



Mars Oasis

Group 1

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Zita Molnar
Mattia Roggia
Puck Swildens
Evanthia-Maria Vassi
Koen Weber

1:1 Interactive
Architecture Prototype

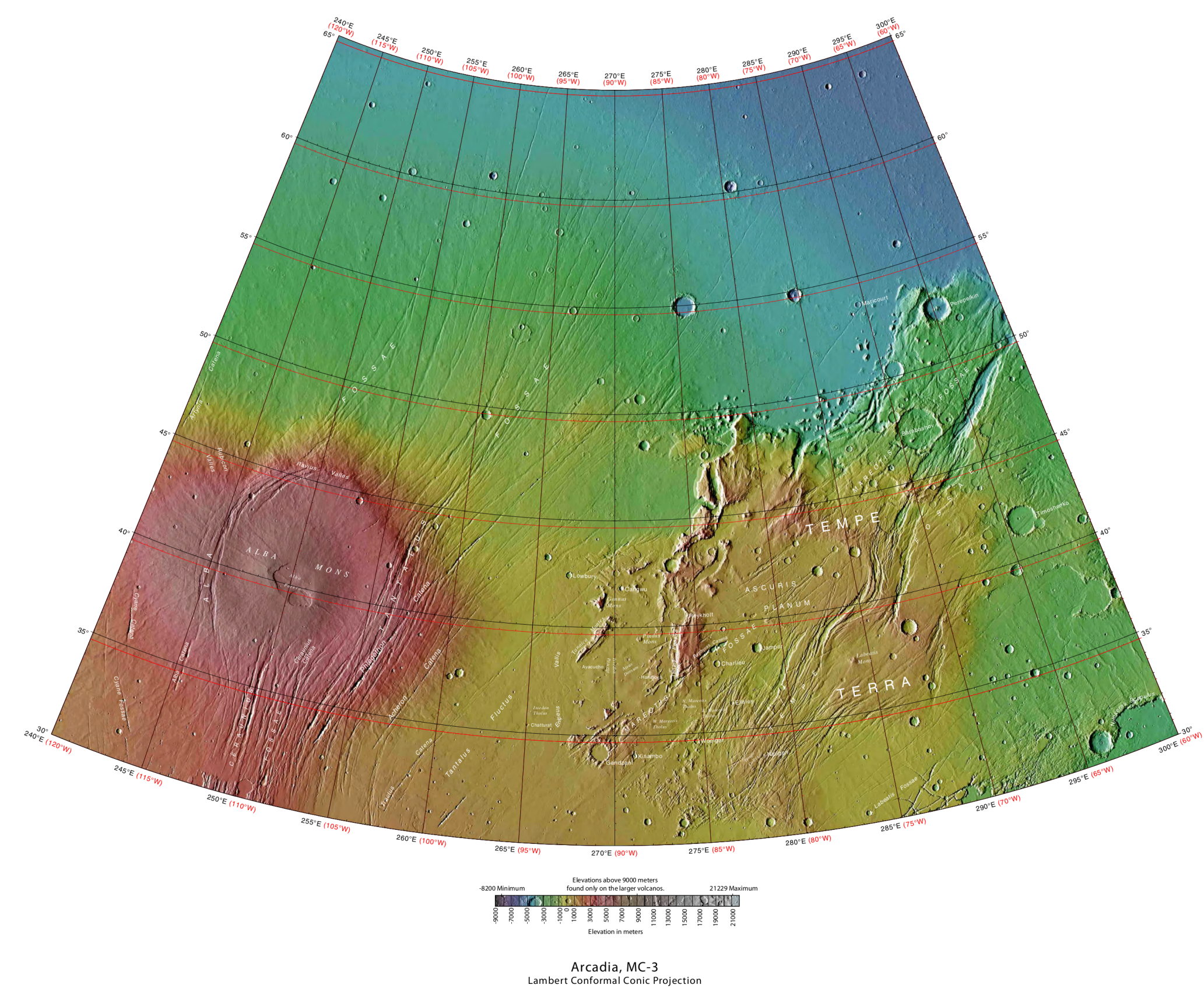
Prof. Henriette Bier
Arwin Hidding

TU Delft
Q3 2025

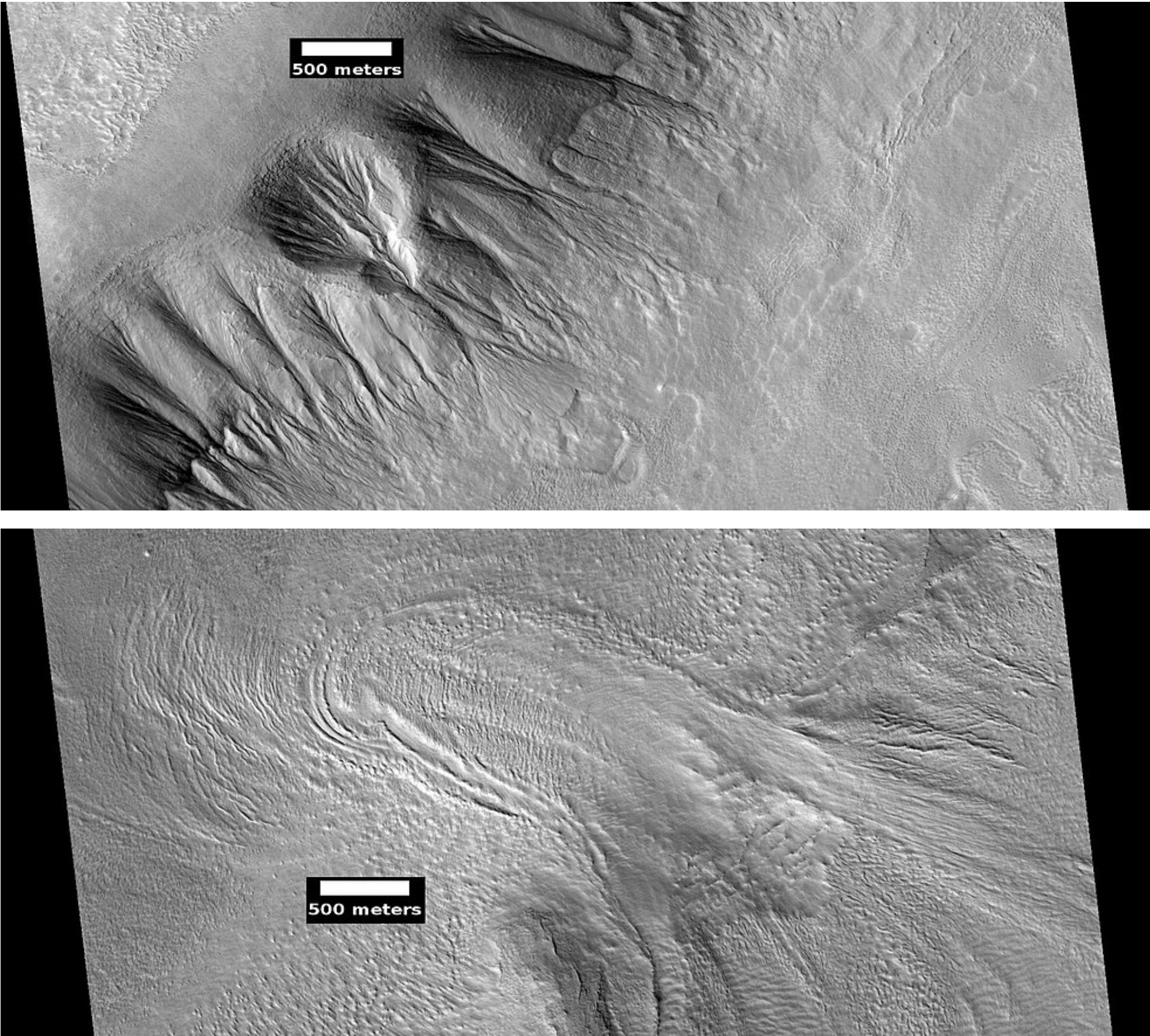
Research background

Site selection

Arcadia Planitia



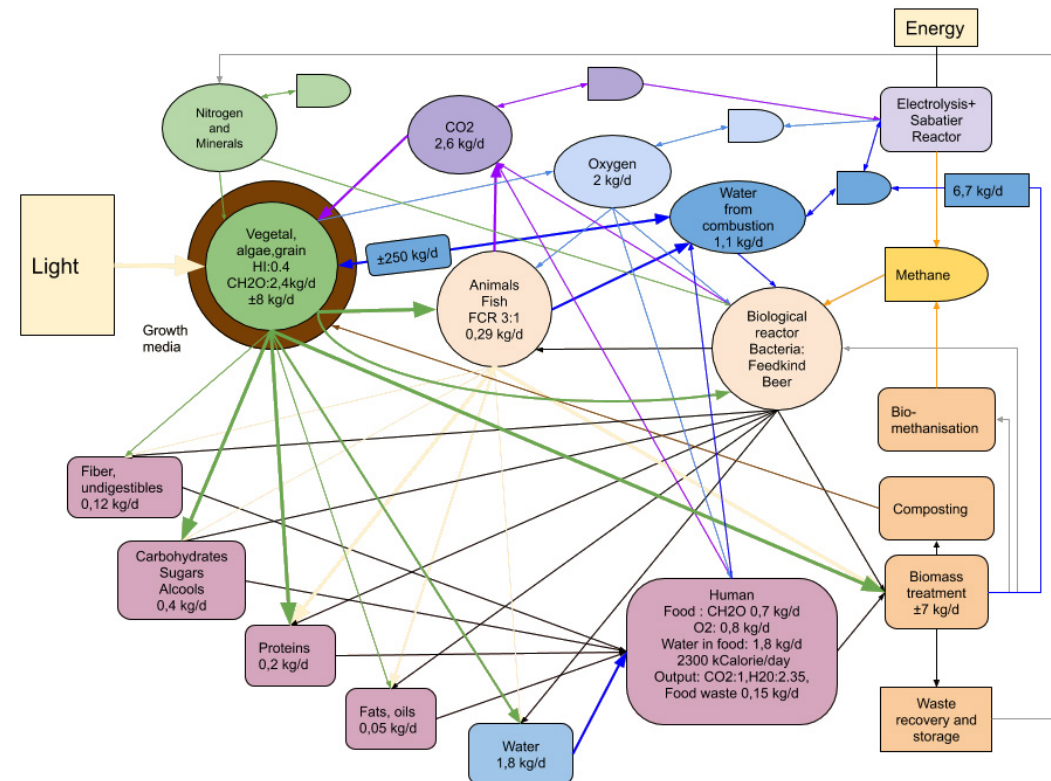
Topographic Map of Arcadia Quadrangle



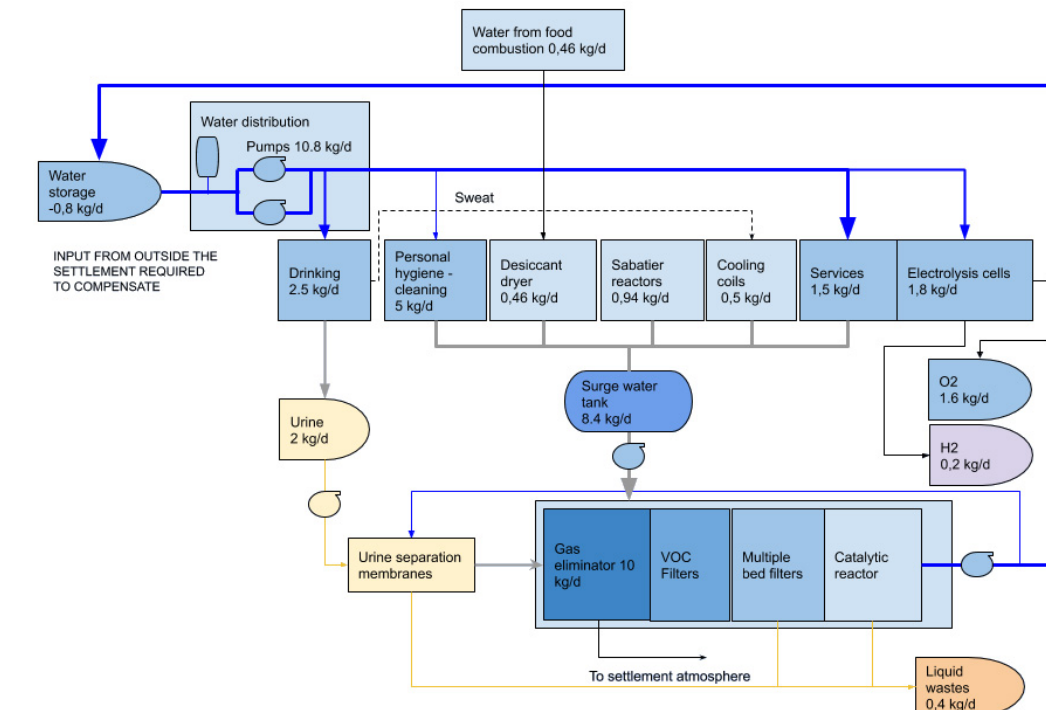
Gullies and glacier, as seen by HiRISE

Life Support System

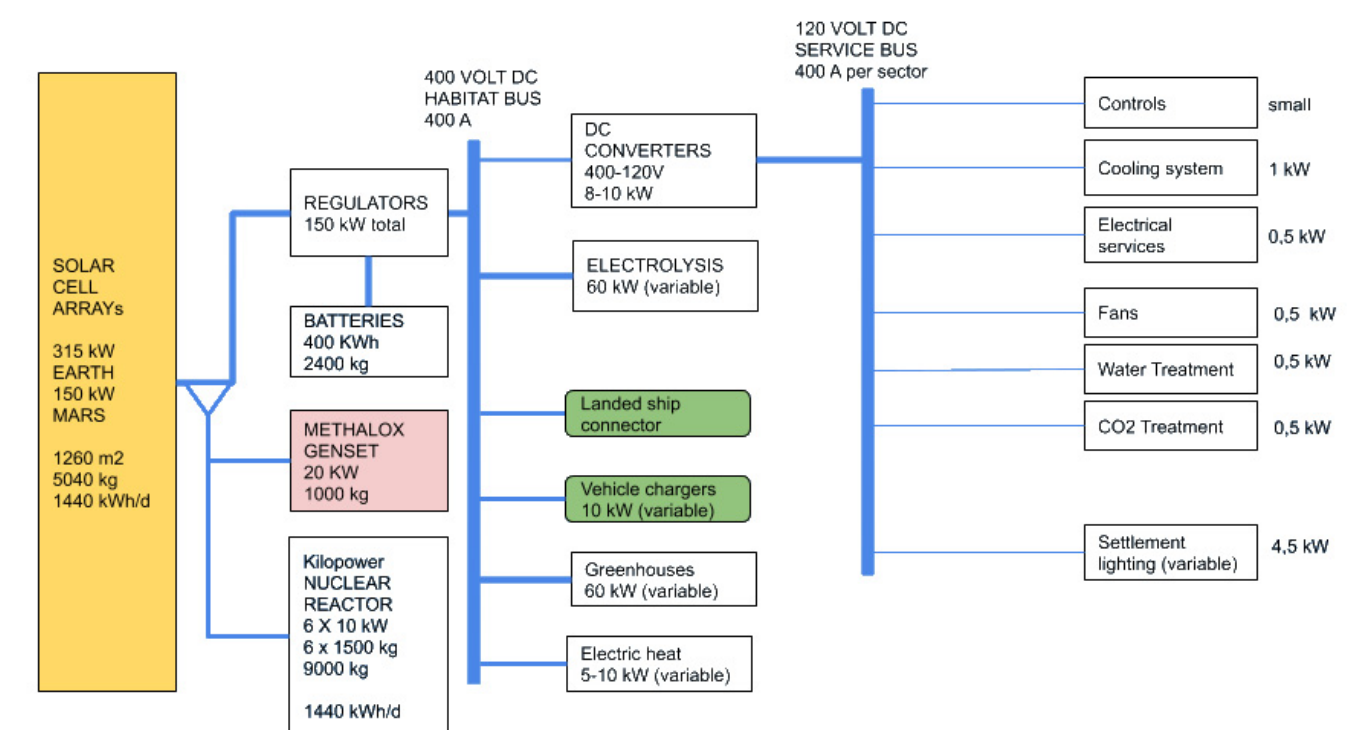
Food Production



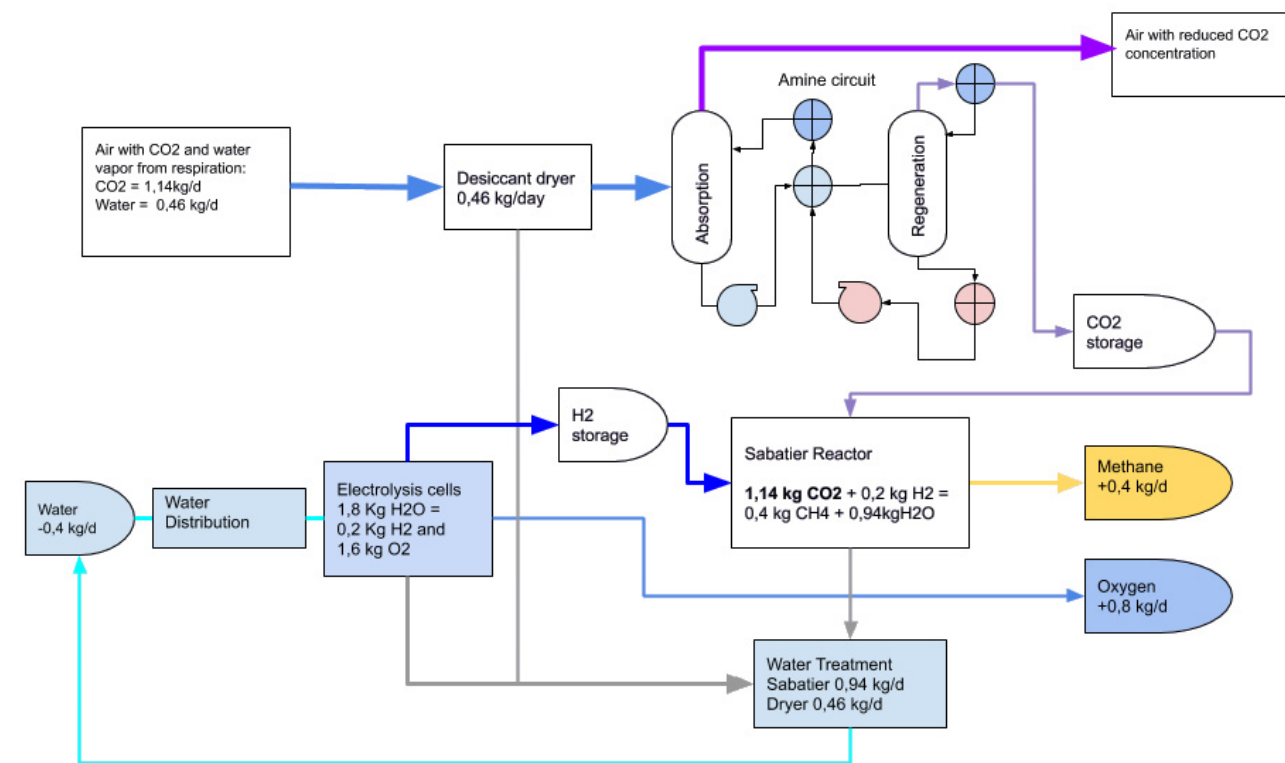
Water Treatment



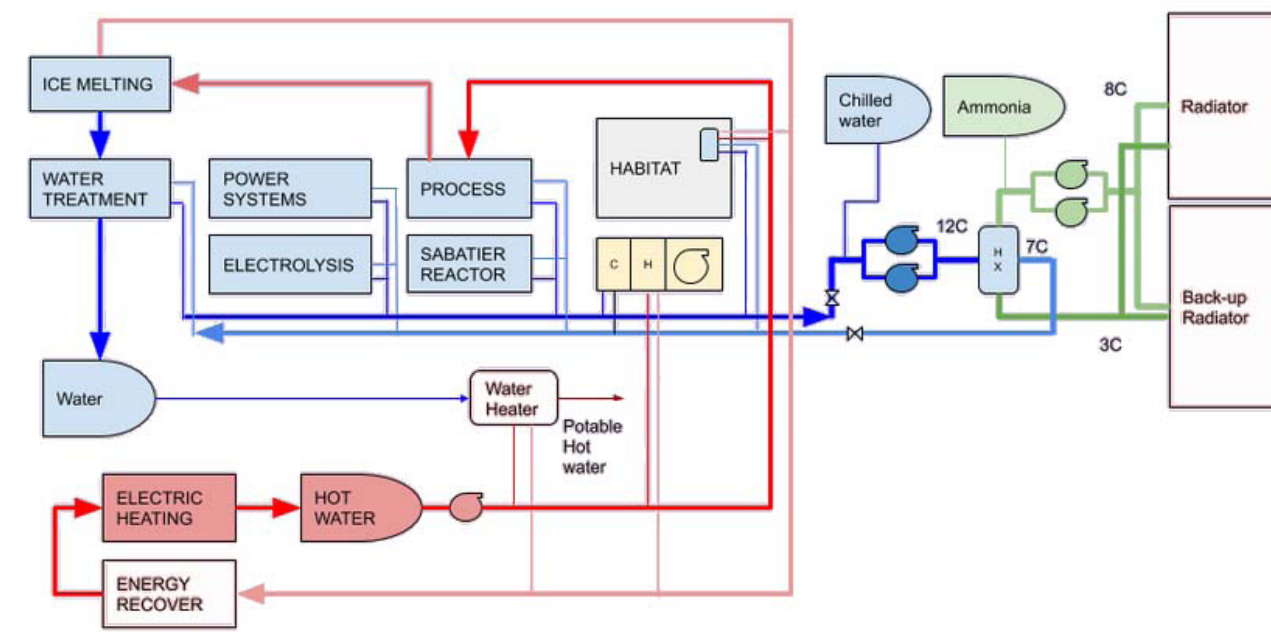
CO2 Treatment



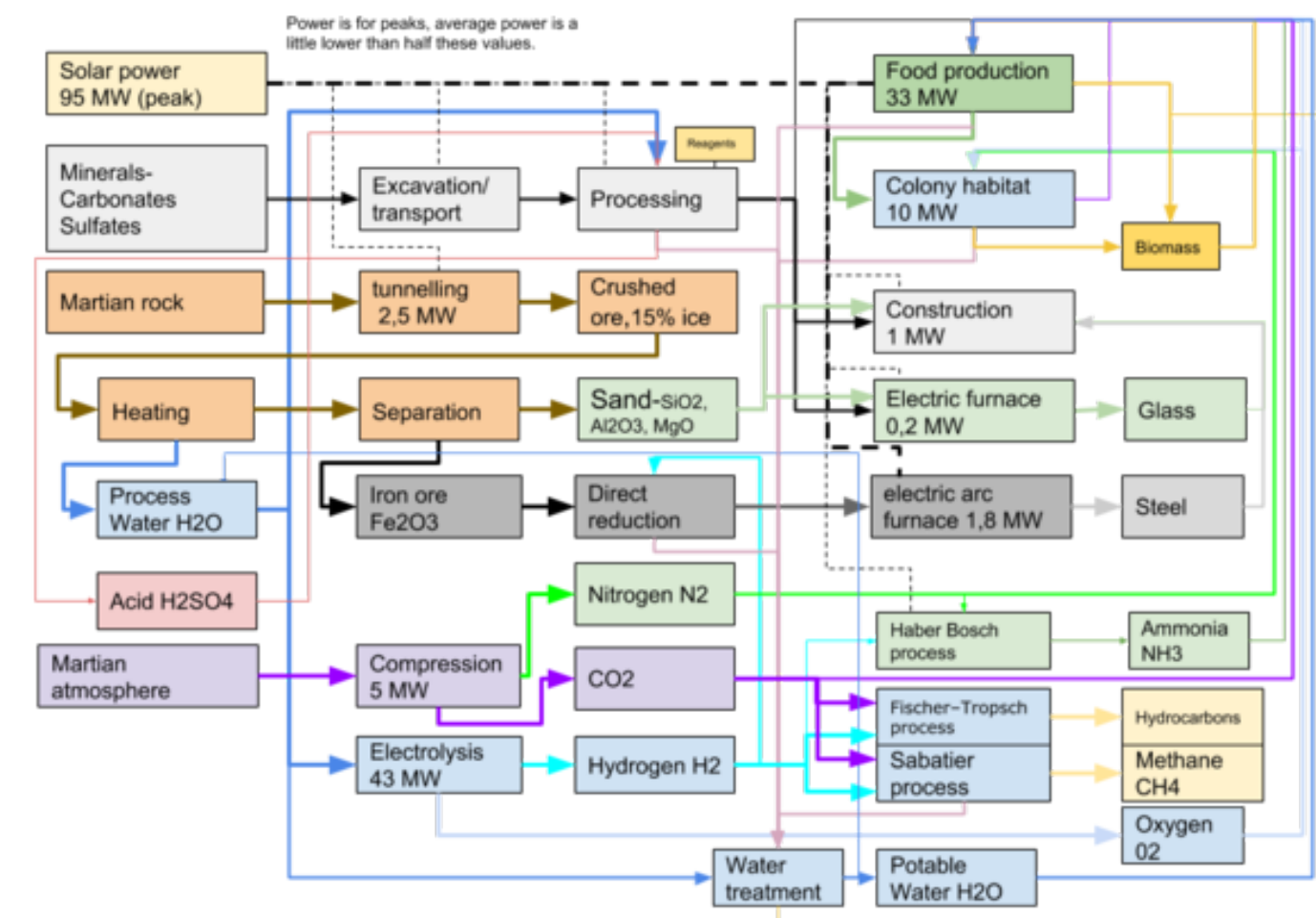
Power Systems



Thermal Systems

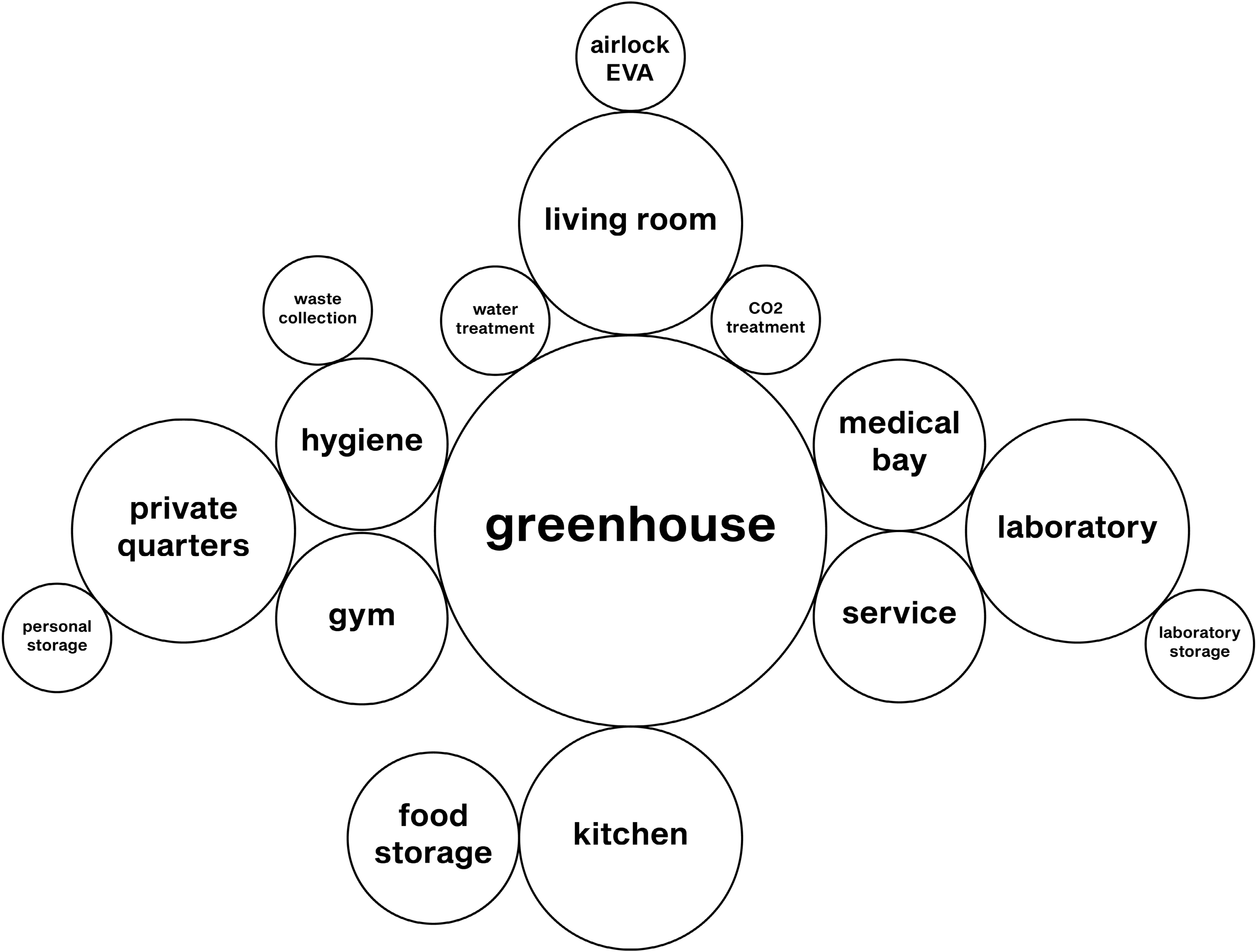


In-situ Resource Utilization

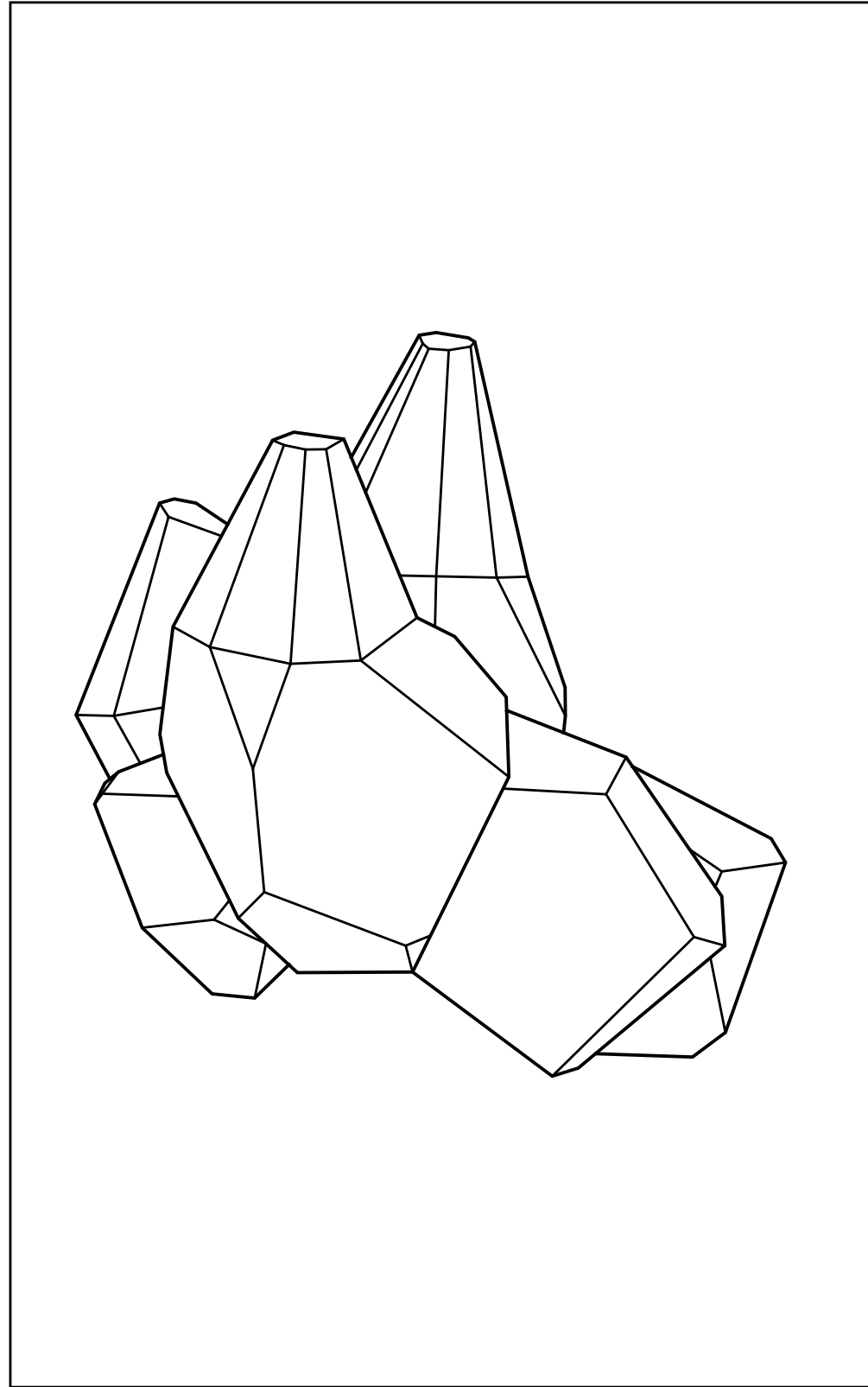


Design

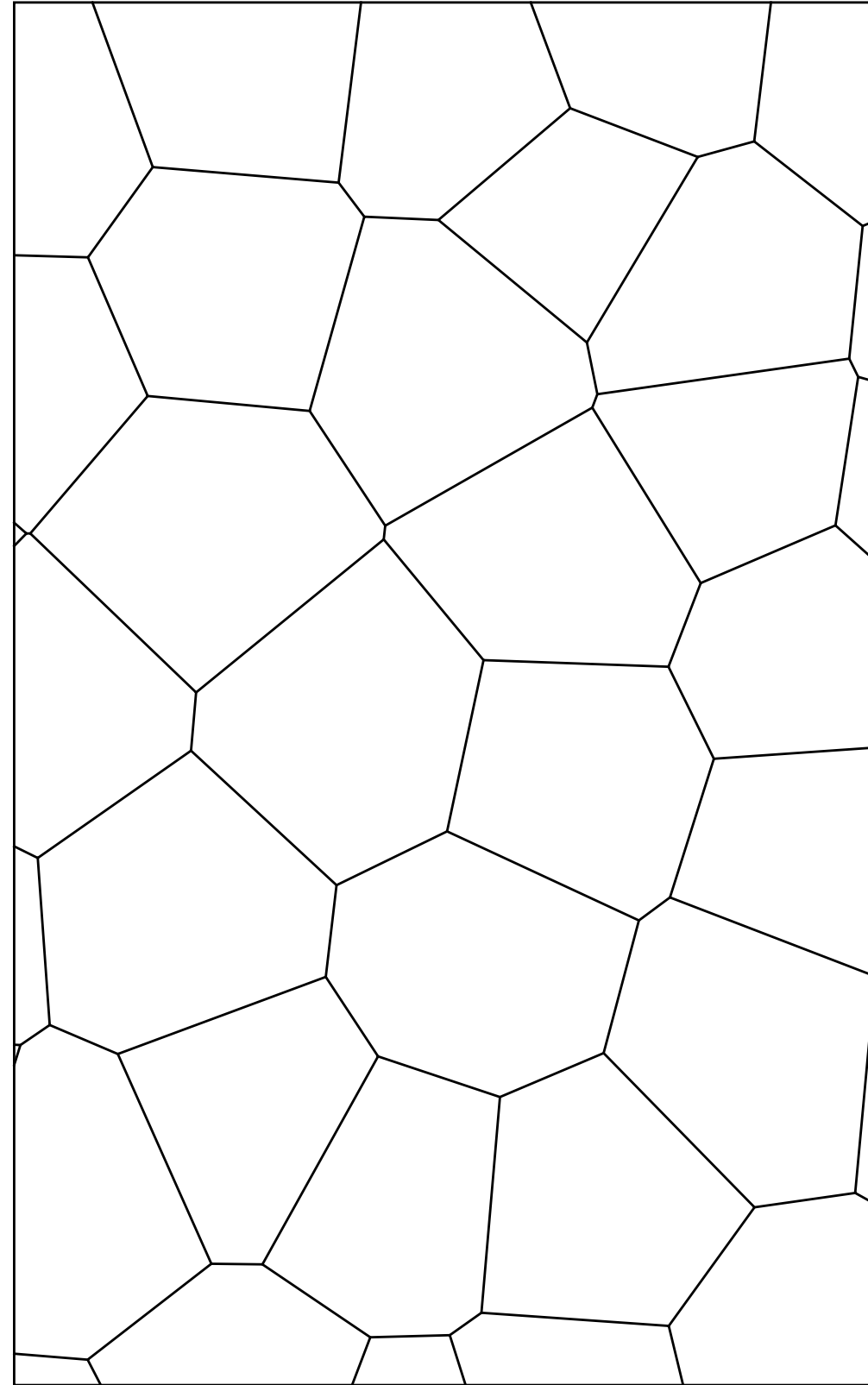
Spatial Configuration



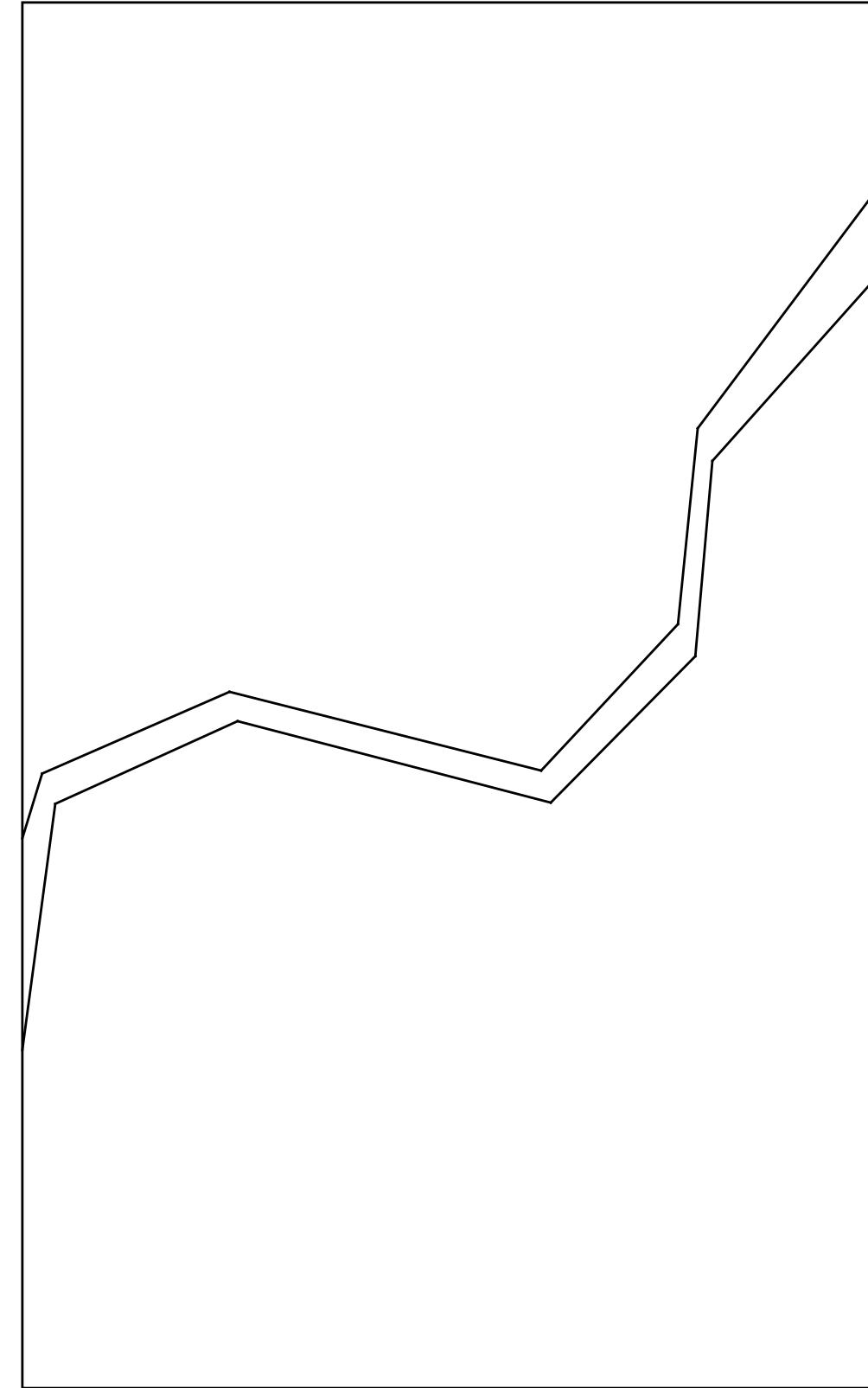
Voronoi-based Design



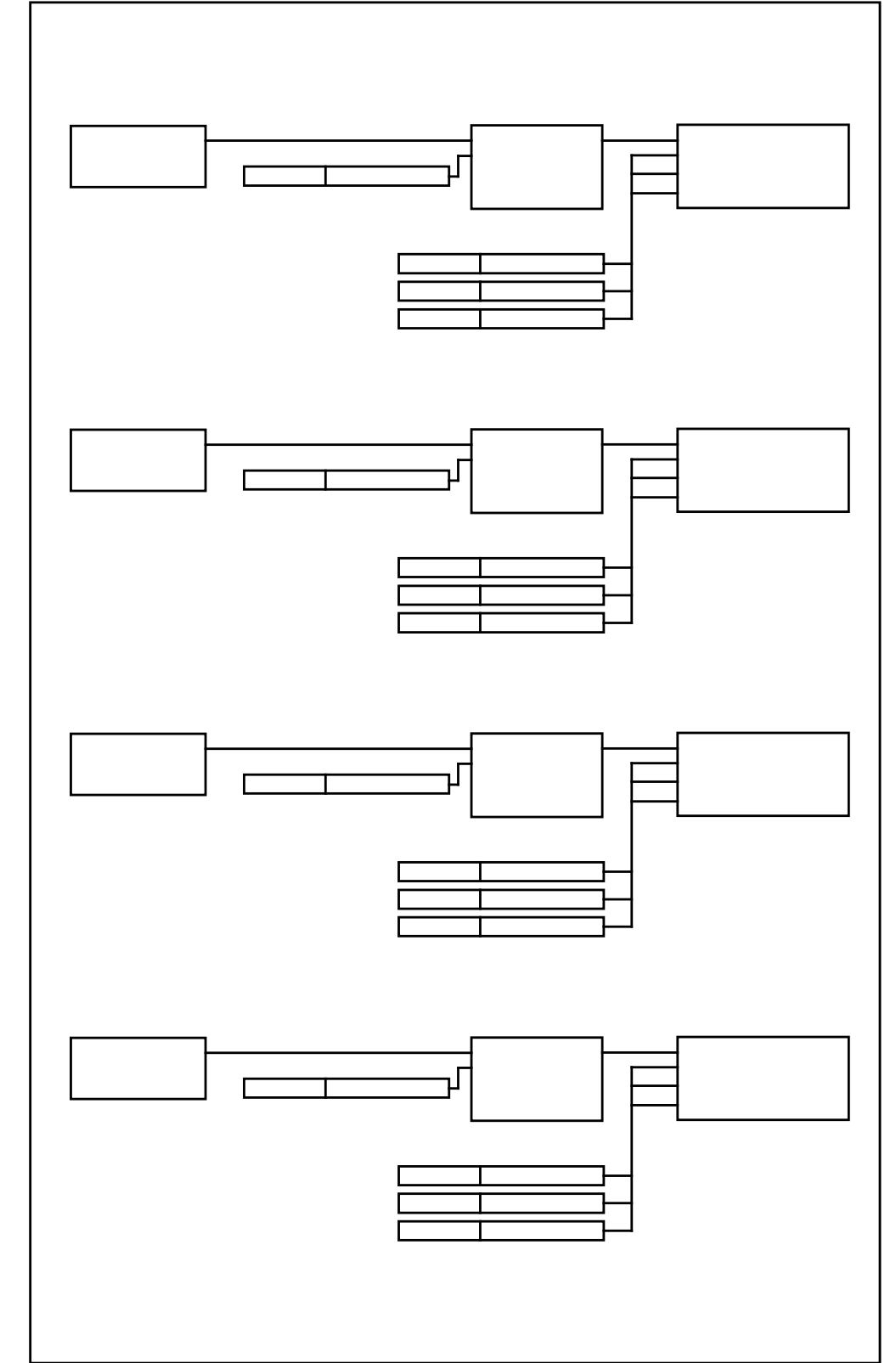
Inspired by naturally
evolved systems



Optimized infill
structures

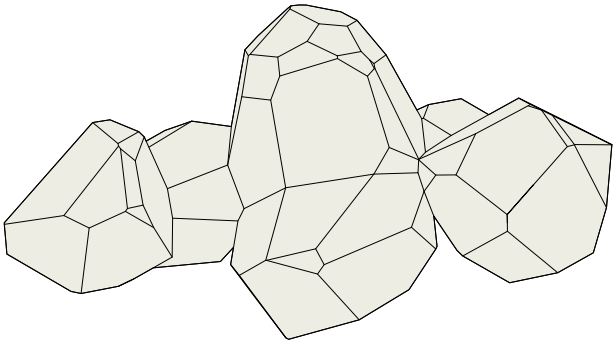
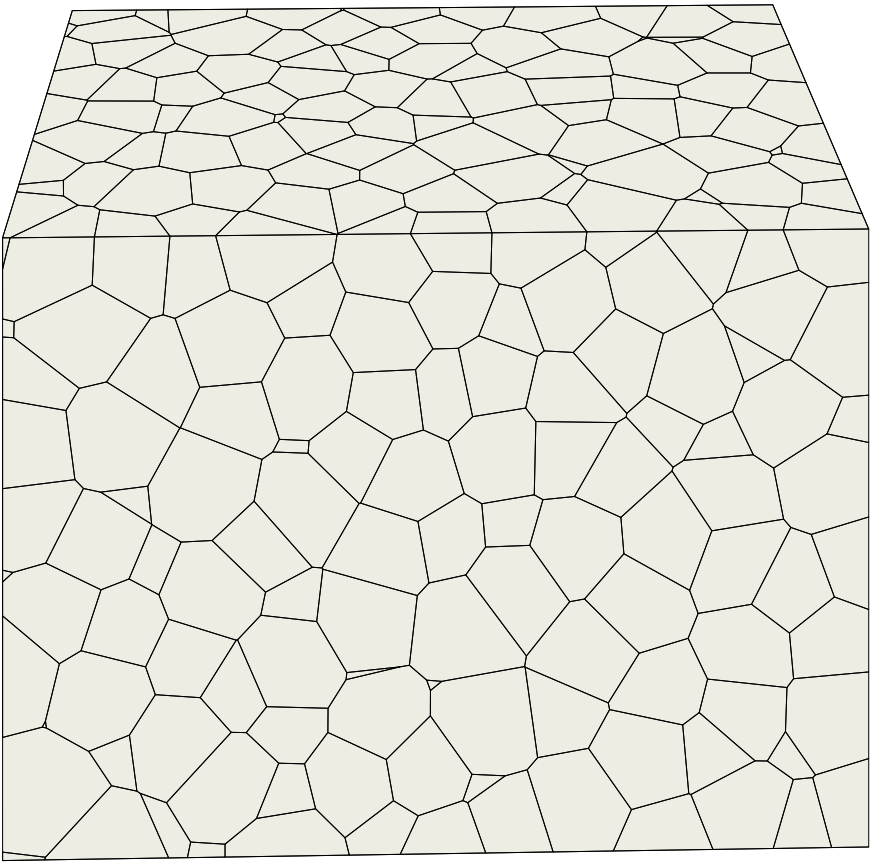
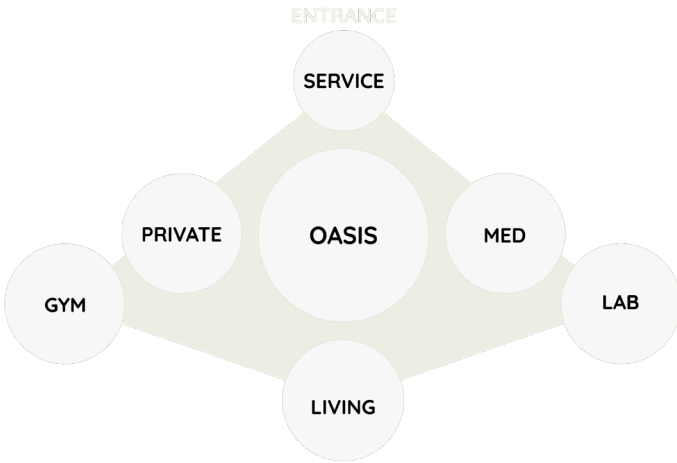


Natural interlocking
properties



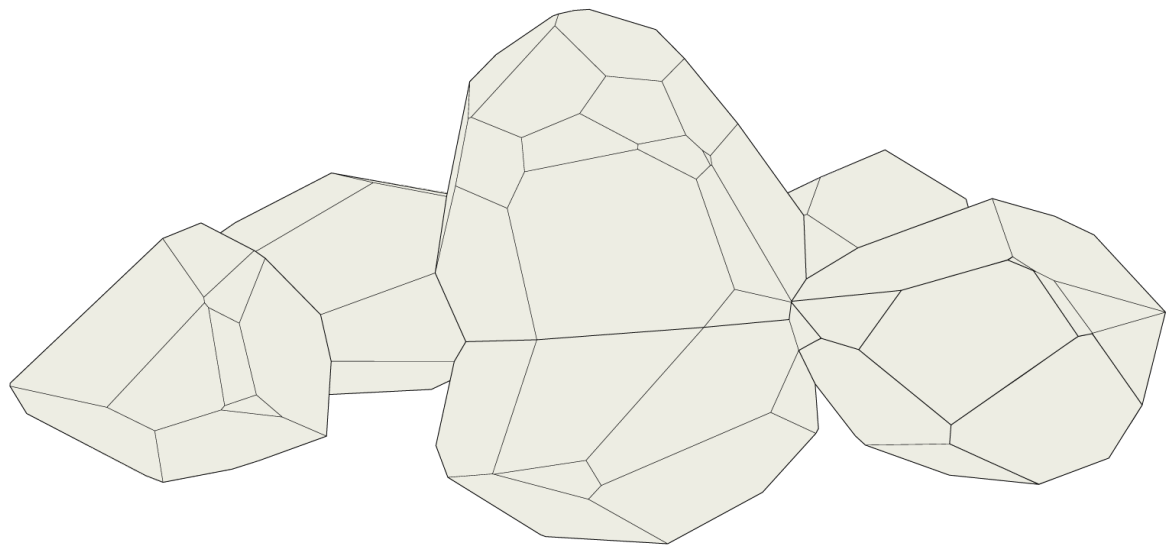
Flexible and modular
computational generation

Volume Generation

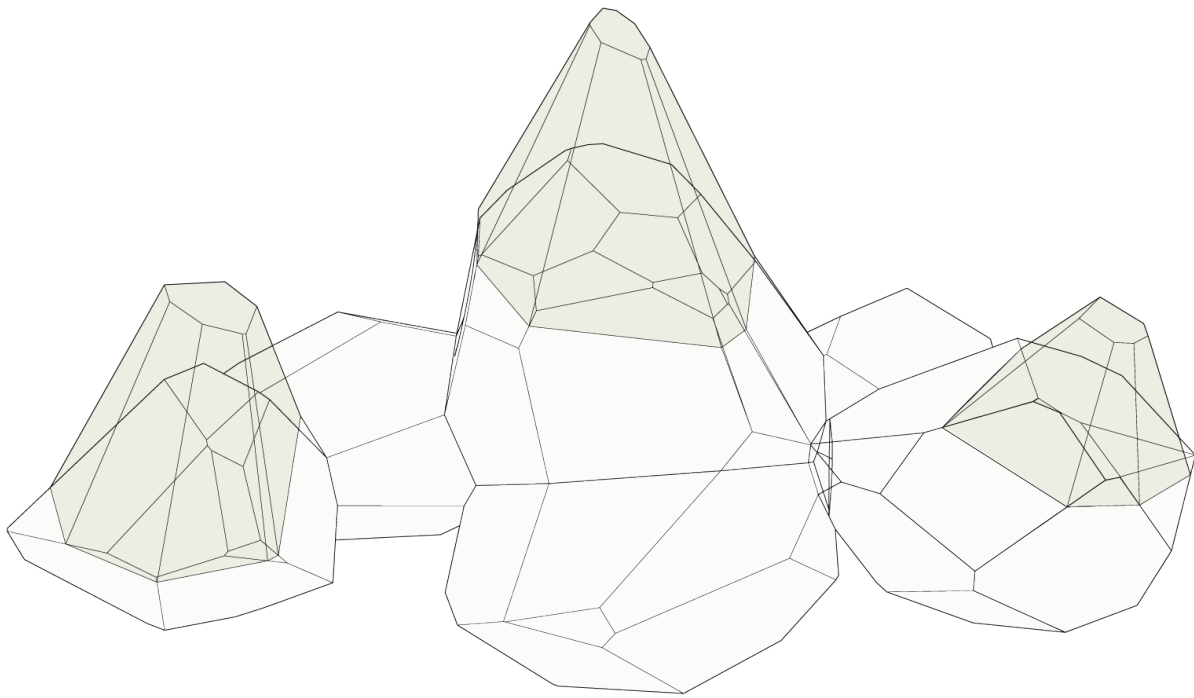


Start → End

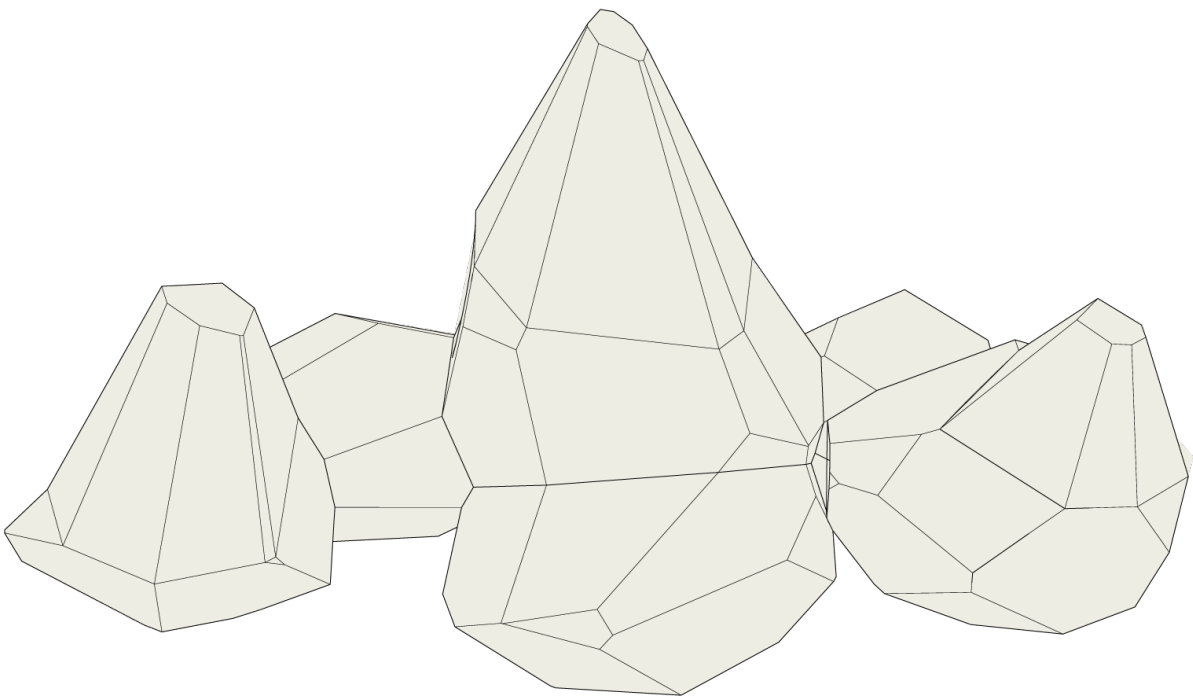
Final Design



Baked Volume



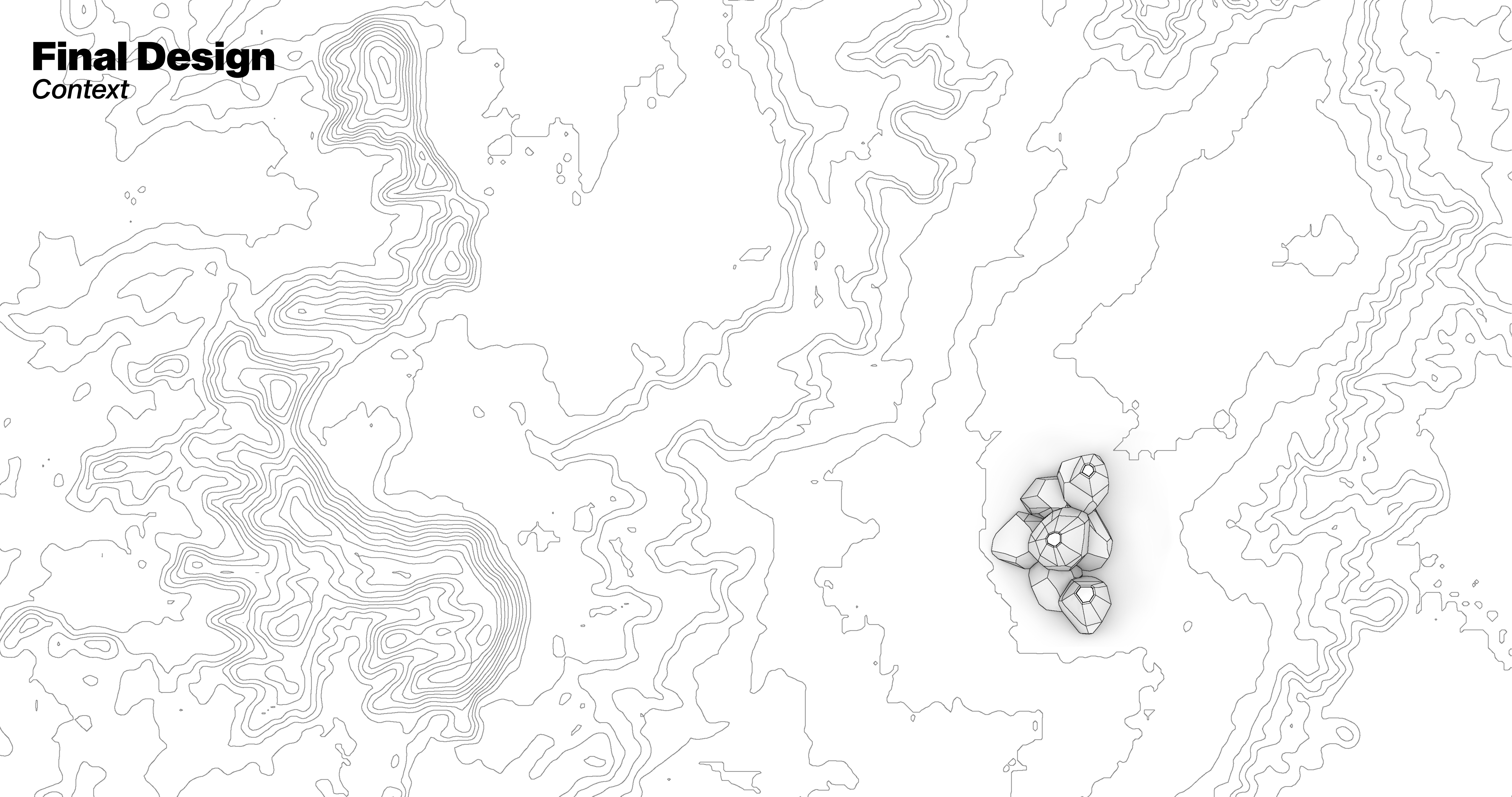
Addition of Cones



Final Volume

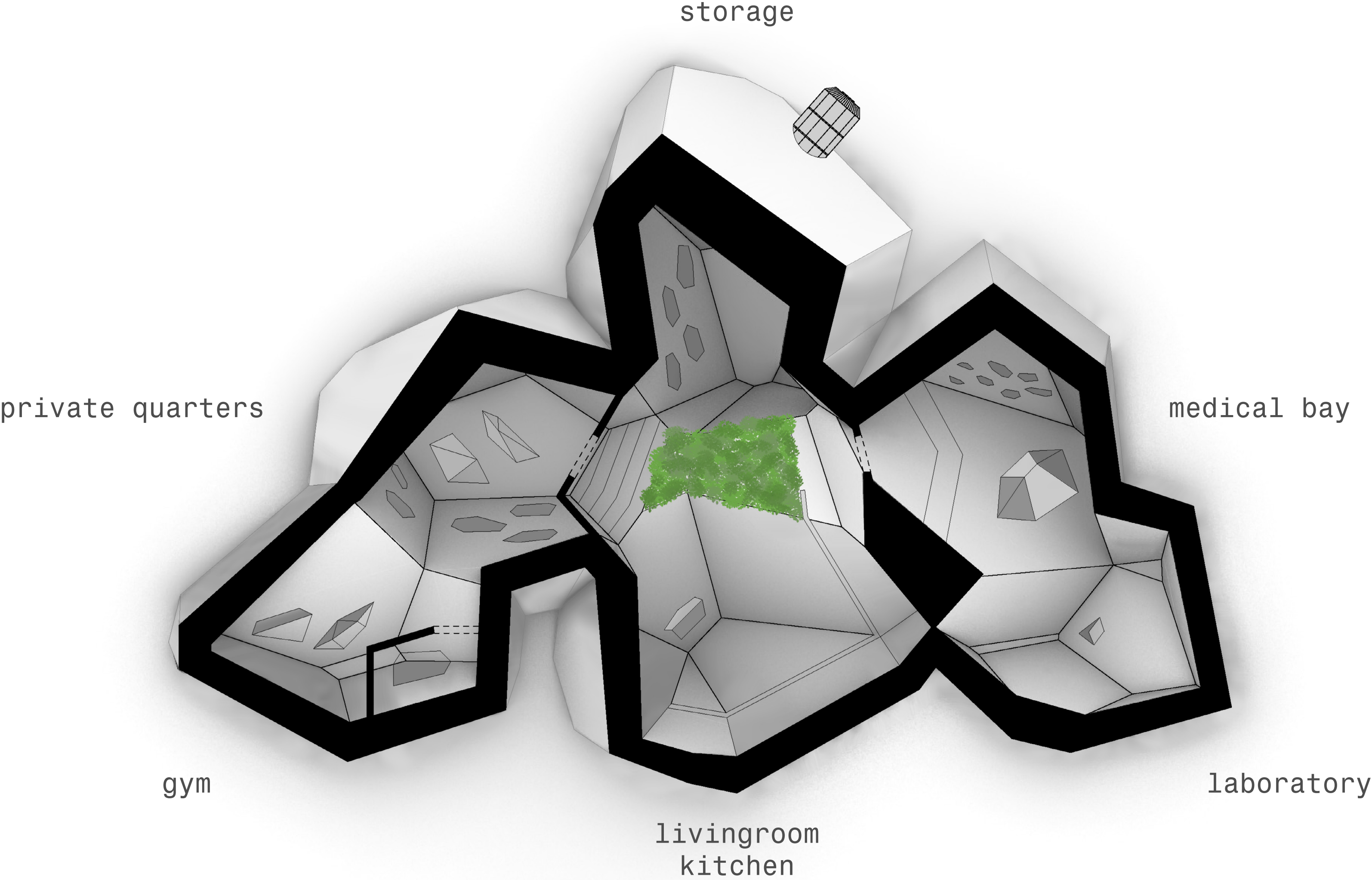
Final Design

Context

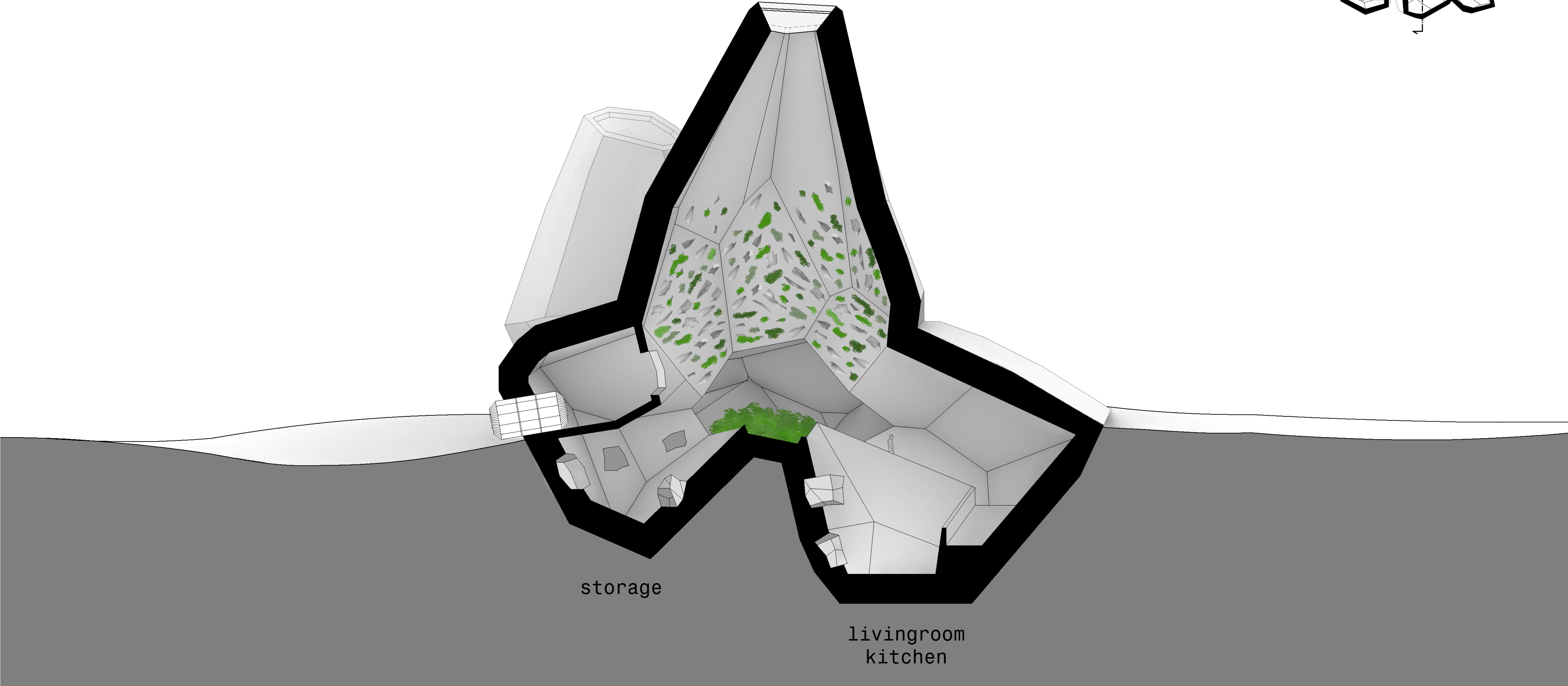
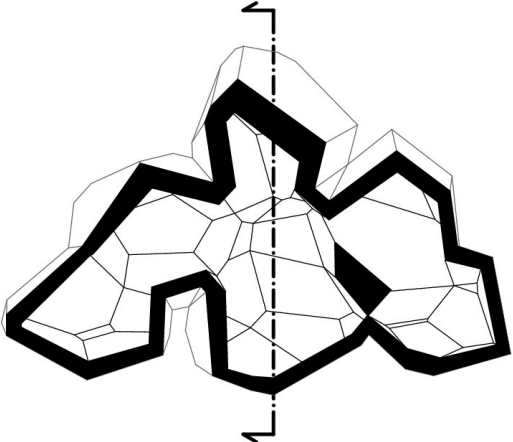


Final Design

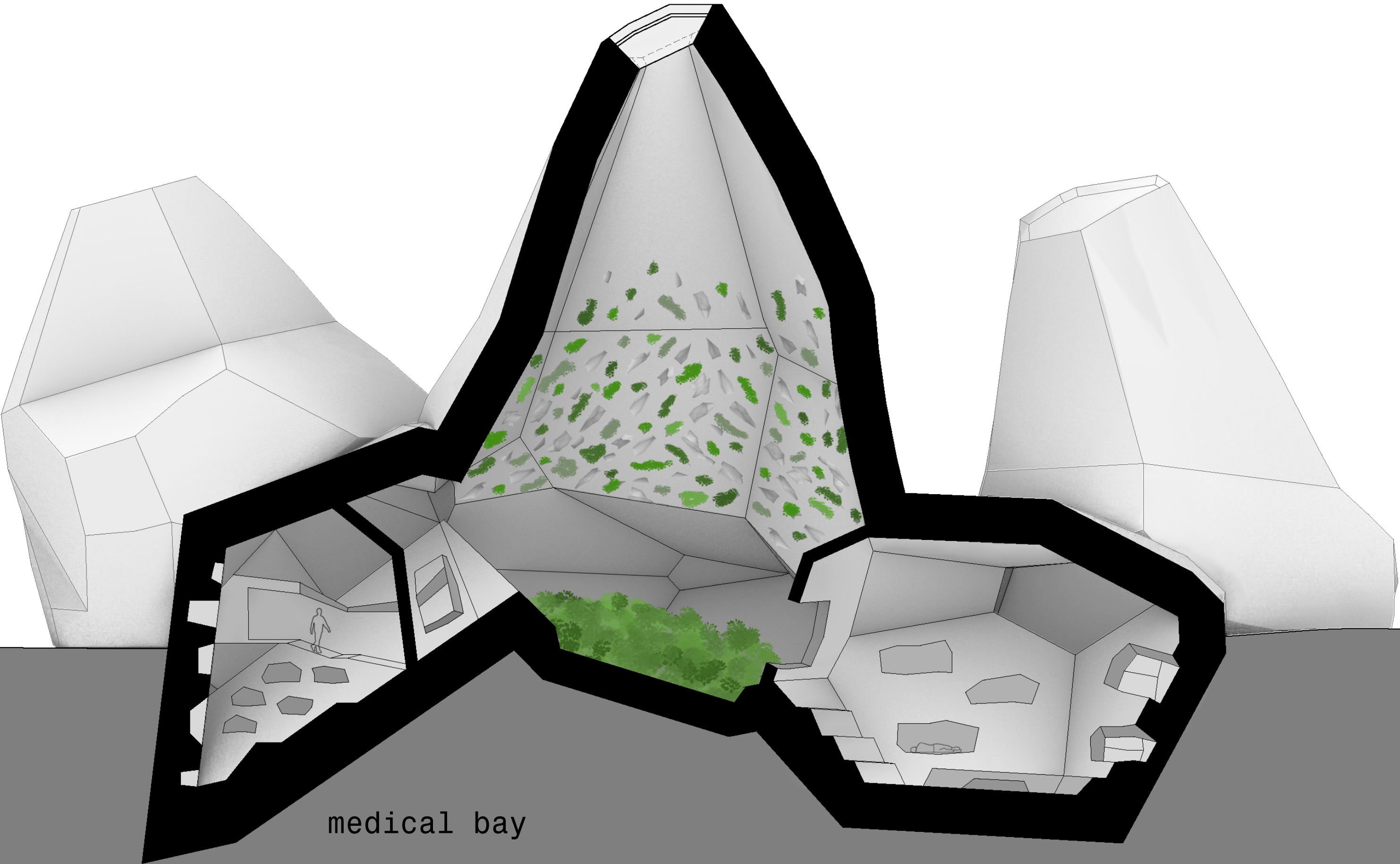
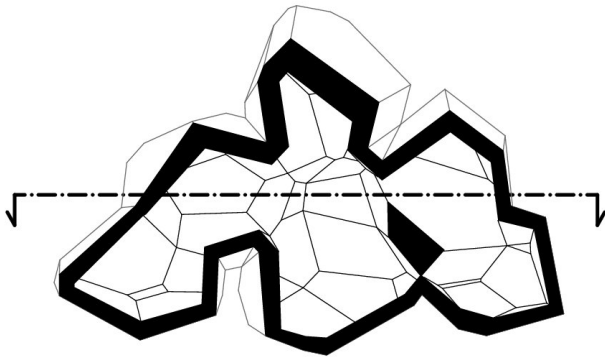
Plan



Final Design
Section AA'



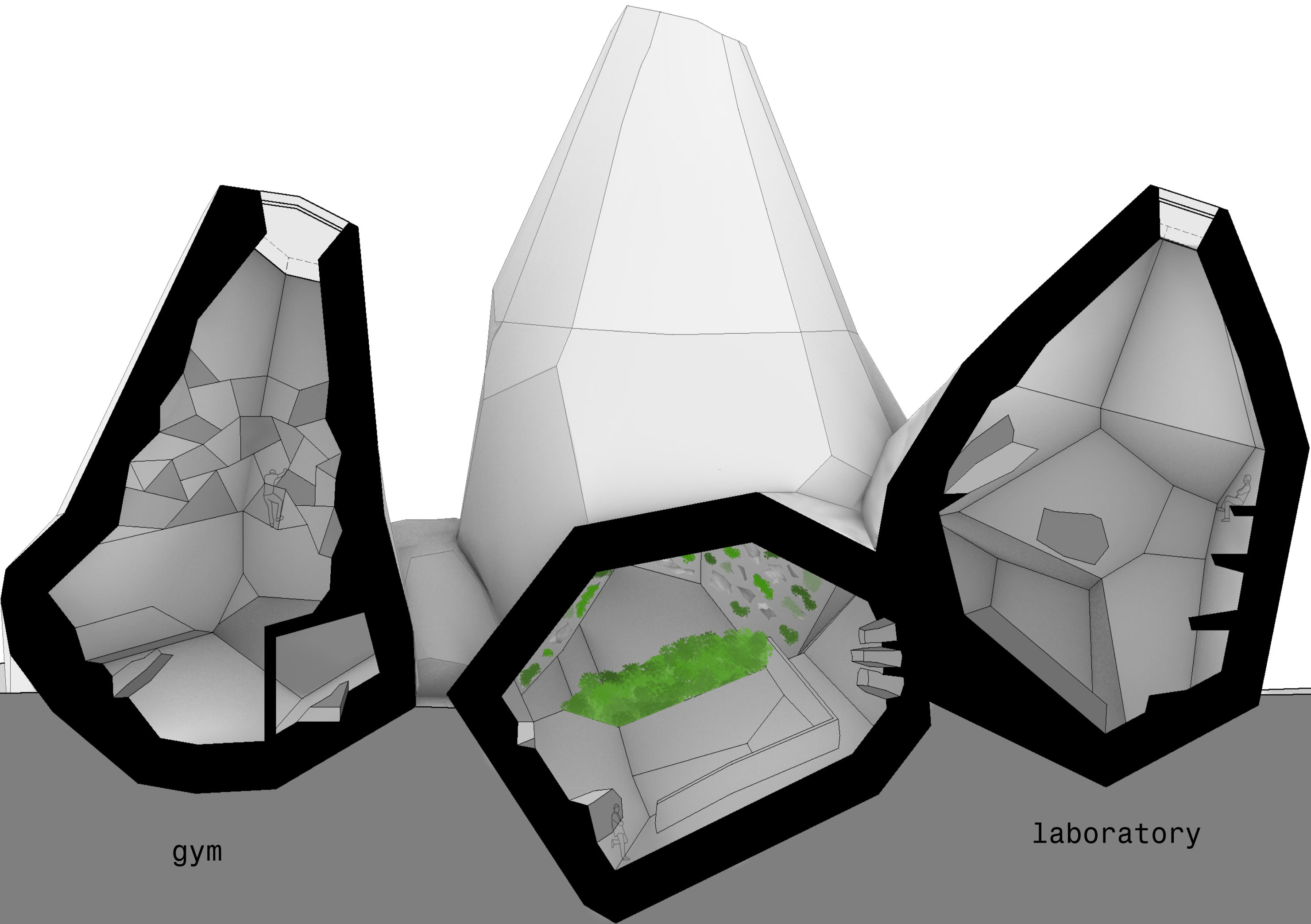
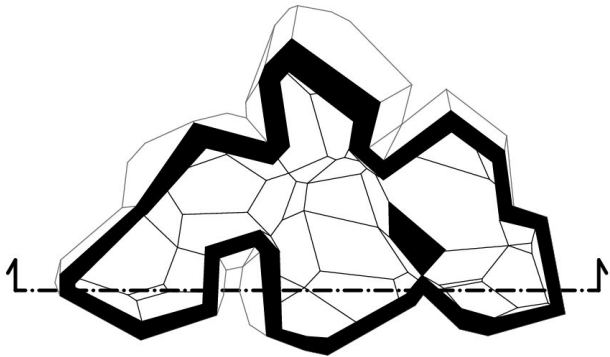
Final Design
Section BB'



medical bay

private quarters

Final Design
Section CC'

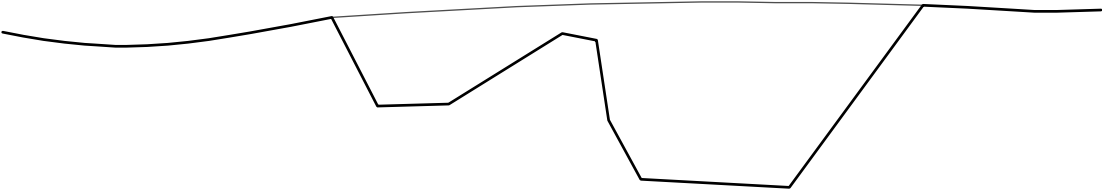


gym

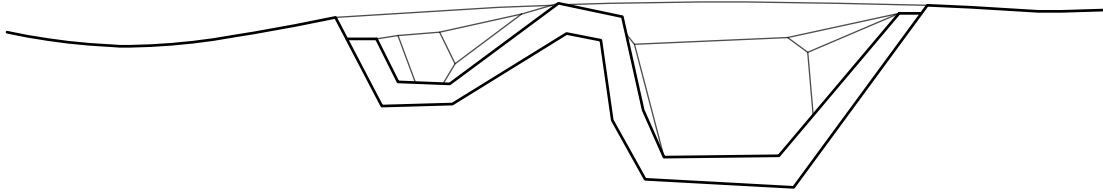
laboratory

livingroom
kitchen

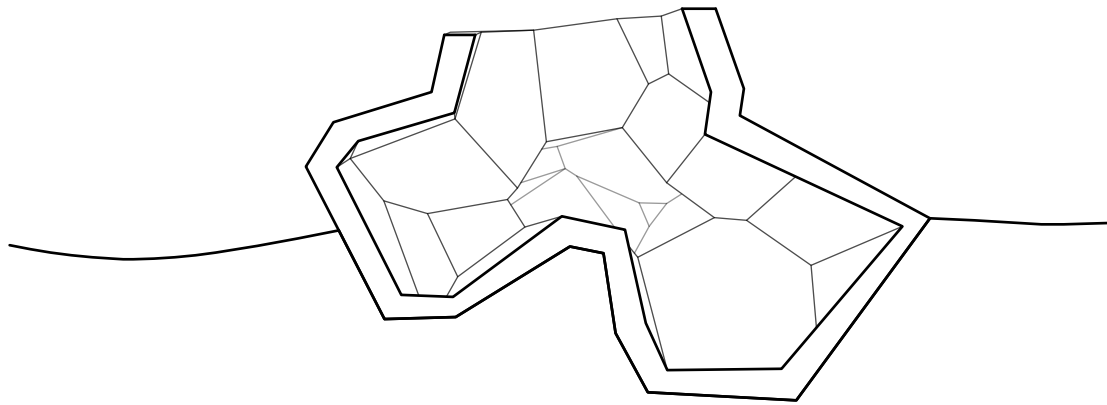
Construction Process



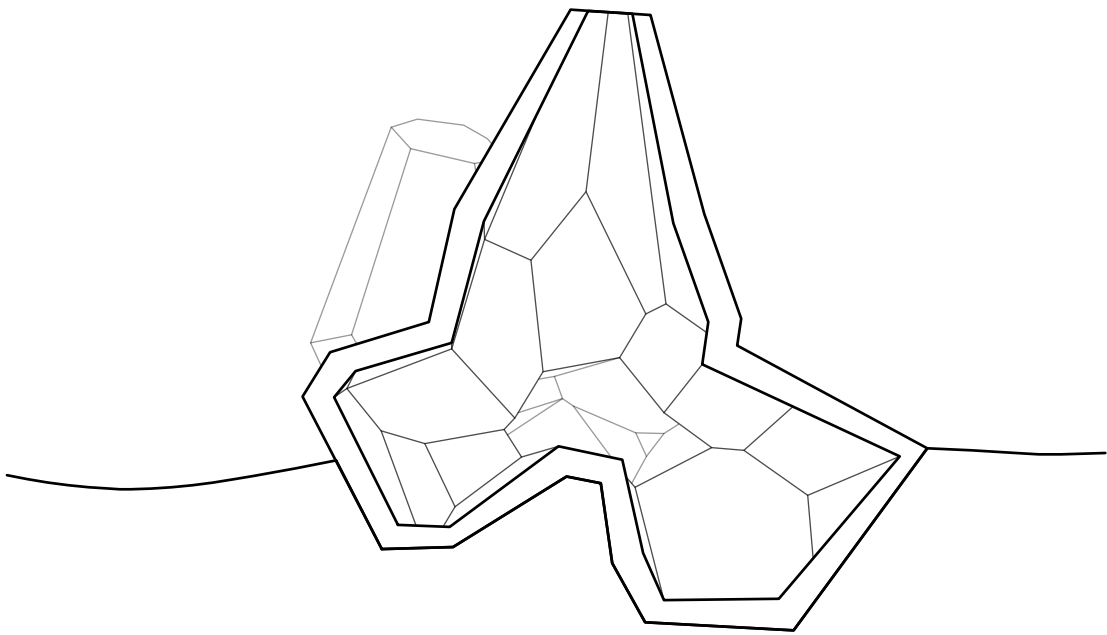
Excavation



Base construction

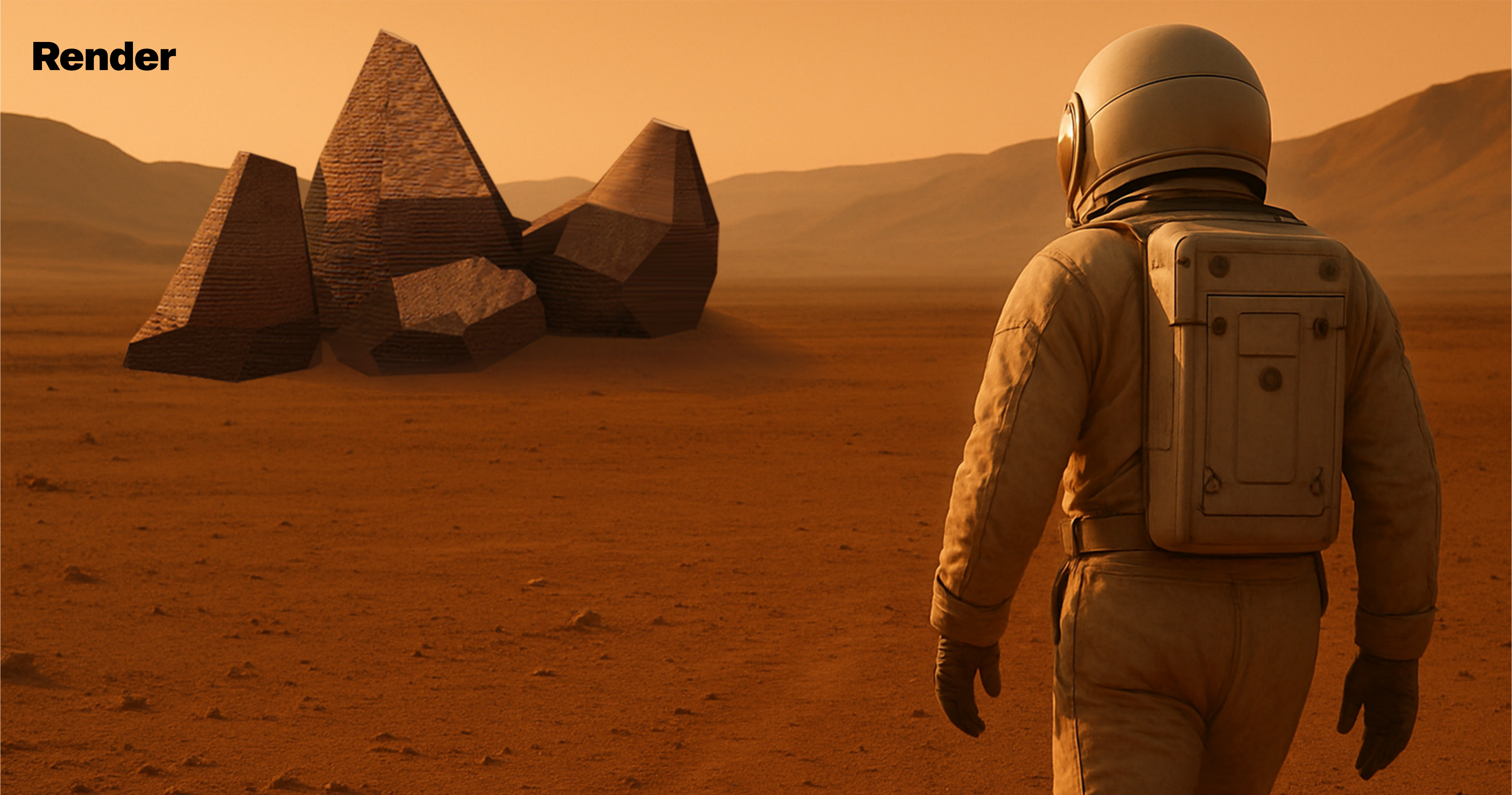


Wall construction



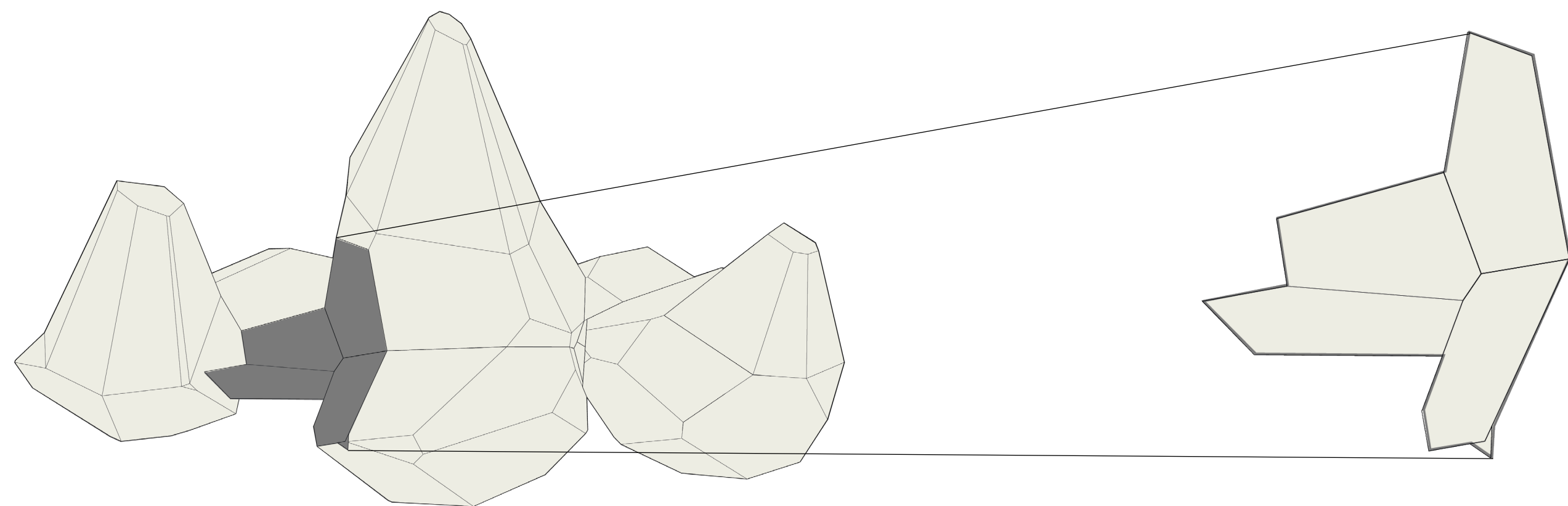
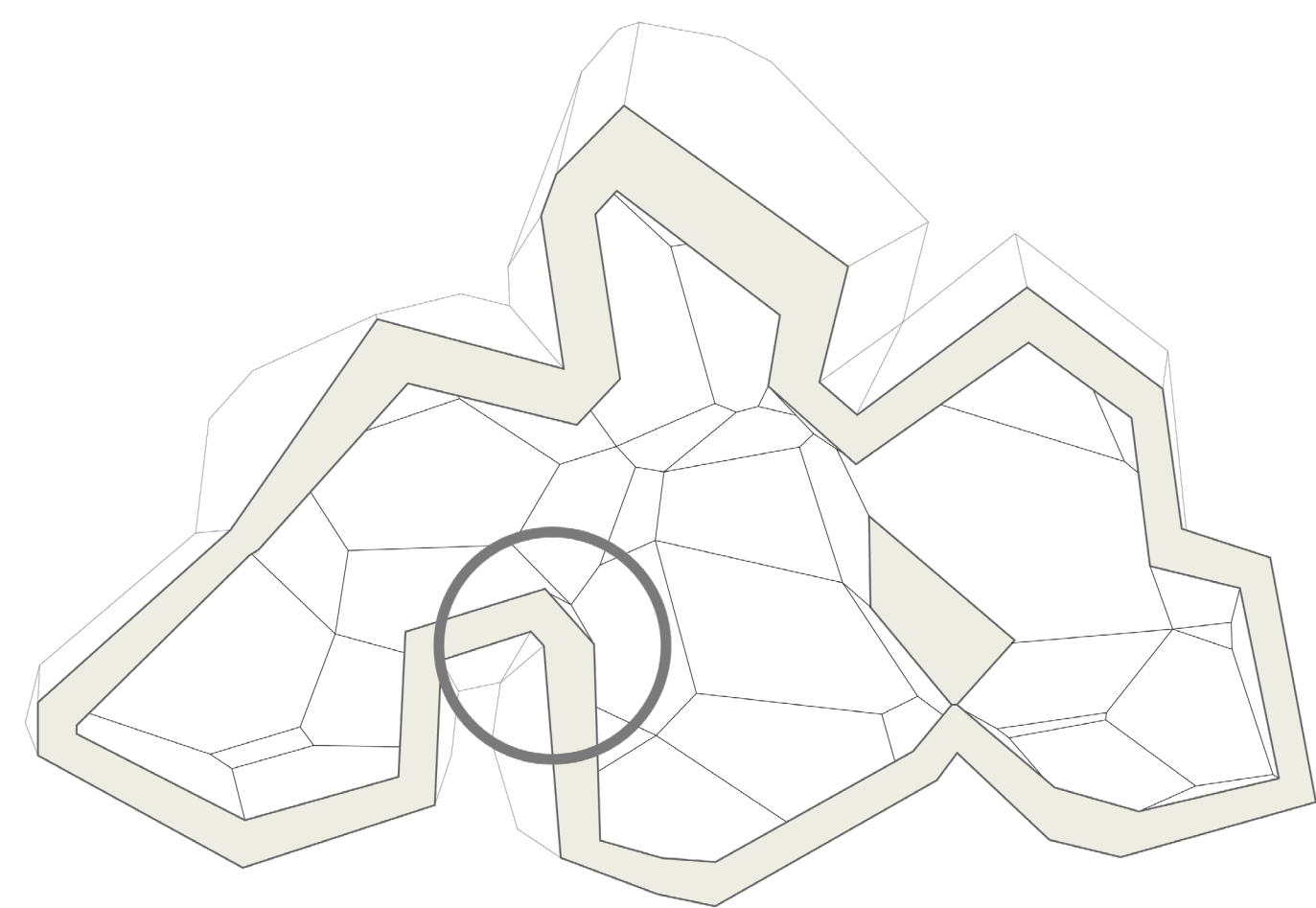
Completed

Render

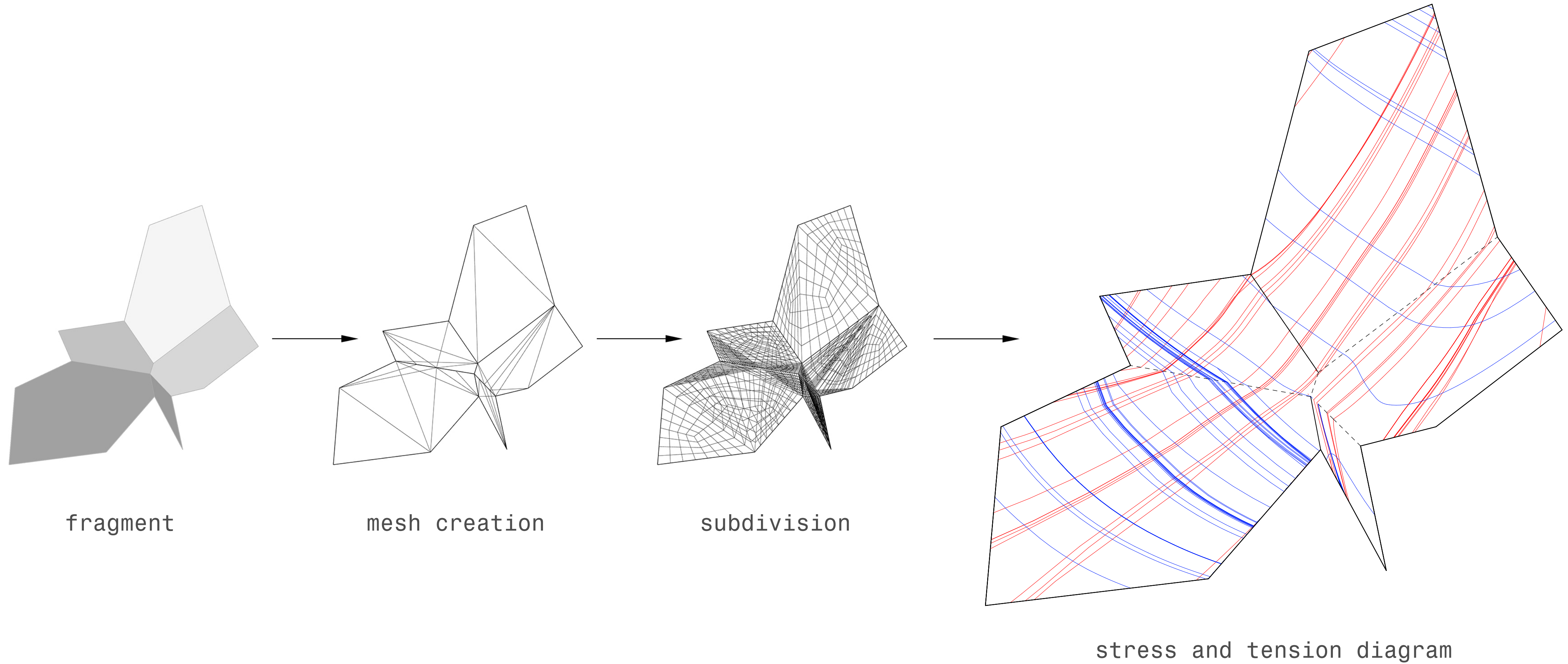


D2RP

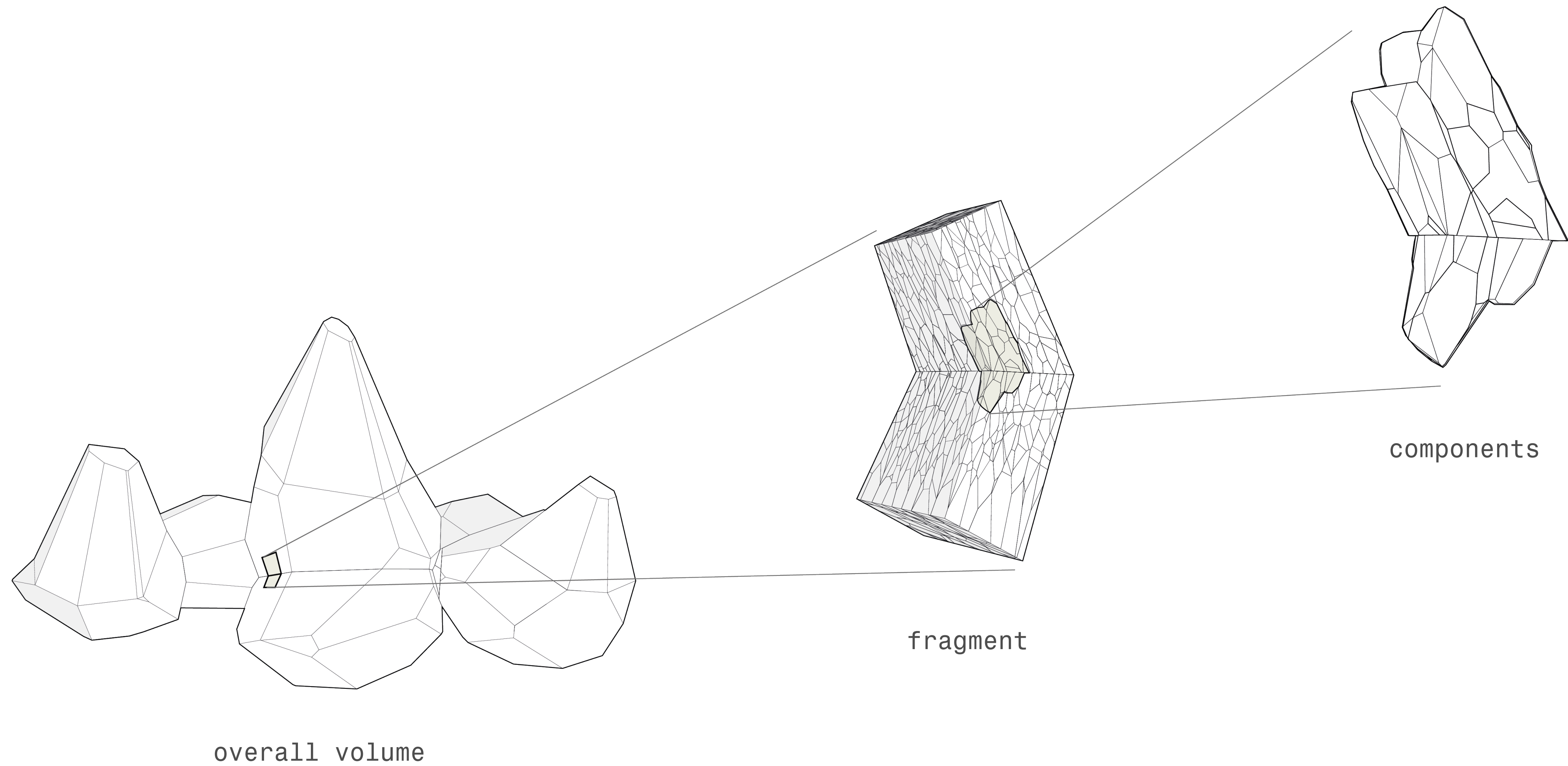
Fragment Selection



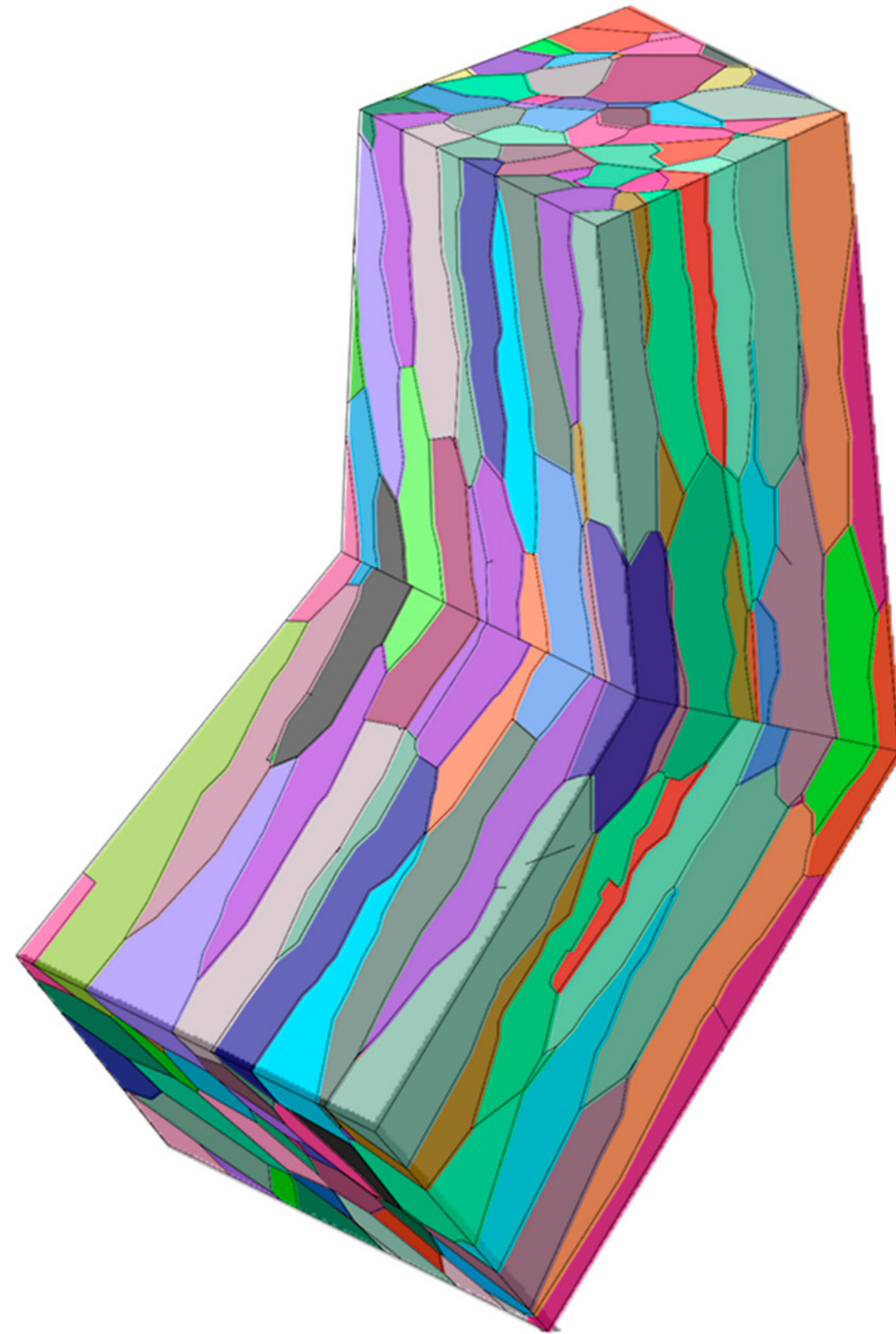
Fragment Structural Analysis



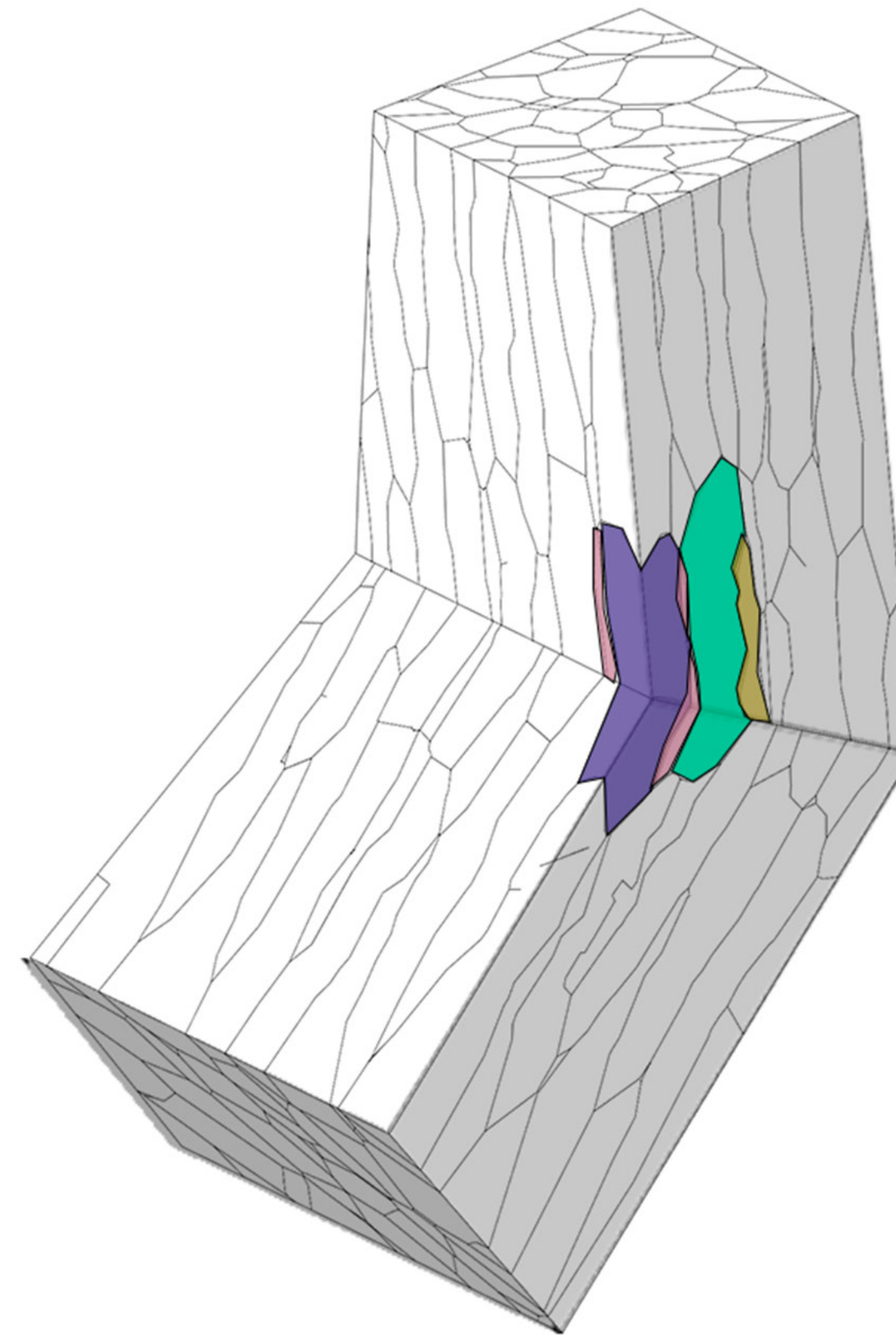
Components Selection



Components Breakdown

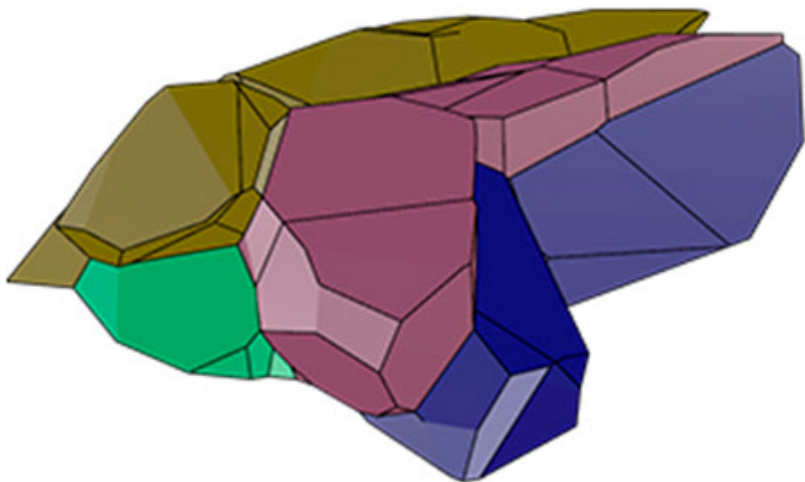


Chosen fragment

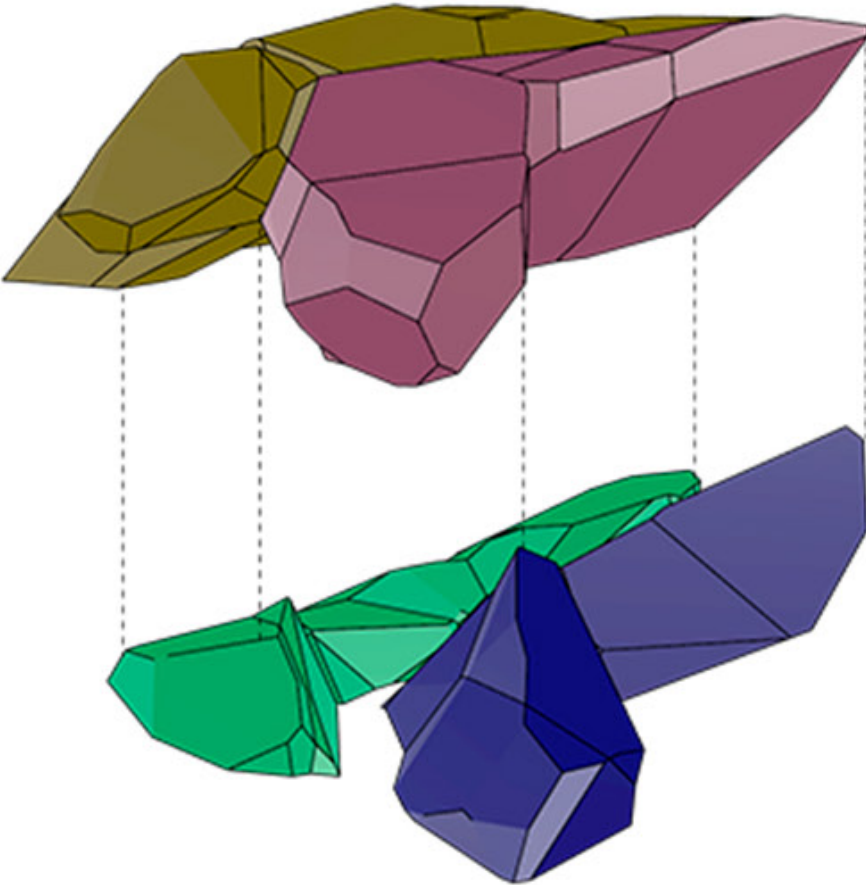


Chosen components

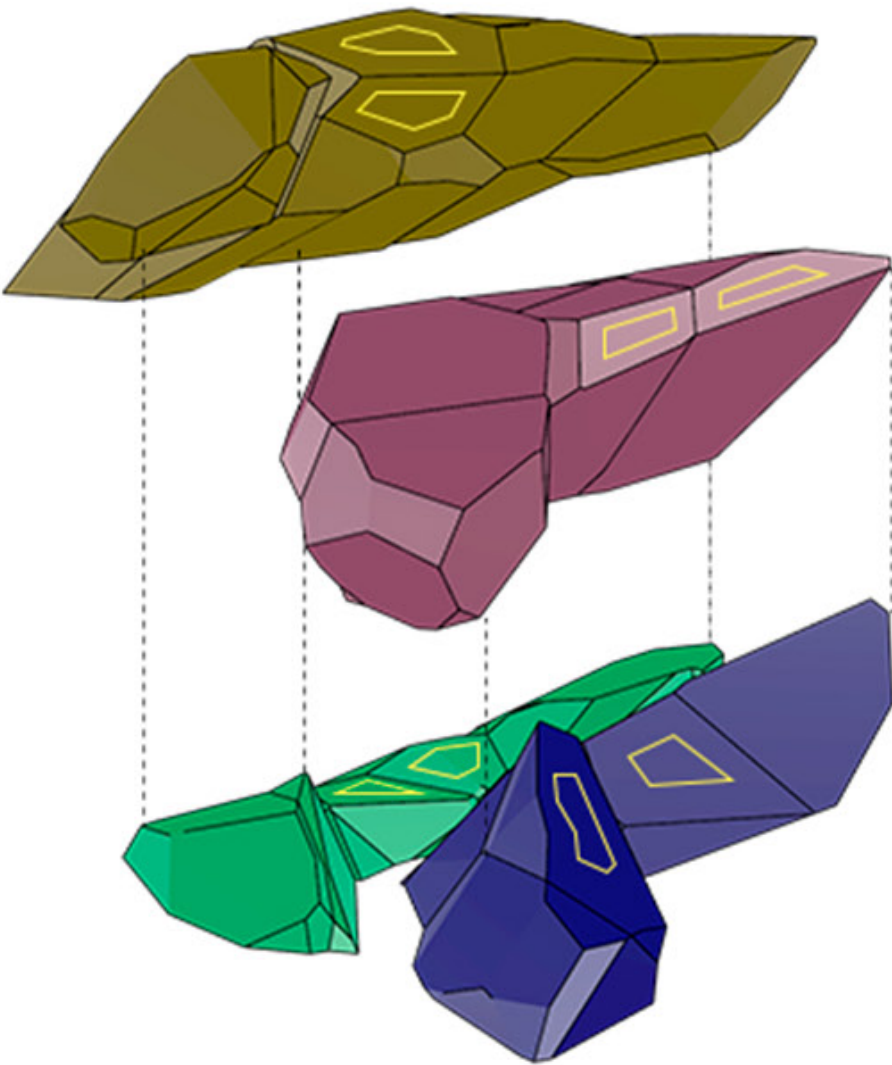
Components Assembly



Chosen components



Connection



Handholes

Fragment Design

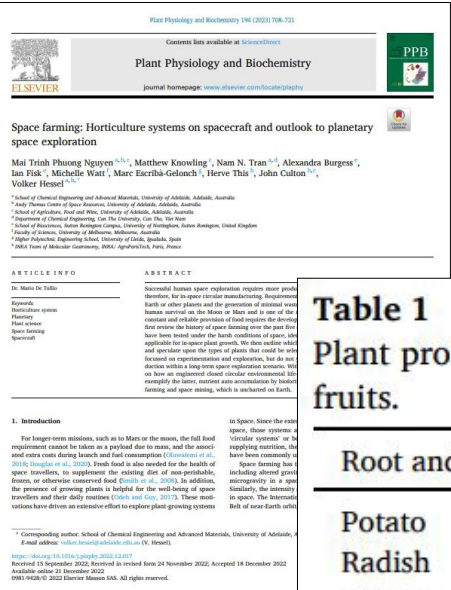
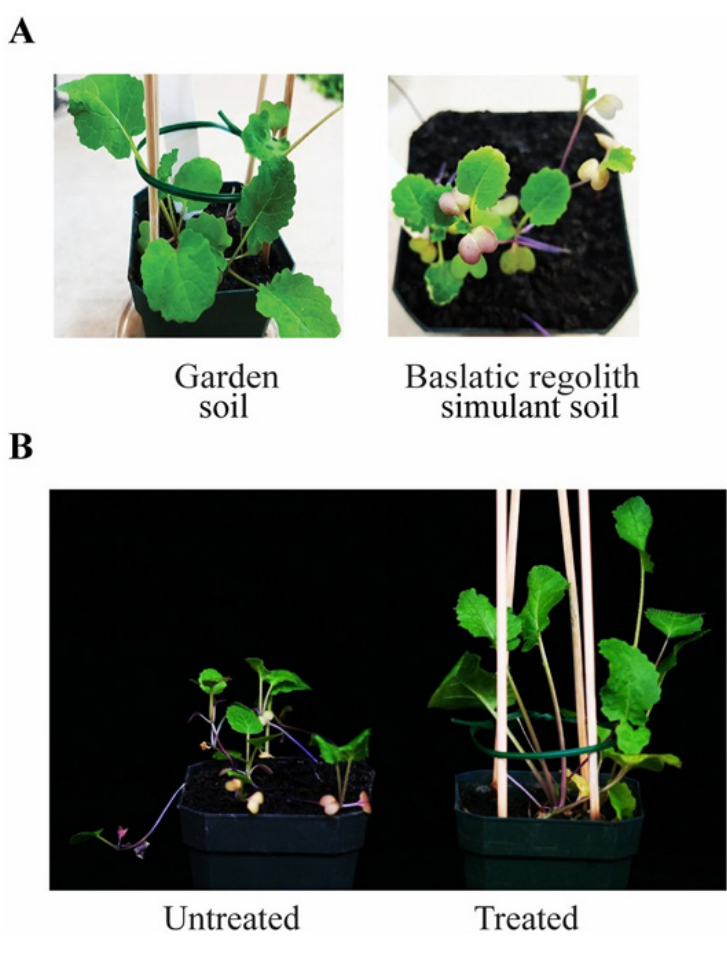
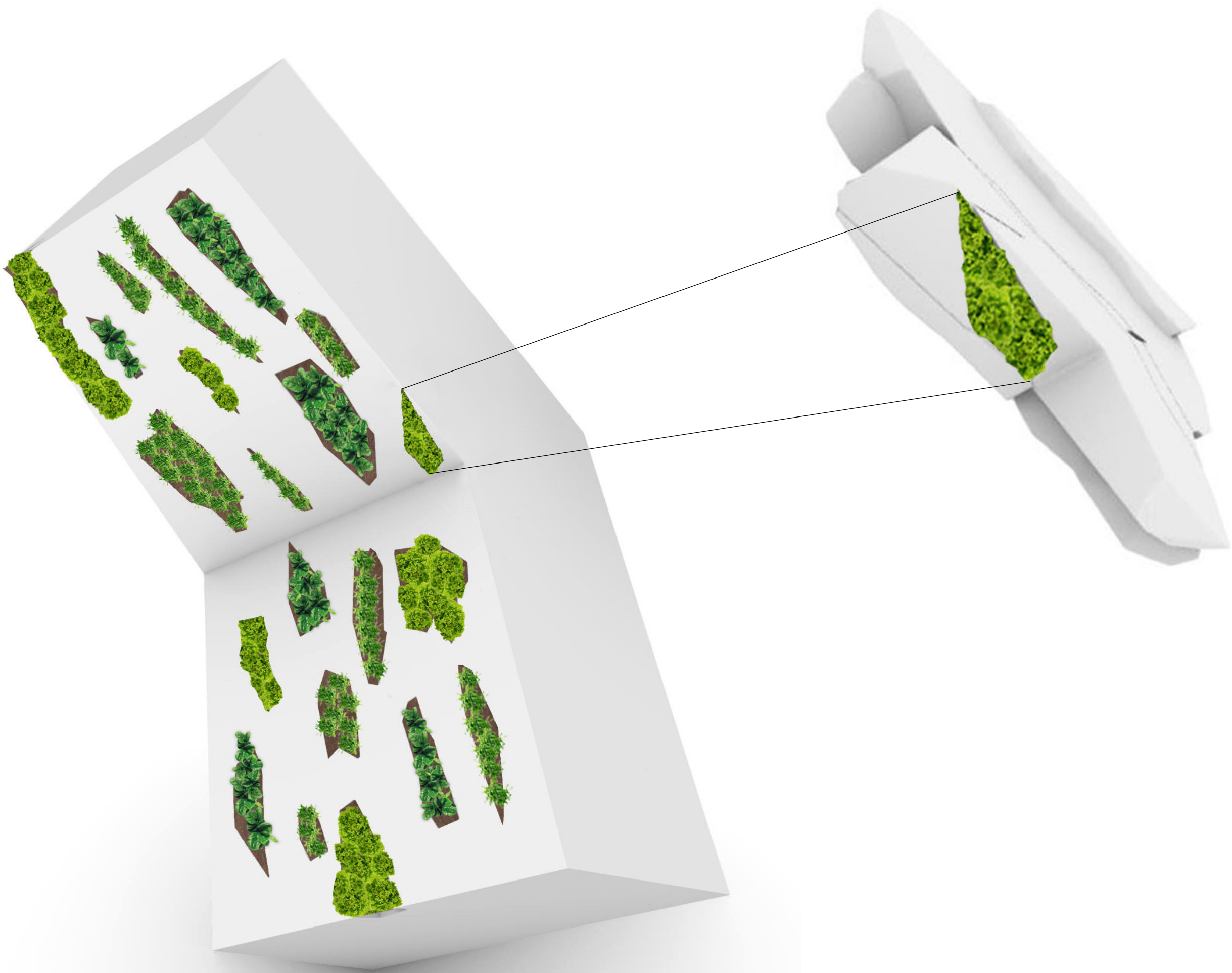


Table 1
Plant products grown in spacecraft: vegetables, cereals, nuts/seeds, herbs, and fruits.

Root and Tuber Vegetables		Brassica Vegetables	
Potato		Chinese Cabbage	
Radish		Cabbage	
Turnip		Mizuna	
Carrot		Kale	
Bulb Vegetables		Mustard	
Onion		Legume Vegetables	
Garlic		Lentil	
Fruiting Vegetables		Pea	
Tomato		Dwarf pea	
Pepper		Soybean	
Cucumber		Stem Vegetables	
Corn		Leek	
Leafy Vegetables and fresh Herbs		Fruits	
Lettuce and Salads		Strawberry	
Cress		Oilseeds	
Spinach		Flax	
Parsley		Cereals	
Chard		Wheat	
Swiss Chard		Barley	
		Rice	

Kasiviswanathan, P. et al. (2022) *Farming on Mars: Treatment of basalticregolith soil and briny water simulants sustains plant growth.*

Nguyen, M. T. P. et al. (2022) *Space farming: Horticulture systems on spacecraft and outlook to planetary space exploration.*

Sensor and Actuators

Pipes sensors

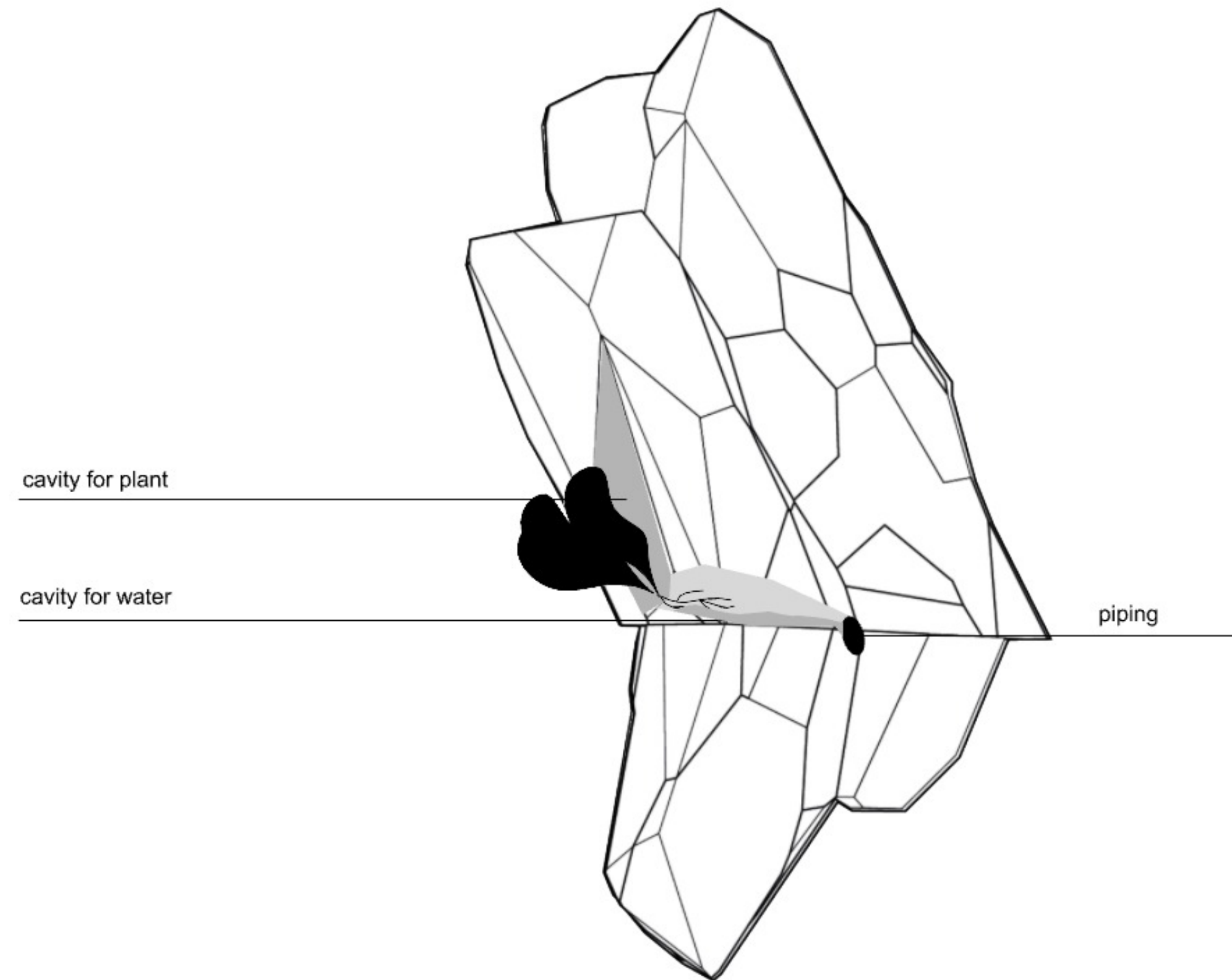
- pH sensor
- nutrient sensor
- temperature sensor
- water flow
- water level

Room sensors

- camera
- temperature sensor
- CO2 sensor

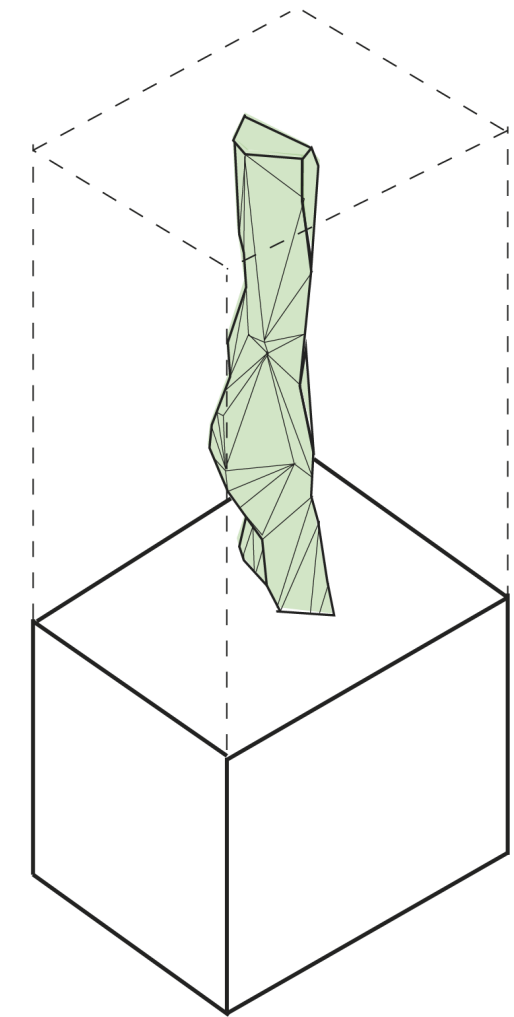
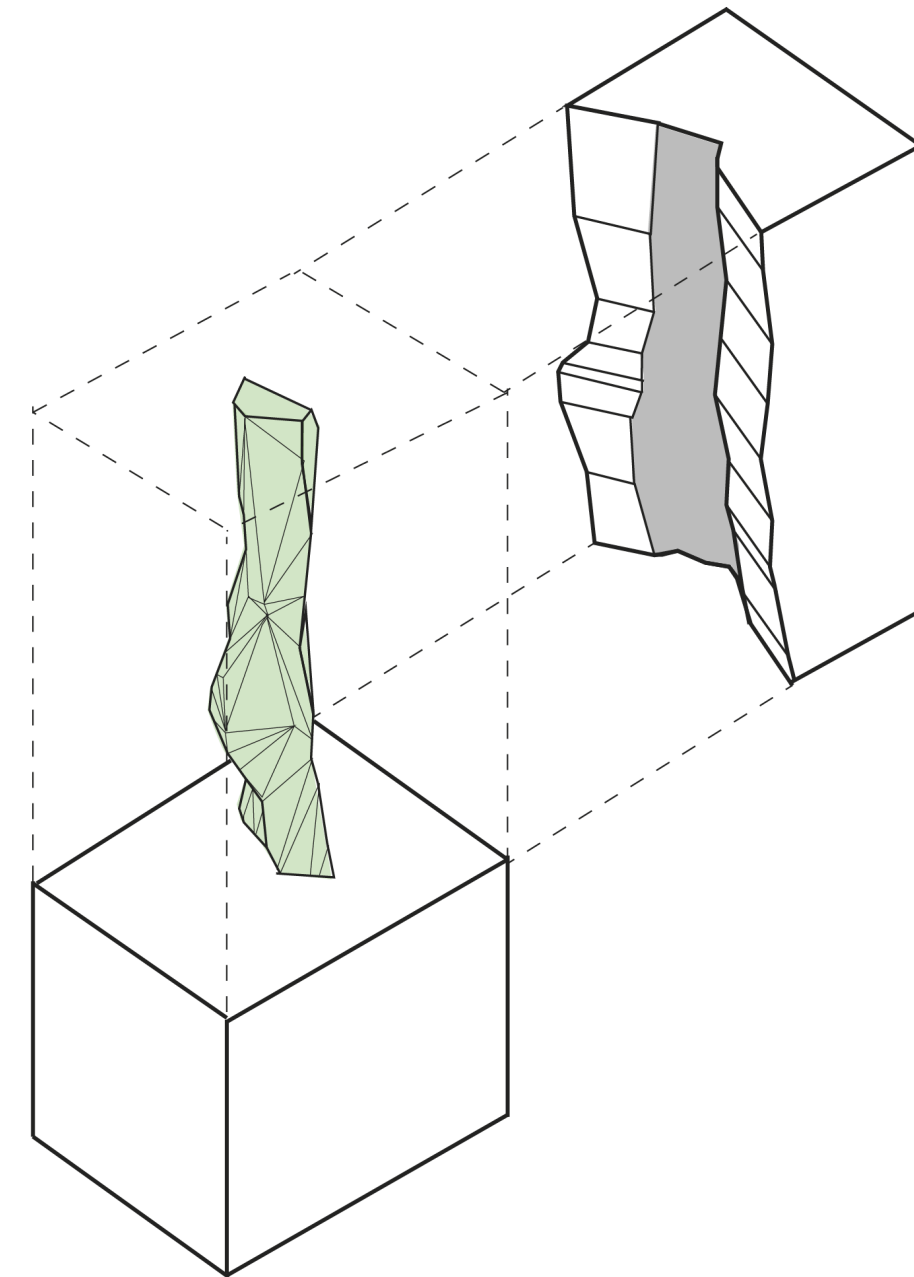
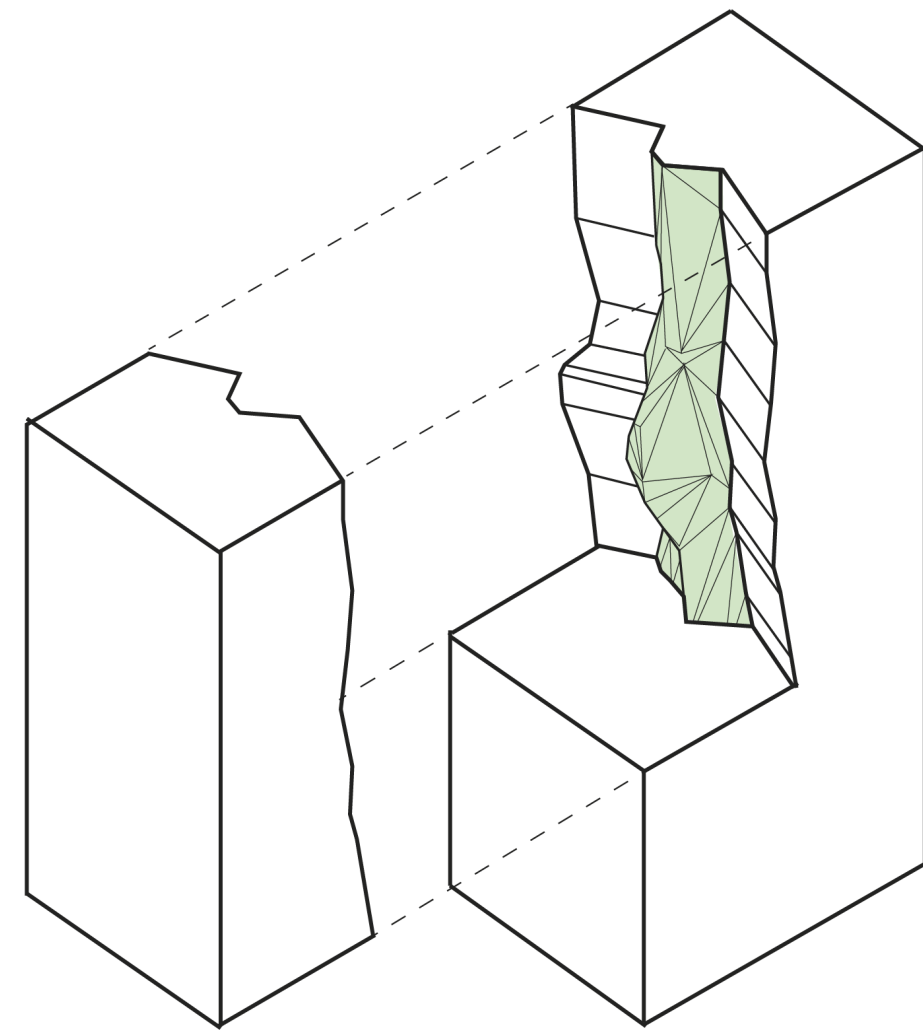
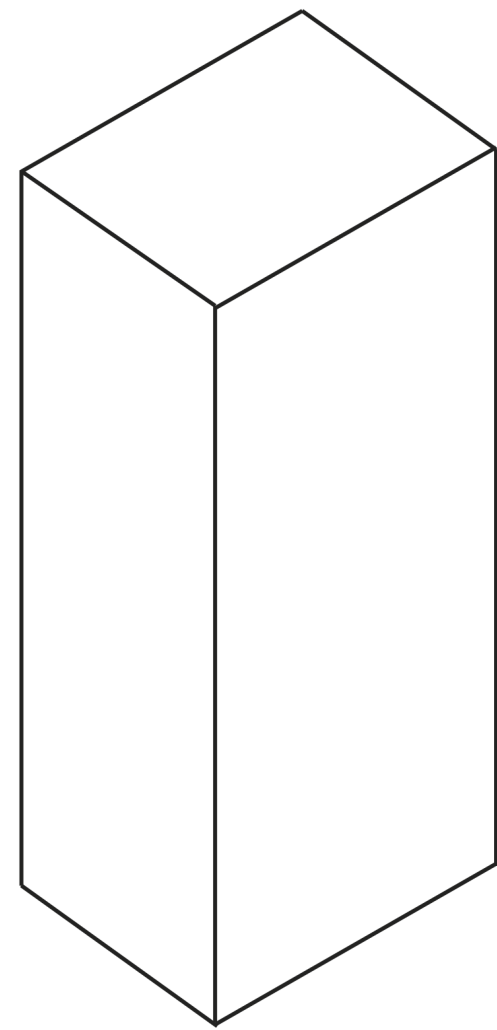
Actuators

- nutrient pump
- water pump
- pH acid pump

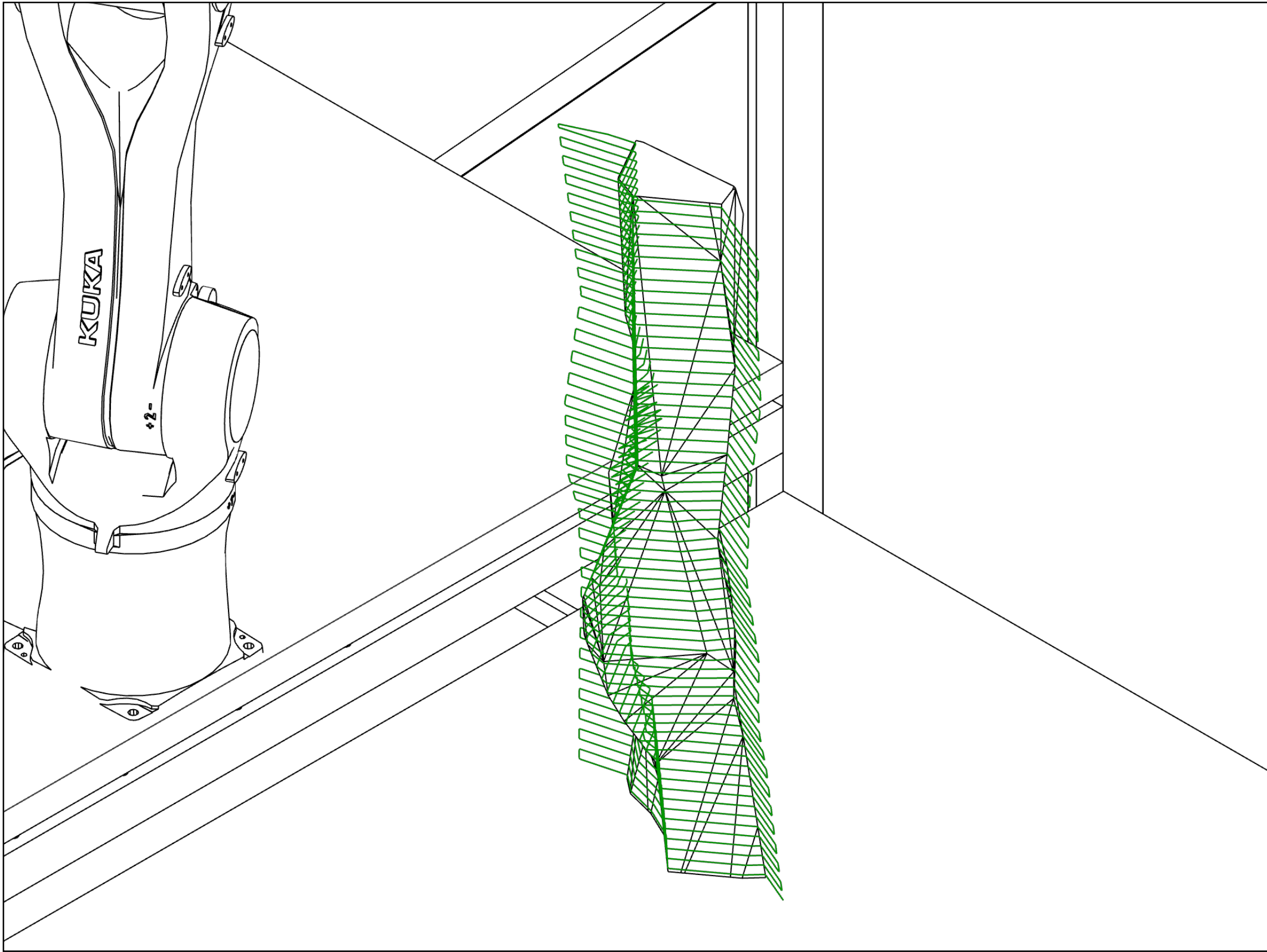


Production

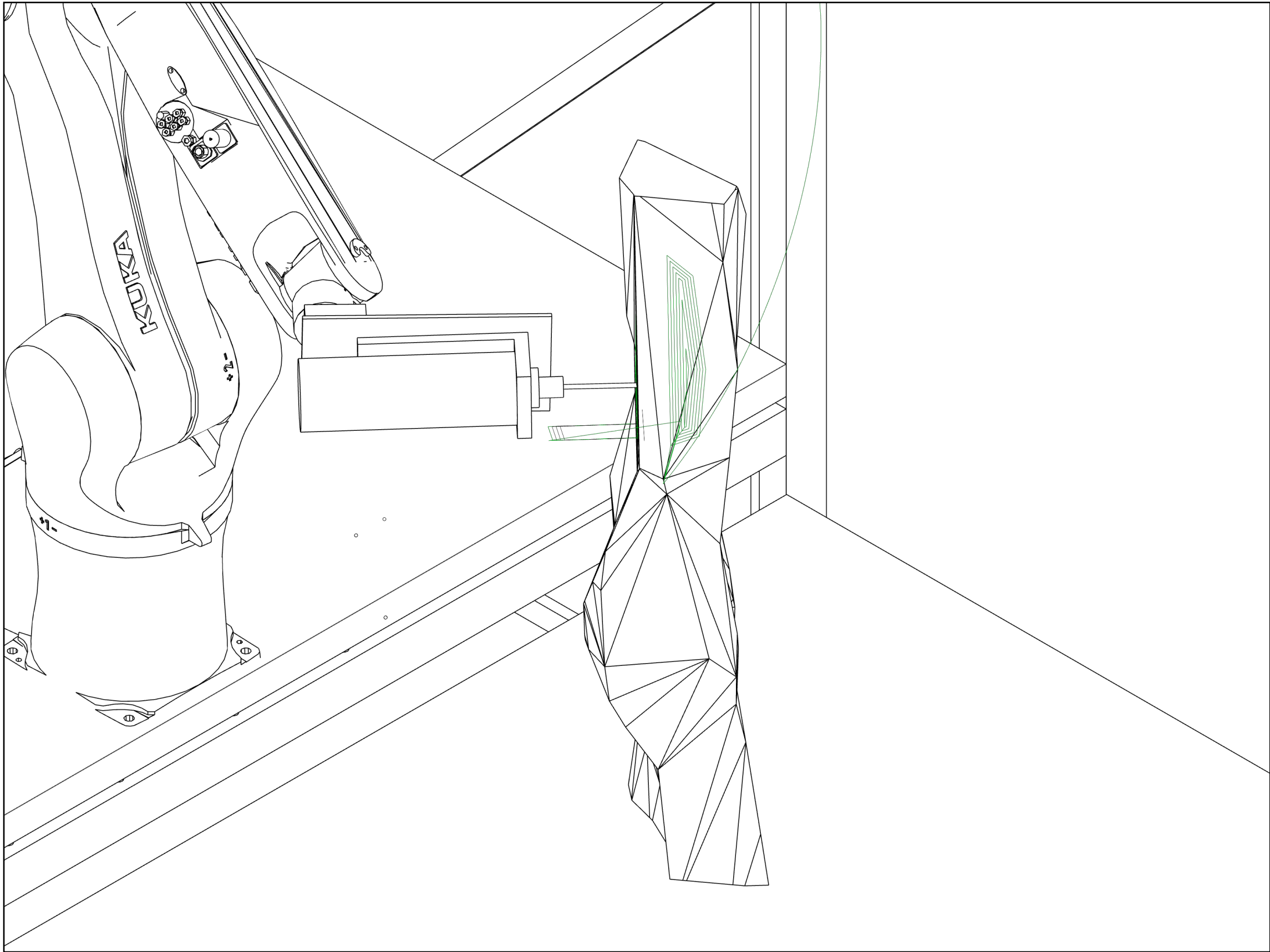
Fabrication



Fabrication



Milling Path



Milling handholes

Milling Process



HRI Assembly



Thank you

