

Moonshot+

Logbook

Robotic Lava Tube Mapping Mission

Sicily, Italy 18-24 November 2024

Mission Team

PhD/ MSc students: A.Hidding, A. Becoy, J. Jonathan, R.Tan, W. Chung (TU Delft); F. Romio (U. Ferrara); G. Calabrese (U D'Annunzio Pescara-Italy)

Tutors: H. Bier, A. Hidding, L. Peternel, R. Rajan (TU Delft)

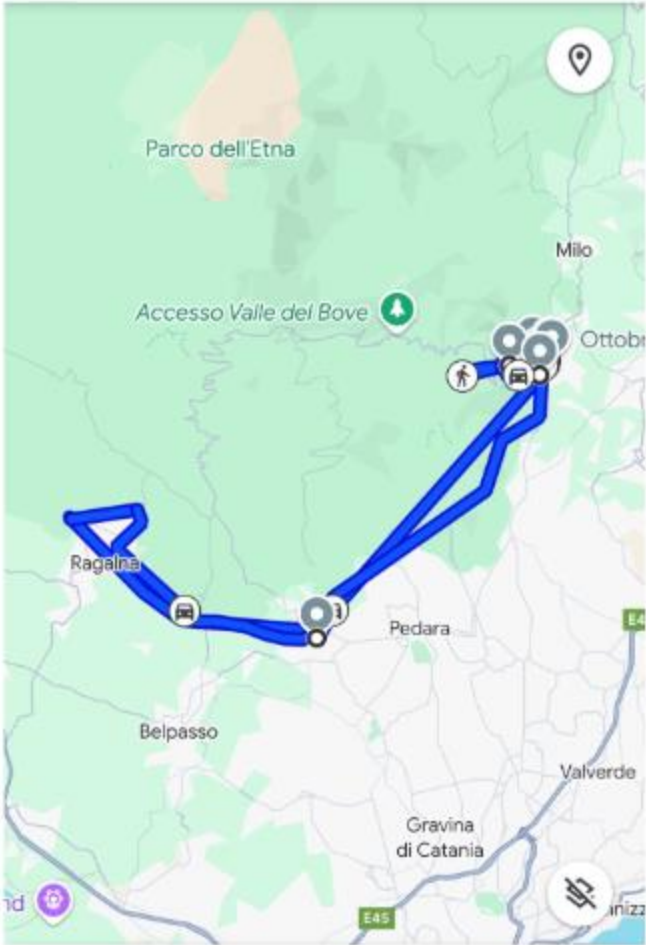
Collaborators: G. Priolo (CAI Catania), S. Rotolo (U Palermo), A. Licciardello (AN Nebrodi)

Partners: TU Delft Moonshot, TU Delft Space and Robotics Institutes, ESA, Erasmus+



Logbook Full Version

Route Day 1 – Exploration of Lava Tubes



- Donna Peppina dal 1924**
 Via Roma, 220, 95019 Zafferana Etnea CT, It...
 09:49 – 10:00
- Driving**
 1,3 km · 7 min
 10:00 – 10:07
- Parco Tematico Sicilia in Miniatura**
 Via Cassone, 114, 95019 Zafferana Etnea CT,...
 10:07 – 10:33
- Walking**
 2,9 km · 2 hrs 1 min
 10:33 – 12:34
- Driving**
 3,4 km · 8 min
 12:34 – 12:42
- Etna Miele**
 Via Pietro Nenni, 2, 95019 Zafferana Etnea C...
 12:42 – 12:52
- Driving**
 19 km · 51 min
 12:52 – 13:42
- Missing visit**
 13:42 – 17:17

- Driving**
 8,1 km · 18 min
 17:17 – 17:35
- PuntoICS Pizzeria Ristorante American ...**
 Via Etna, 93/95, 95030 Nicolosi CT, Italy
 17:35 – 18:28
- Missing travel**
 12 km · 33 min
 18:28 – 19:00
 + Add travel
- Via Eugenio Montale, 23**
 Via Eugenio Montale, 23, 95019 Zafferana Et...
 19:00 – 20:15
- Walking**
 550 m · 5 min
 20:15 – 20:20
- Visited Ottobrata Zafferanese?**
 Via Roma, 323, 95019 Zafferana Etnea CT, It...
 20:20 – 21:08
 ✓ Yes Edit

Monday, 18 November 2024



Moonshot+

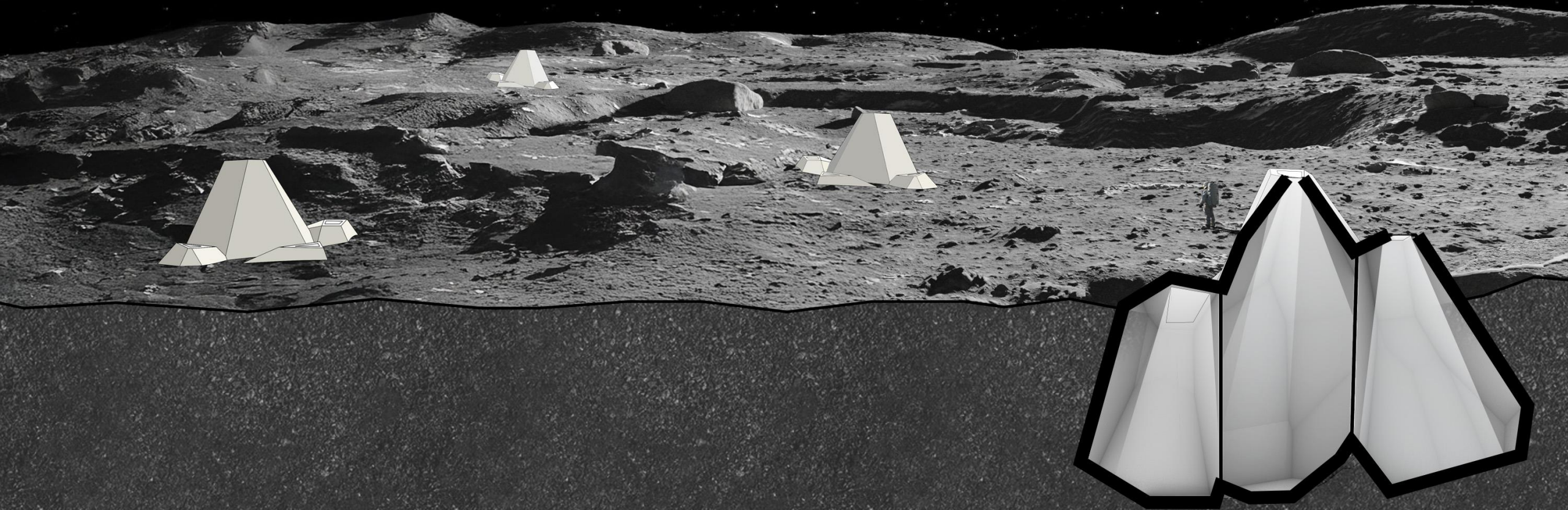
TU Delft lava tube mission in Sicily | 18-24 November 2024

[Video link: Moonshot+ TU Delft lava tube mission in Sicily2024](#)

TuliPOD

Exploring Clustered Compounds on Moon

Workshop 1



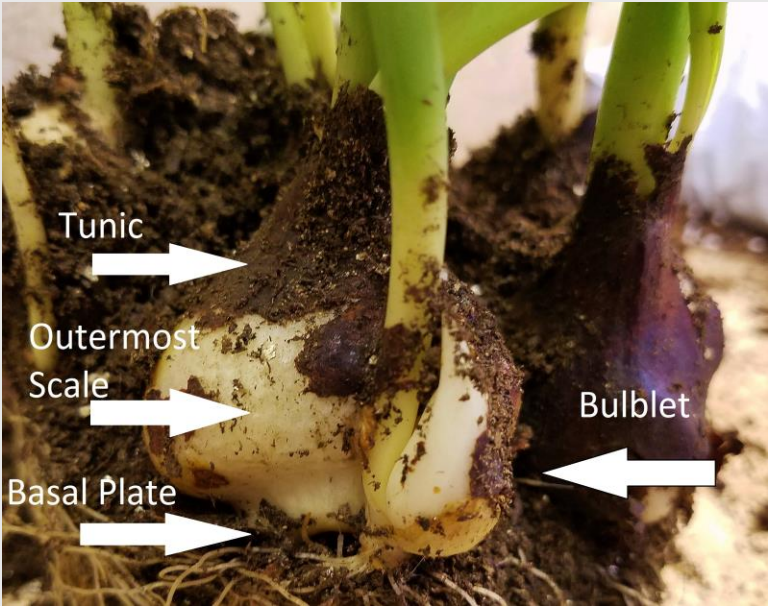


Concept

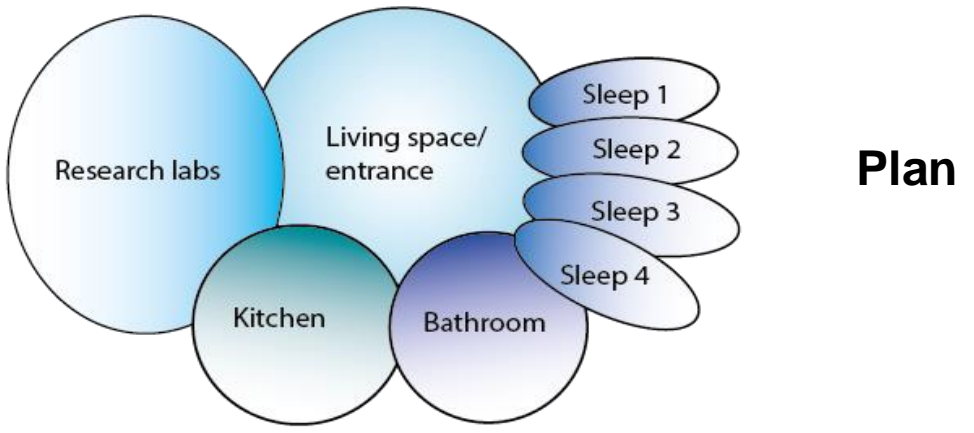
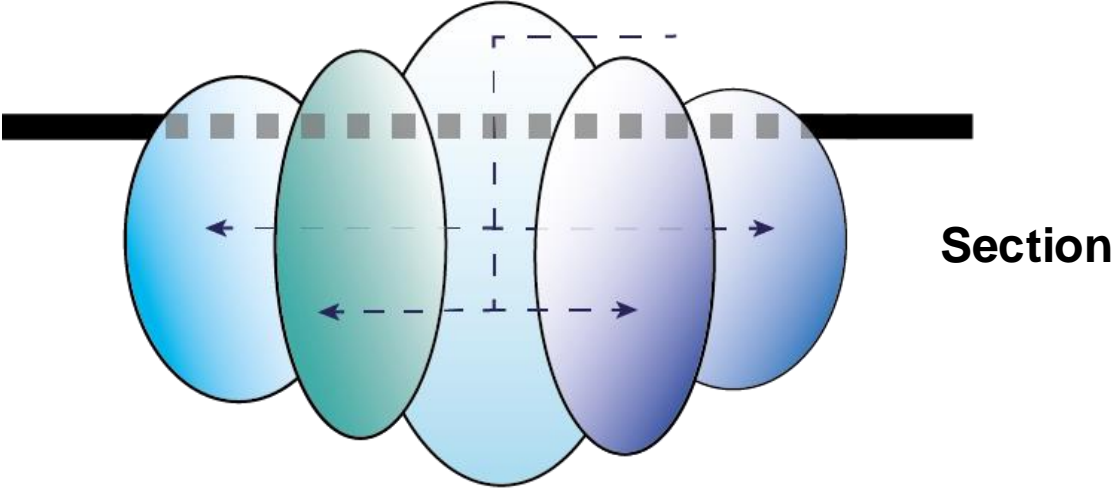
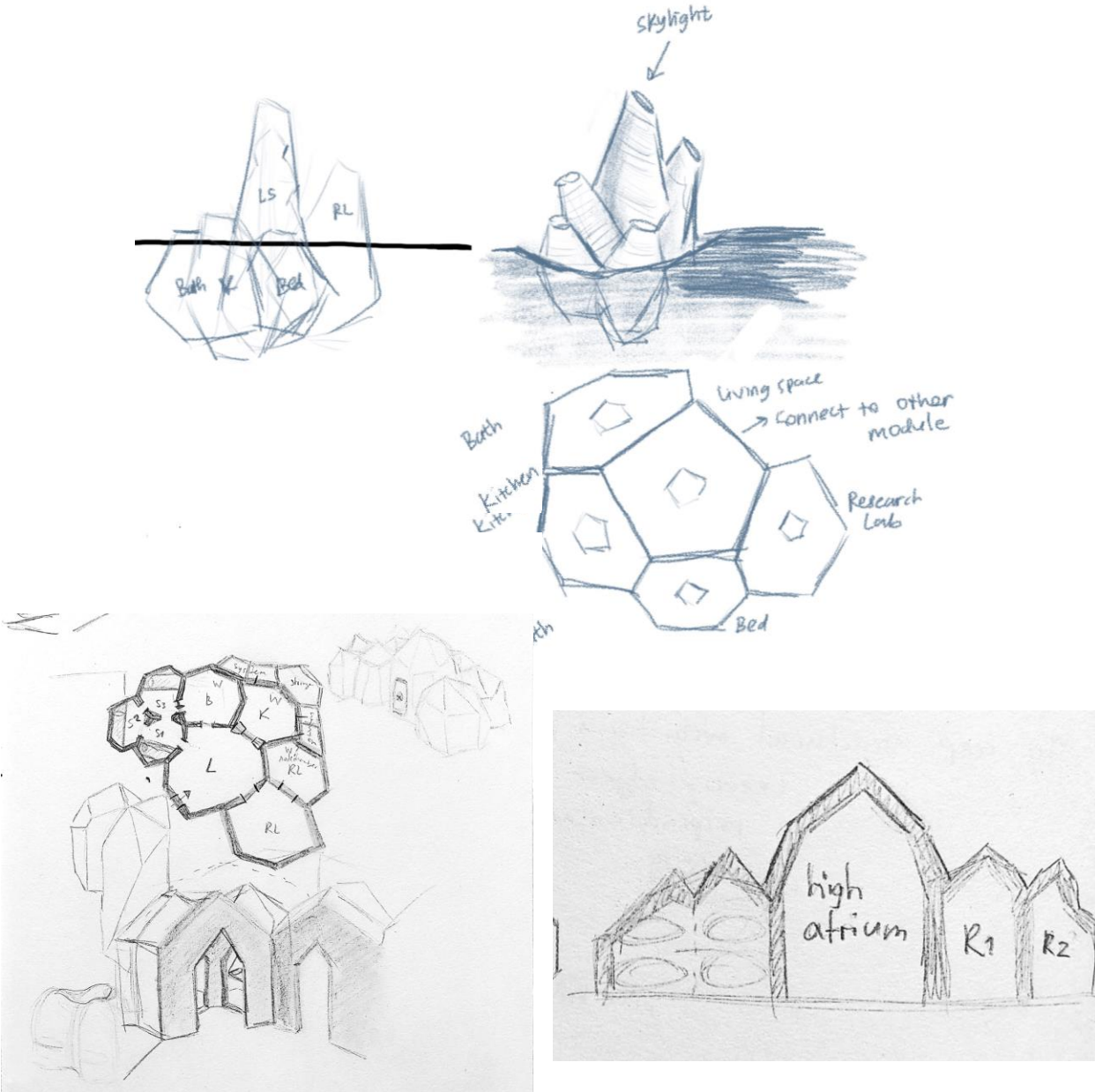
Voronoi geometry in nature



Underground formation in nature: Tulip bulbs



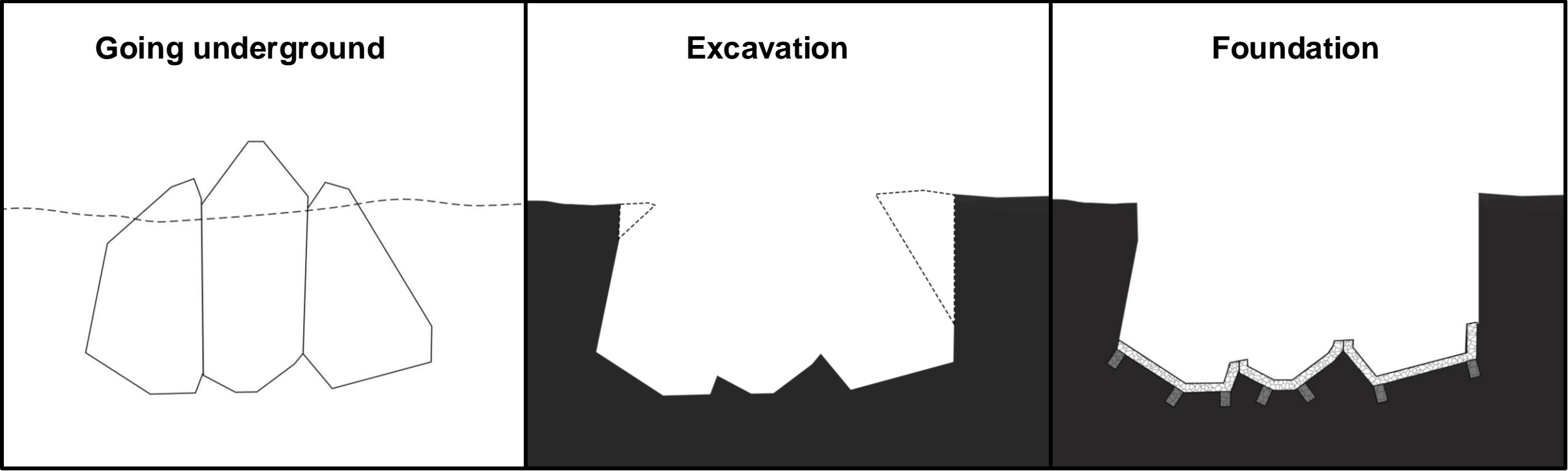
Synthesis tulip bulblets concept | Concept diagrams



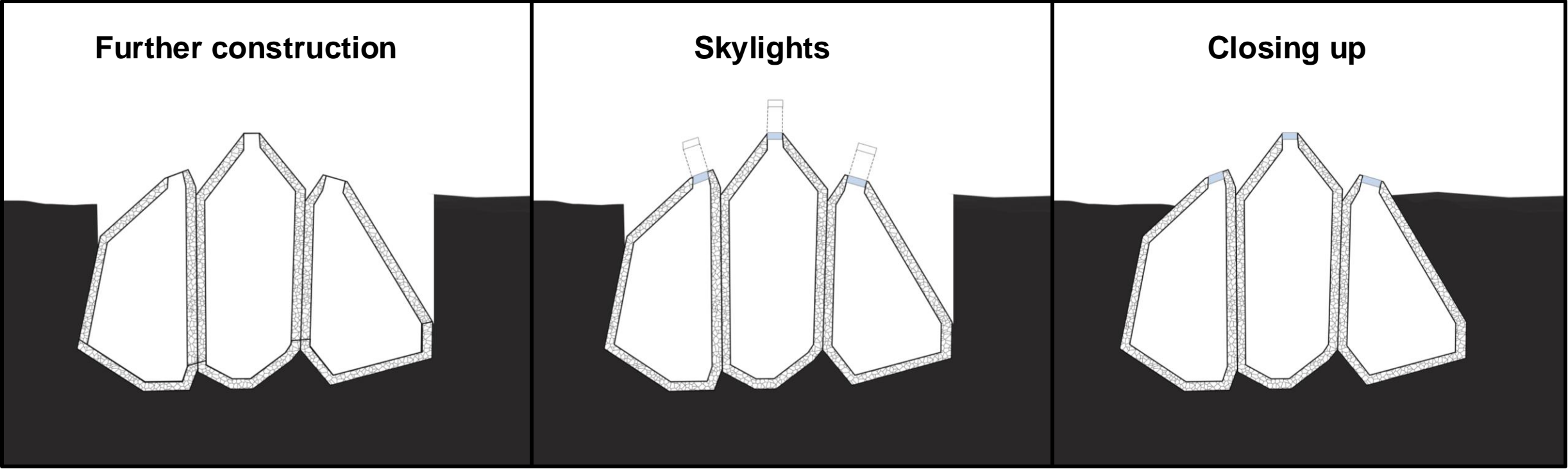
An abstract geometric composition of white, faceted shapes on a light gray background. The shapes are rendered with soft shadows, suggesting a three-dimensional space. The central element is a tall, narrow, multi-faceted prism. To its left is a smaller, wider, multi-faceted shape. To its right is a thin, triangular prism. In the foreground, there are two more triangular prisms, one pointing left and one pointing right, both with a double-line border on their top surfaces. The overall aesthetic is clean, minimalist, and architectural.

Construction

Construction Process |



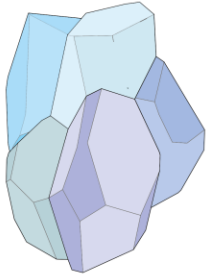
Construction Process |



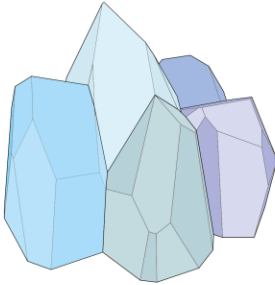
The background features several abstract, three-dimensional geometric shapes in white and light gray. These shapes include a tall, narrow prism with a hexagonal top, a shorter, wider prism with a triangular top, and several triangular prisms of various sizes and orientations. The shapes are rendered with soft shadows, giving them a sense of depth and volume. The text 'Form-Finding Process' is centered over these shapes.

Form-Finding Process

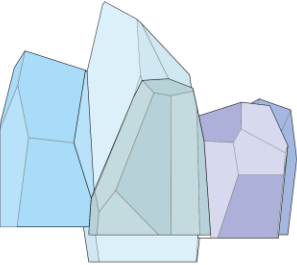
Form-finding process | Iterations



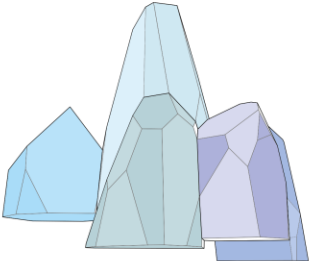
Starting shape: vertical cluster



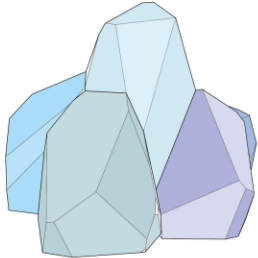
Iteration 1: flat bottom and central atrium



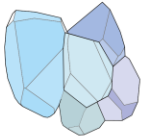
Iteration 2: different levels



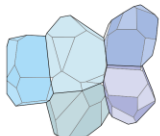
Iteration 3: enlarge atrium



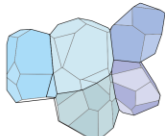
Iteration 4: bring together



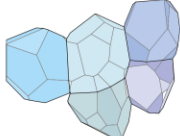
Iteration 5: change proportions



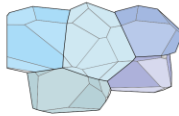
Iteration 6: 2-sided cluster



Iteration 7: change proportions



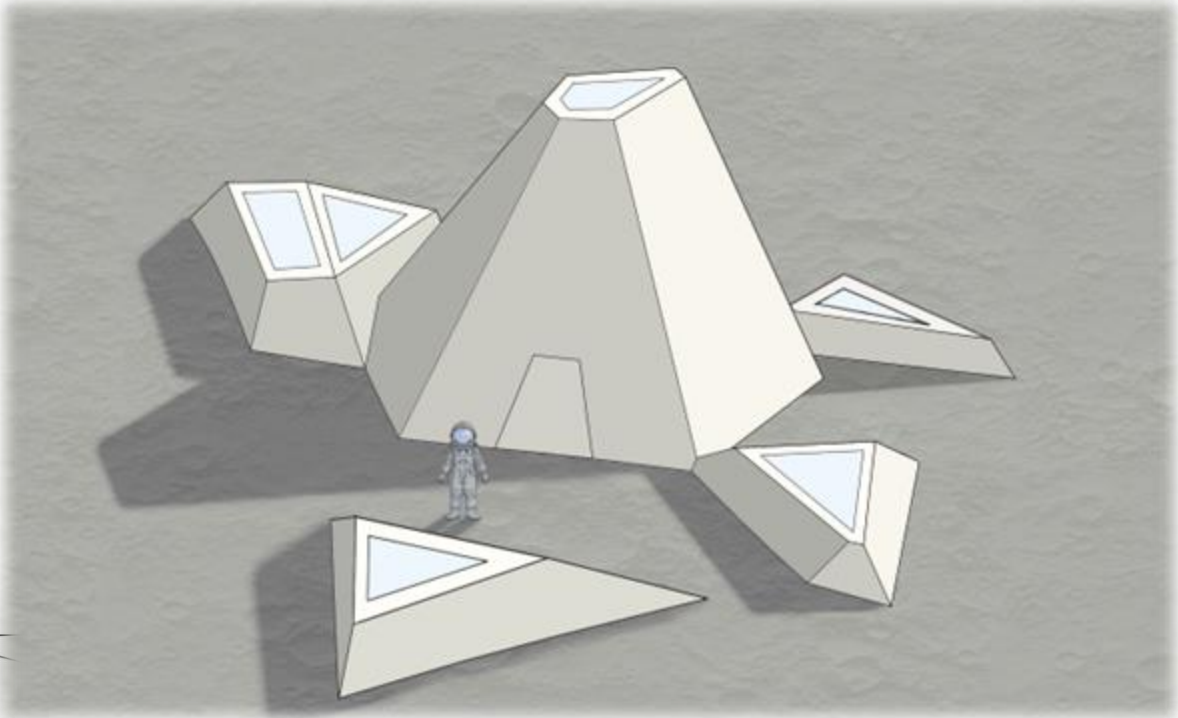
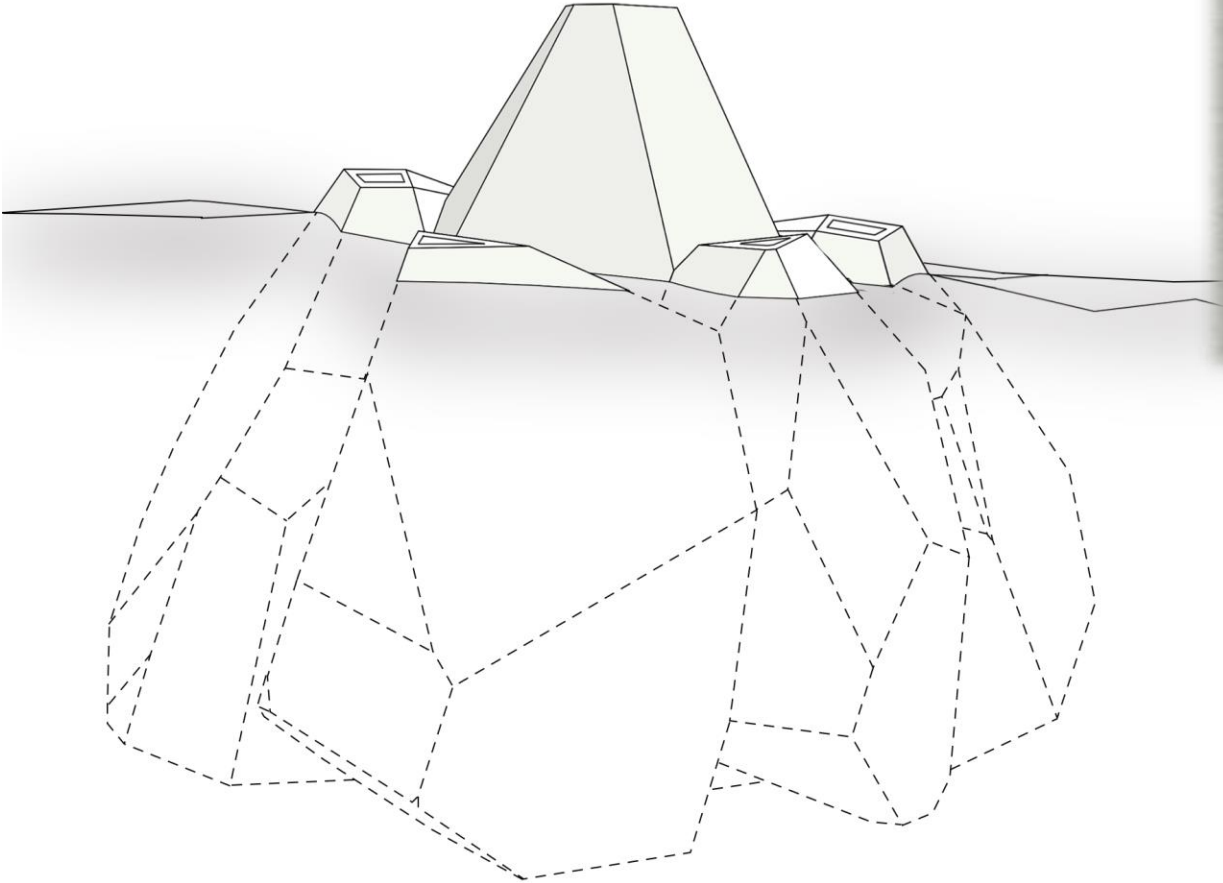
Iteration 8: no flat bottom



Iteration 9: multiple skylights

Form-finding process | Skylights

Back view - closed pod
underground



Skylights surface view



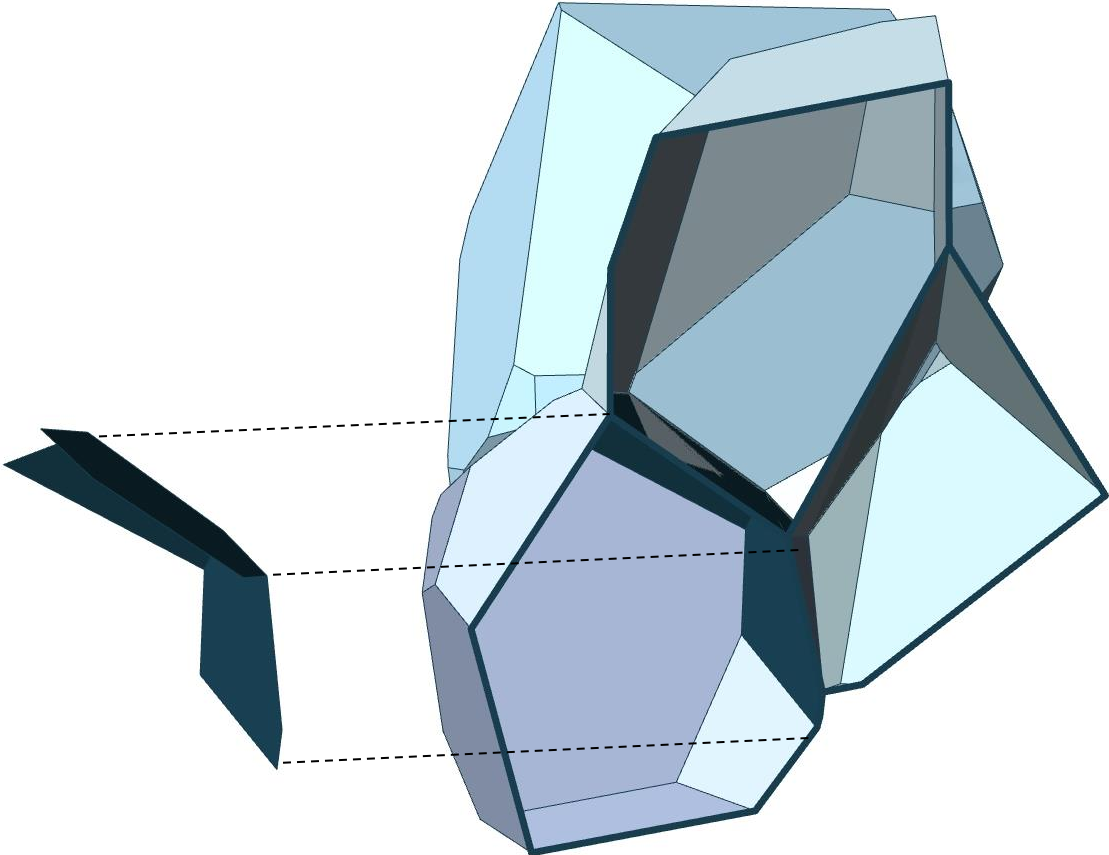
D2RP&A

Building Fragment

Wall Fragment

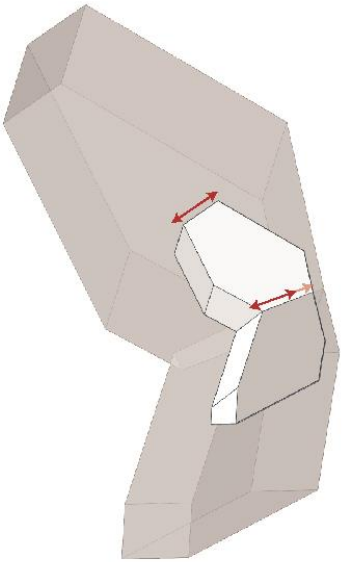
Fragment Components

Choosing Representative Fragment



D2RP&A
Building Fragment
Wall Fragment
Fragment Components

Fragment Extraction Process



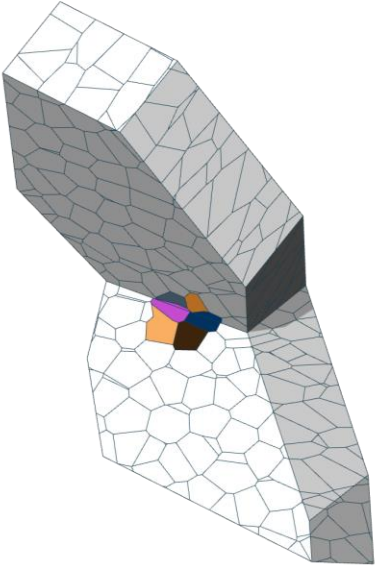
Extract wall fragment for voronoi iteration



Evaluate iterations

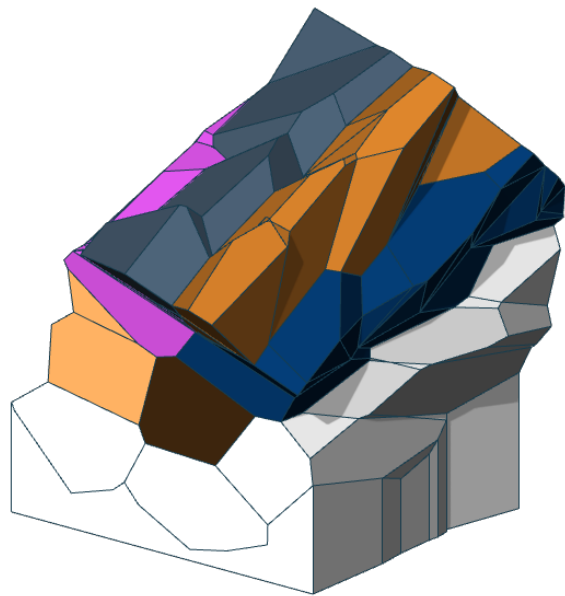


Chosen fragment composition

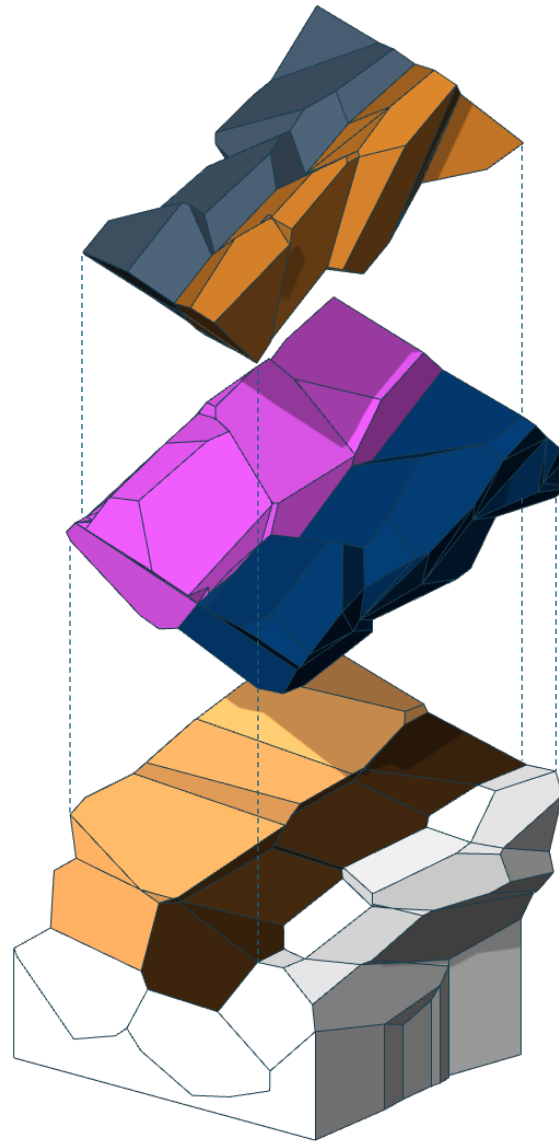


Chosen component to develop for production, to test stability

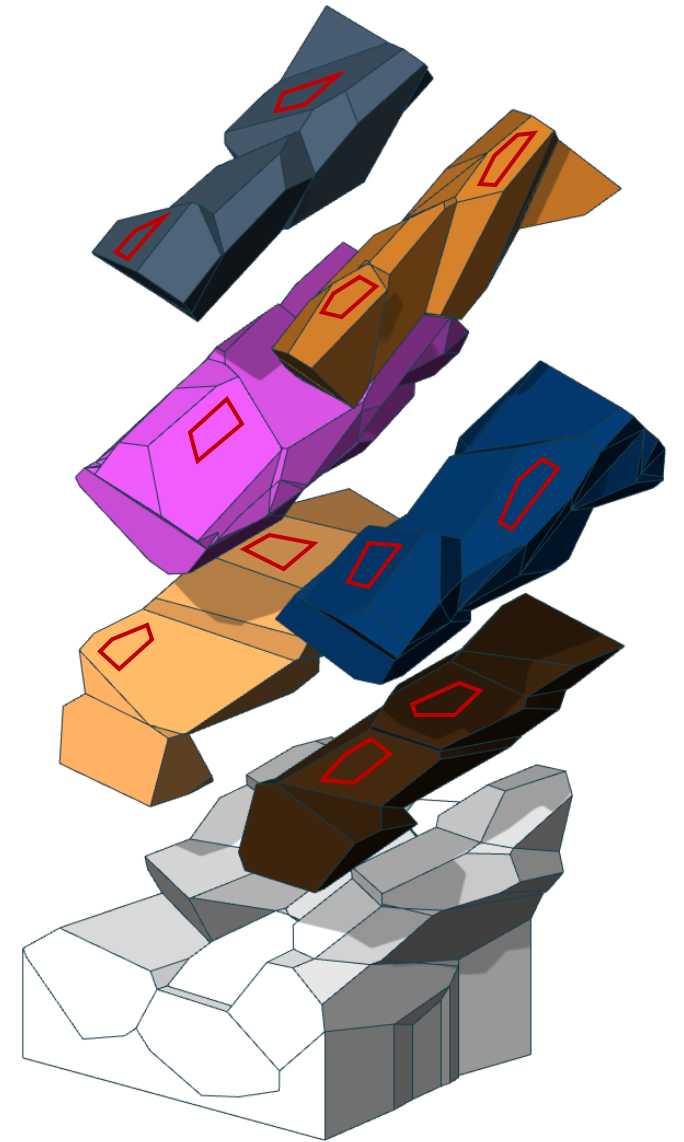
Fragment of 6 Components



Chosen Component

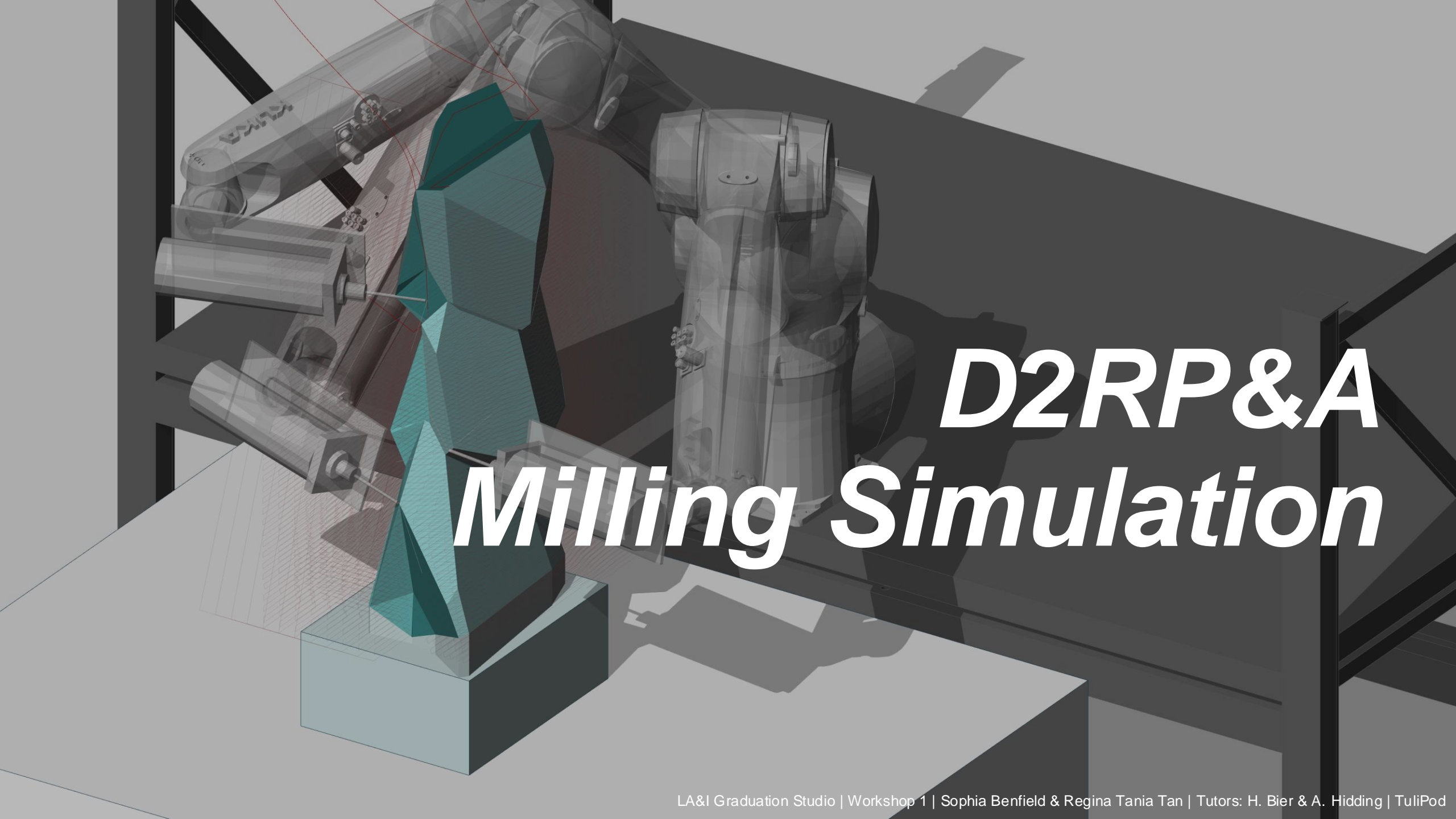


Connection

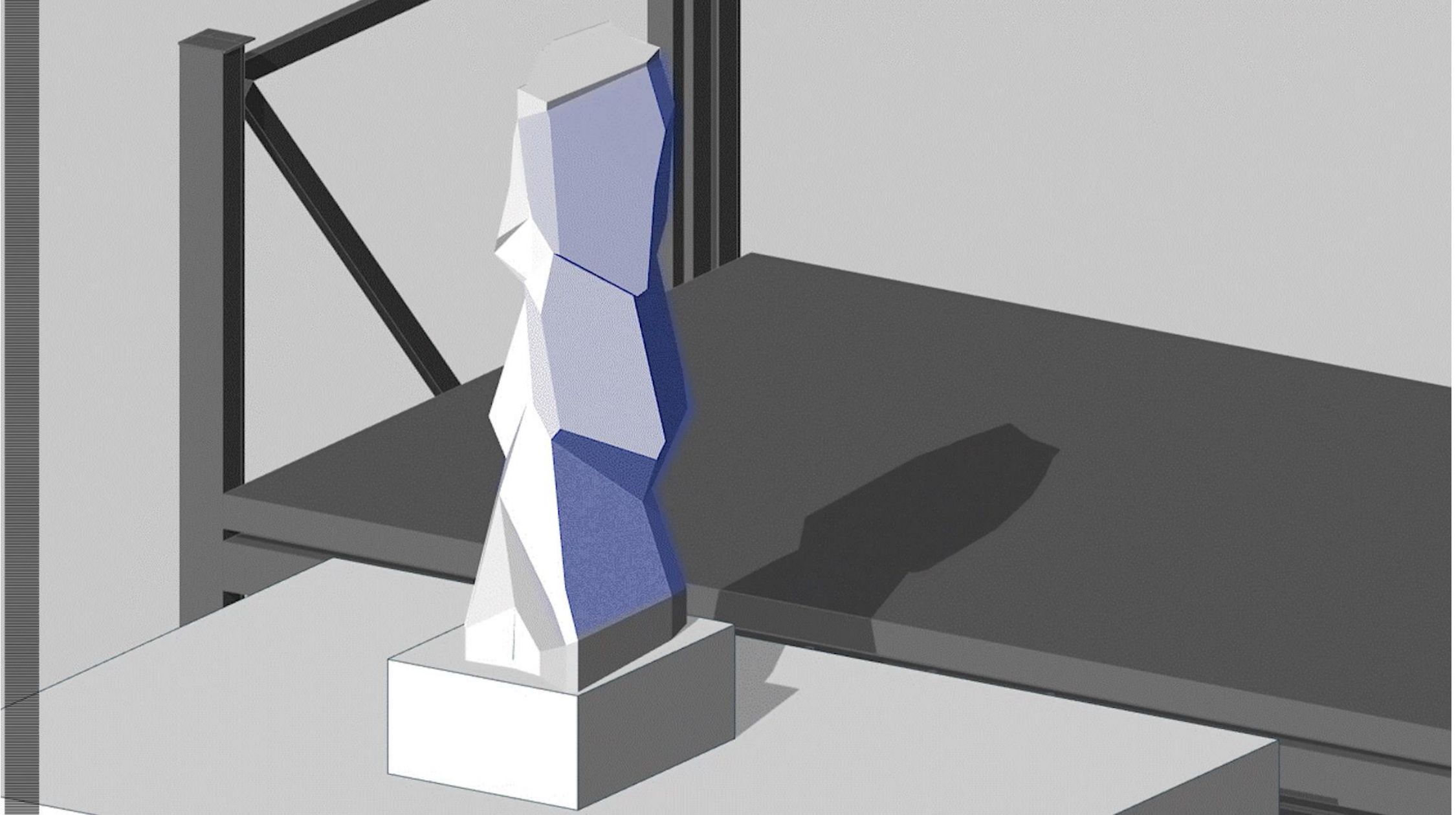


Milling Holes

D2RP&A
Building Fragment
Wall Fragment
Fragment Components

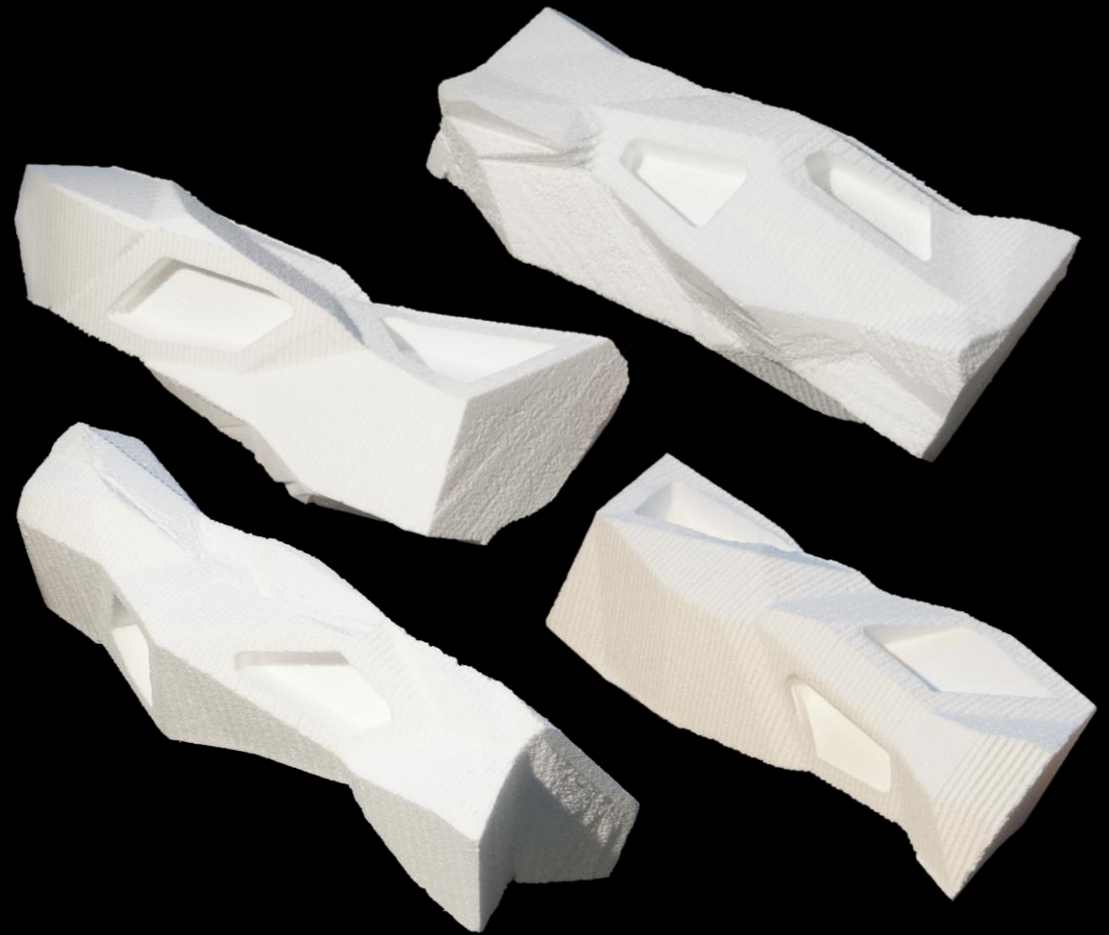
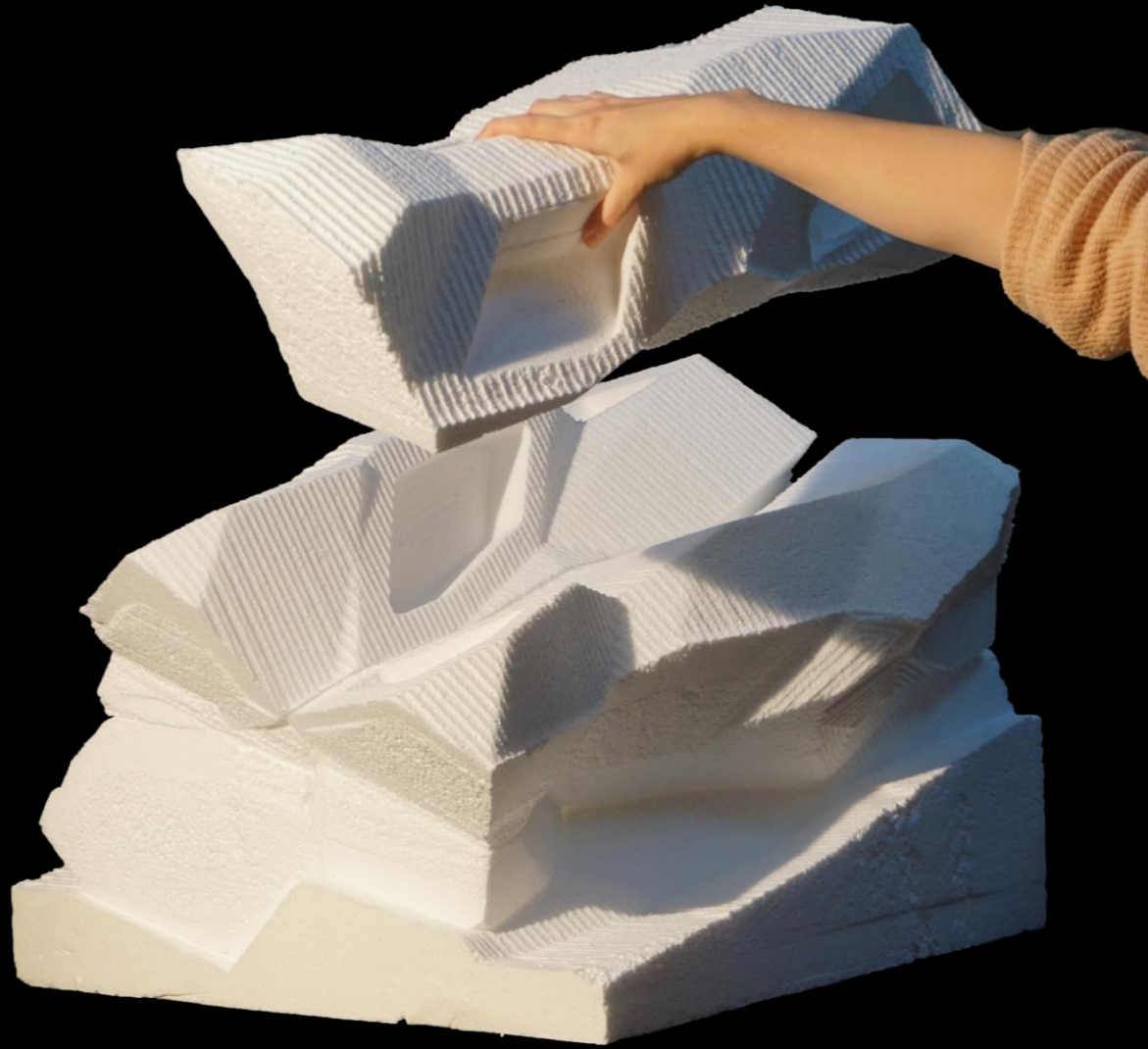


D2RP&A *Milling Simulation*



D2RP&A
Building Fragment
Wall Fragment
Fragment Components

D2RP&A | Lunar Architecture Graduation Studio | Moonshot



D2RP&A
Building Fragment
Wall Fragment
Fragment Components