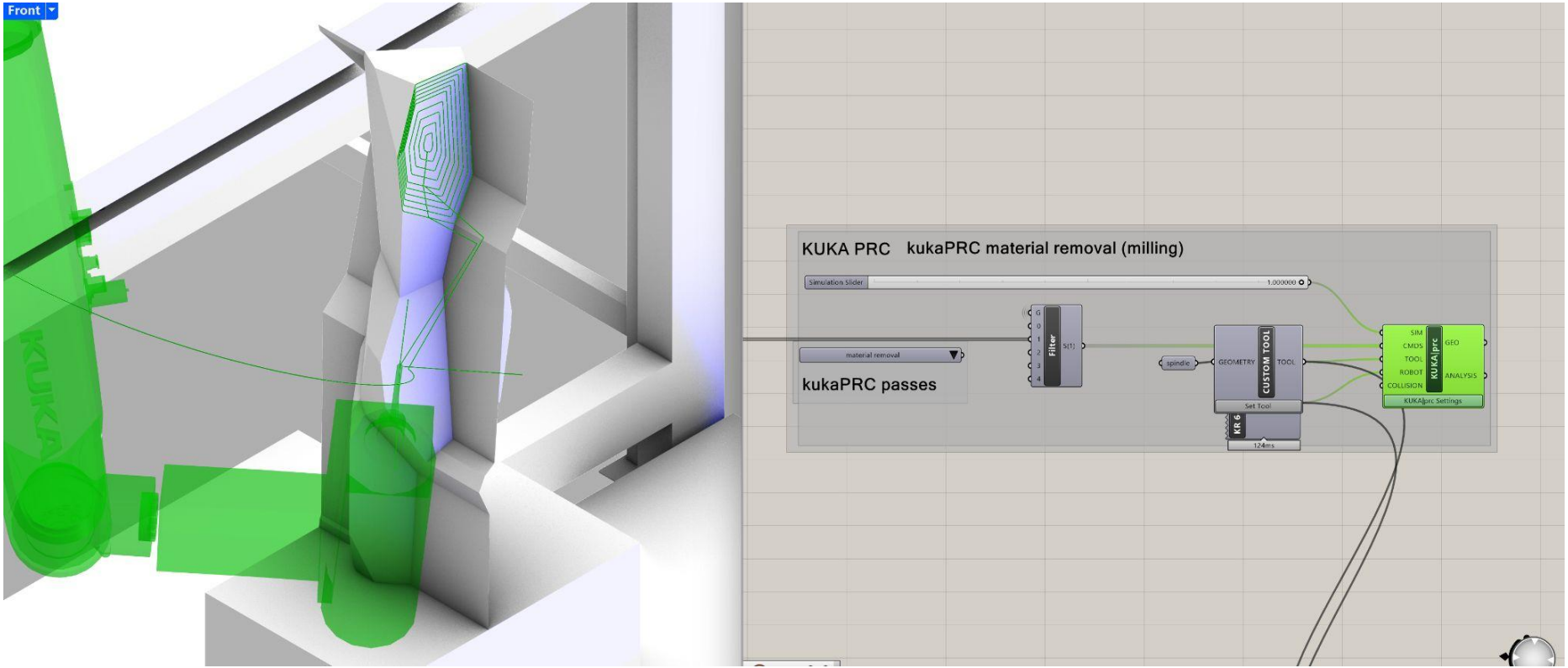
MILLING PROCESS

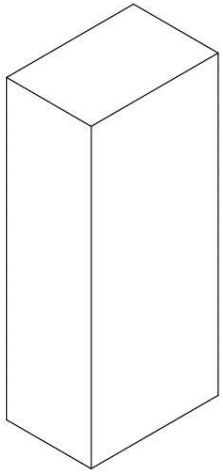



Parallel
Ln
10ms
MCX
304ms
Item
32ms
Data
Ln
106ms
Ln
42ms
Len
212ms
Len
171ms
End
196ms
Smaller
39ms
Dispatch
40ms
Dispat
77ms
Pt
5ms
PLine
18ms
Data
Data
PLine


Parallel
KUKA PRC
kukaPRC material removal (milling)
PLN
VEL
LIN MOVE
COMMAND
13ms
Simulation Slider
0.500000
material removal
Filter
S(1)
spindle
GEOMETRY
CUSTOM TOOL
TOOL
Set Tool
Button
213ms
SIM
CMDS
TOOL
ROBOT
COLLISION
SAVE
NAME
KUKA|prc
GEO
ANALYSIS
KUKA|prc Settings
27ms


Front
Trim
PLine
DivLength
Nurbs
End
MEval
Length
2.3052
Amplitude
115.445
Amplitude
99.471


Front
KUKA PRC kukaPRC material removal (milling)
Simulation Slider
1.000000
material removal
kukaPRC passes
Filter
spindle
GEOMETRY
CUSTOM TOOL
TOOL
Set Tool
KR 6
124ms
SIM
CMDS
TOOL
ROBOT
COLLISION
KUKAprc
GEO
ANALYSIS
KUKAprc Settings



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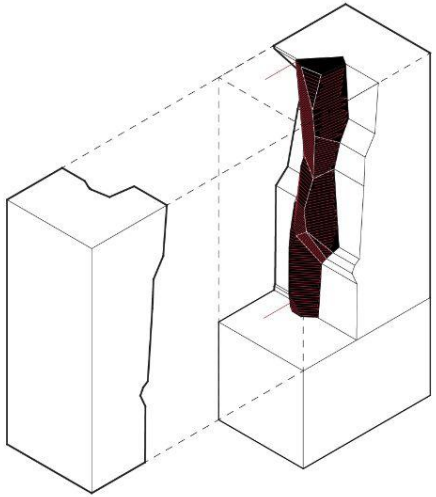

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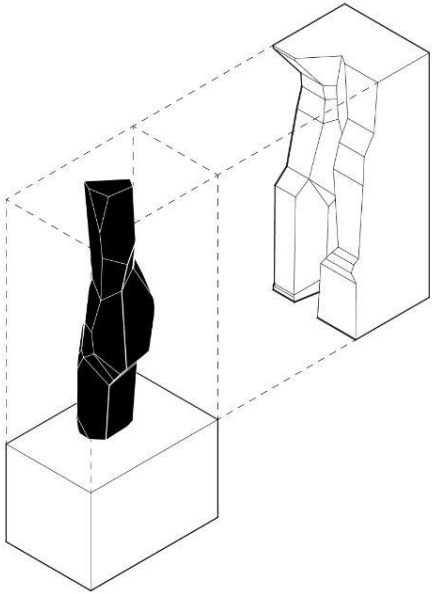

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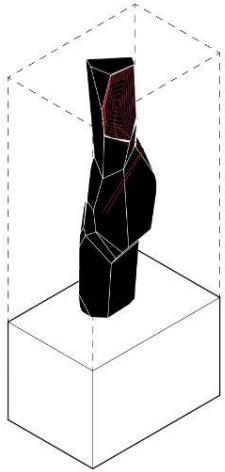

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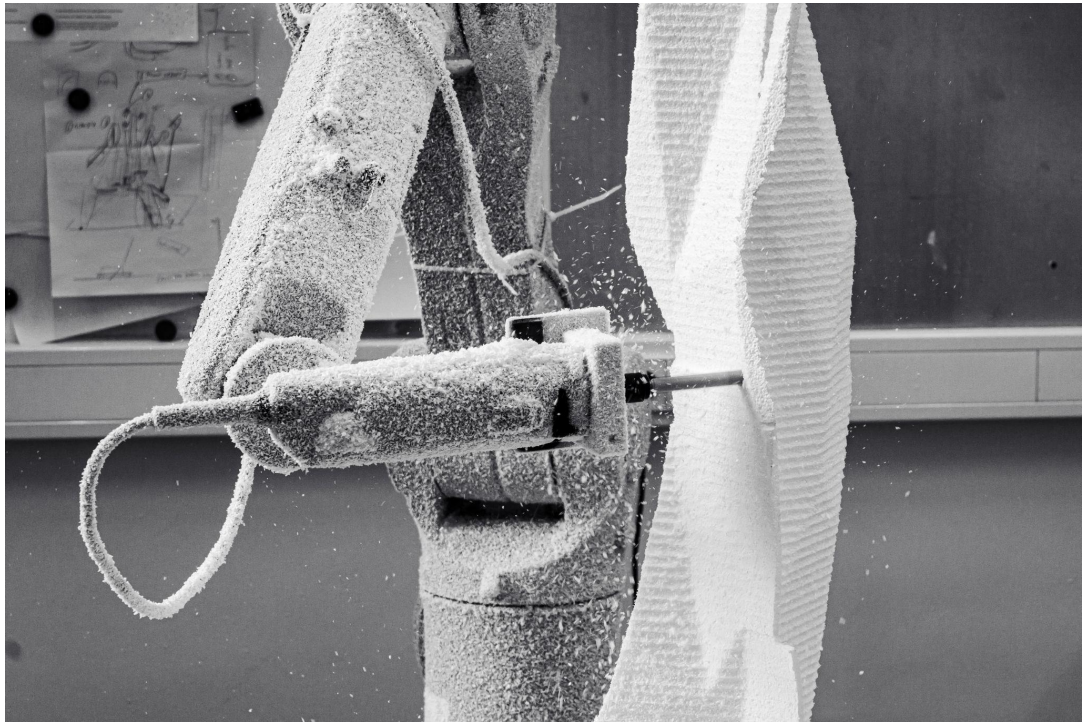
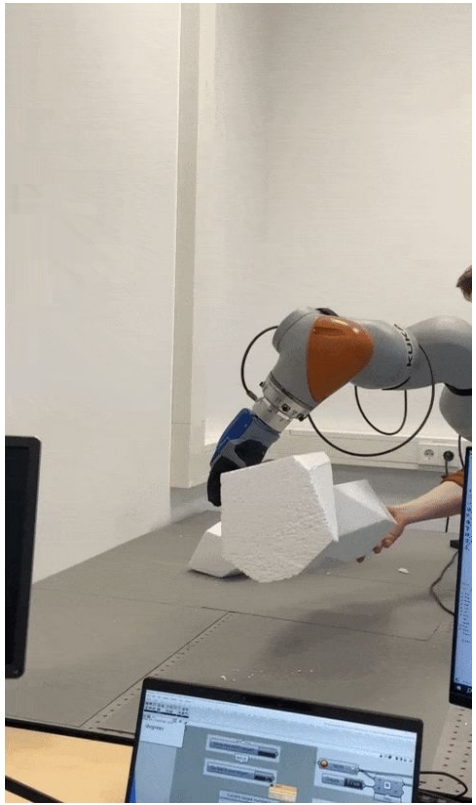
FRAGMENT PRODUCTION



HUMAN ROBOTIC INTERACTION



MODEL